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CONSULAR REPORTS ON INDUSTRIAL EDUCATION IN GERMANY

I. The System of Industrial Schooling
II. Schools for Builders
III. Preparatory Courses for Master Craftsmen
IV. "Meisterkurse" at Frankfort on the Main
V. The Trade Institute at Cologne
VI. Schools for Fruit-Growing

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
BUREAU OF EDUCATION,
Washington, October 2, 1913.

SIR: The people of the United States are greatly interested in the German systems of industrial and trade education. There is a large demand for information in regard to the general policies of German cities and States in regard to such education, and also for information in regard to schools for special trades.

I therefore recommend that the consular reports submitted herewith, (1) The German System of Industrial Training, (2) German Schools for Builders, (3) Preparatory Courses for Master Craftsmen, (4) Courses for Master Tradesmen at Frankfort on the Main, (5) Brief Report of the Trade Institute at Cologne, (6) Schools for Fruit-Growing—the first two by Ralph Busser, American consul at Erfurt; the third by George Nicholas Ifft, American consul at Nuremberg; the fourth by Vice Consul General William Dawson, jr., at Frankfort on the Main; the fifth by W. G. Dunlop, American consul at Cologne; the sixth by Consul General H. W. Harris, at Frankfort on the Main—be printed as a bulletin of the Bureau of Education.

Respectfully submitted.

P. P. CLAXTON,
Commissioner.

THE SECRETARY OF THE INTERIOR.

CONSULAR REPORTS ON INDUSTRIAL EDUCATION IN GERMANY.

I. THE SYSTEM OF INDUSTRIAL SCHOOLING.

By RALPH C. BUSSER, *United States Consul at Erfurt.*

1. OUTLINE OF SYSTEM.

CLASSIFICATION.

The industrial schools of Germany may be classified as follows: (1) General trade schools; (2) special trade schools; (3) engineering and scientific schools.

The general trade schools embrace the industrial continuation schools (gewerbliche Fortbildungs-Schulen), or part-time schools for young people between the ages of 14 and 17 (or 15 and 18) who have finished their general education in the common schools (Volksschulen) and are employed in the industries as apprentices, helpers, or other manual workers; the mechanics' schools (Handwerker-Schulen) with Sunday morning and weekday evening classes for the technical and theoretical instruction of journeymen; and the industrial art schools (Kunstgewerbe-Schulen) for the better education of artisans and mechanics in the theory, art, and technique of their respective crafts.

The special trade schools (gewerbliche Fachschulen) provide specialized technical and manual training in particular trades, aiming to take the place of ordinary apprenticeship, in whole or in part, by preparing the learner for pursuit of the trade as master, journeyman, or skilled apprentice. In Germany they are generally understood to include such institutions as textile schools, special schools for the metal industry, schools for builders, schools for woodworkers, tanners, clockmakers, opticians, potters, coppersmiths, bookbinders, printers, decorators, dyers, shoemakers, tin workers, plumbers, locksmiths, blacksmiths, toy makers, gardeners, brewers, bakers, millers, butchers, barbers, tailors, etc.

Each of the engineering and scientific schools makes a specialty of some of the following technical professions: Civil, mechanical, elec-

trical, and marine engineering; architecture, shipbuilding, navigation, forestry, mining and metallurgy, chemistry, pharmacy, and general science. Architecture is also the principal course in the schools for builders, which are classed as special trade schools because all of the building trades are there taught. The highest grade of engineering or scientific school is the Technische Hochschule.[1]

ORGANIZATION, GOVERNMENT, AND MAINTENANCE.

Most of the trade schools in Germany have been organized either by the respective trade guilds or other industrial associations or by the city or town in which they are located. Others were established by private endowment. The higher technical schools and industrial art schools are in most cases either State or municipal institutions. While the special trade schools are still largely managed by representatives of the appropriate guilds, industrial associations, or municipalities, many of them receive State appropriations by complying with certain requirements designed to bring about uniformity in educational standards, curricula, qualification of teachers, examinations, etc.

The development of the factory system, the substitution in many branches of machinery for hand labor, the growing utilization of art in industry, and the increasing technical knowledge and skill required in various departments of manufacture have created a demand for workmen with more thorough training and expert knowledge than could be acquired merely by learning the trade in the old-fashioned way. The necessary theoretical and technical training could only be given in industrial art and mechanics' schools, special trade schools, and engineering and technological institutes. In order to keep in close practical touch with the actual industries for whose operation the young people are being trained, these trade schools are usually found in the same localities where the related industries flourish. The relationship between the trade school and the industry is thus one of reciprocity, the school adapting itself to the changing conditions in the industry, and the industry being continually revived and stimulated to further improvement by the regular accession to its ranks of workmen trained in the school. Furthermore, as many of these trade schools, in addition to the theoretical, technical, and artistic training, offer to the students workshop practice, either in the school plant itself or in the appropriate mill or factory, the advantage of the proximity of the latter to the school is apparent.

Where the particular trade school is related to a factory industry the manufacturers concerned, as well as the industrial associations of which they are members, have in many cases been the prime

[1] See p. 28.

movers organizing or promoting it. Whether or not they or their predecessors have participated in the formation of the school, they are keenly interested in its curriculum and administration and are usually well represented on the board of directors or supervisors. This representation in the control or management of the school by the leaders in the industry for whose advancement it was established naturally tends to keep the educational work of the institution adjusted to meet the progressive requirement of the trade. Where, however, the trade school is not related to mines, mills, or manufacturing establishments, but to industrial operations conducted by independent artisans or mechanics, such as masons, carpenters, cabinetmakers, plumbers, locksmiths, shoemakers, decorators, bookbinders, etc., then the guild, consisting of the master workmen in the particular trade, will be found either in control of the institution or possessing certain supervisory or advisory powers in determining its curriculum, hours of instruction, entrance, and graduation requirements, etc.

In nearly every German city evening and Sunday classes have been organized for artisans in the various trades practiced in the community. The trades most closely related to each other are grouped together. The school composed of these various evening trade classes is usually called a "mechanics' school" (Handwerkerschule), which in many cities is consolidated with the local industrial-art school. While the mechanics' and industrial-art schools in a Prussian city are generally administered by the local school authorities, the State exercises certain rights of inspection and control as a consequence of its financial aid. The local chamber of commerce or other official body representing the manufacturers, and the trade guilds representing the master workmen, usually have the privilege of inspecting the departments in which they are especially interested, and due consideration is given by the school authorities to their suggestions as to courses and time of instruction, entrance requirements, workshop practice, etc. In Prussia all the trade schools receiving State aid, including the continuation schools, special trade schools, and the mechanics' and industrial-art schools, are under the supervisory control of the minister of commerce and industry, in whose hands it was considered that the schools could best be adapted to the local and national needs of commerce and industry. The more local administrative work of the State is divided among the various Prussian district presidents (Regierungs-Präsidenten), under whom are industrial school counsellors (Gewerbeschulräte) who act as supervisors of the trade schools in the particular Government district.

In Prussia nearly all the textile schools are local institutions, but receive State aid contingent upon compliance with the requirements of the national authorities. Each school is directly managed by a

body called a Kuratorium, composed of representatives of the local textile industry and Government officials. In technical management the Prussian textile schools are subject to the central technical bureau for the textile industry. The engineering and technological schools of Prussia are also under State supervision and receive appropriations from the State or city, or from both. The industrial continuation schools in most German cities and towns form part of the public school system, and as such are supported by the respective municipalities, usually receiving aid from the State, and sometimes from the manufacturers and trade guilds especially interested. The appropriations of the German State governments to the industrial continuation schools vary from one-third to two-thirds of the expenditures, not including the cost of rooms, heating, lighting, and janitor service, which is met by the local community. In Prussia the proportion contributed by the State depends largely upon the size and financial condition of the community—to the larger cities with more than 60,000 population, not more than one-third of the total outlay, and to the smaller cities from one-half to two-thirds, exclusive of the buildings and operating expenses connected with them. The total expenditures in Prussia for the industrial continuation schools amounted in 1911 to $2,304,792, of which 52 per cent was borne by the municipalities, 35 per cent by the State, 2 per cent by associations and guilds, and 11 per cent by employers' contributions, consisting of the obligatory tuition fees paid for their employees, together with amounts donated by some of them voluntarily.

2. GENERAL TRADE SCHOOLS.

A. INDUSTRIAL CONTINUATION SCHOOLS.

AIM AND CHARACTER.

The continuation schools complete the common-school education in Germany by giving the youths who are obliged to start at once upon the task of earning a living the rudiments of a practical education which will be useful to them not only as citizens, but in the active pursuit of their respective vocations. The course in the common schools of Prussia covers eight years, upon the completion of which the compulsory period of full-time schooling ends. As a rule, however, compulsory education does not then entirely cease, for in most cities and towns German boys are required to attend the continuation school for six or seven hours per week during three years; that is, usually between the ages of 14 and 17. The boys who have entered as store or office employees upon a business career attend the commercial continuation school (Kaufmännische Fortbildungsschule); those who have taken up an industrial vocation,

as trade apprentices, factory workers, or otherwise, attend the industrial continuation school (Gewerbliche Fortbildungsschule).

The aim of the industrial continuation school is to furnish the young apprentice or factory worker with the kind of technical and business instruction which he can not get in the shop or factory where he is employed, but which he needs in order to ply his vocation intelligently and advance his economical well-being. Another important object of the continuation school is to give the youth instruction in language, science of government, civic and industrial affairs, trade practices, hygiene, factory sanitation, etc., that will fit him to be an intelligent citizen as well as an efficient master workman or competent employer.

The tuition of the students in the continuation schools is paid by their employers, but it is merely nominal, amounting to but $1 or $2 per year. The main financial burden is borne by the municipality, with the aid of State appropriations, provided the local authorities have complied with certain requirements set by the State.

VOCATIONAL STUDIES.

For industrially employed youths who have neither the time nor the money to attend a special trade school the continuation school constitutes an exceedingly valuable and important aid, especially in view of the thoroughness and growing importance of the examinations for journeymen's and masters' certificates. Naturally, the industrial continuation school can reach its full development only in the large cities, where a special organization in ascending single-trade classes is possible. Good results are, however, attained in the smaller cities and towns by grouping related trades; for example, the apprentices of the various building trades.

In selecting the subjects of instruction, the aim is to serve the civic, vocational, and economic interests of the apprentices and to cultivate in them the technical knowledge, artistic sense, and idealism that, with the necessary mechanical skill and practical experience, go to make the master craftsman. The vocational studies (Fachkunde) are designed to broaden as much as possible the apprentice's knowledge of his trade. For classes which embrace single trades or groups of trades this expert or technical instruction includes elementary geometry, professional trade drawing, machine drawing, and the sketching of designs from prepared drawing cards; and, also, if teachers and other facilities are available, the handling of raw materials, tools, machines, and working models. For practical manual instruction, however, especially that relating to the particular trade, one must look, as a general rule, to the more advanced or specialized institutions, such as the industrial art schools, mechanics' evening

schools, and the special trade schools. In some large industrial continuation schools algebra, physics, chemistry, natural science, and mechanics are taught in elementary form. In the great majority of schools, however, these advanced subjects are omitted, because the very limited period of instruction must be devoted to more necessary studies.

BUSINESS INSTRUCTION.

Another illustration of the practical nature of the instruction in well-organized industrial continuation schools of German cities is the teaching of business methods and affairs (Geschäftskunde), the knowledge of which will be useful to an artisan or mechanic in the carrying on of his particular vocation, whether as employer or subordinate. The apprentice or learner receives such instruction in industrial bookkeeping and arithmetic as can be applied to his trade; he is taught the principles governing production, distribution, and consumption; the sources of supply of raw materials; the market for the products of his trade; the computation of cost; and the fixing of prices. He learns about simple mercantile and credit relations, insurance, postal affairs, and railroad traffic. He is informed as to the appropriate industrial laws and regulations, hygienic requirements of the workshop, the functions of chambers of commerce, guilds, and other industrial organizations, trade customs, etc. In the arithmetic course a study is made of checks, drafts, and bills of exchange; currency, weights, and measures; interest, percentage, commissions, contract estimating, etc.

GENERAL INSTRUCTION FOR UNSKILLED WORKERS.

The most difficult task of the German industrial continuation schools, especially in the large cities, has been the planning of the instruction for the unskilled workers, namely, those not apprenticed to or learning any particular trade, but performing unskilled or automatic labor as barrow men, drivers, deliverymen, helpers, or machine operatives in the various industries. These youth, who constitute about one-fifth of the total number of boys attending the industrial continuation schools of Prussia, are without the undivided aim in life that the apprentice has in his single vocational work; the will to learn some one trade thoroughly is often lacking; the manual skill remains undeveloped; and the proper love of work or pride of vocation can not be cultivated. Such a boy is usually controlled by the desire to earn money as quickly as possible; the income is proportionately high and makes him independent of home control too soon. It is only in exceptional cases that the employer takes a personal interest in such workers, and the dangers of the big city approach closer to them than to other classes of employed youth.

The consequence is that a comparatively large number of them fall into evil ways. In view of these conditions, the establishment of an effective system of education for the unskilled workers is considered in Germany an urgent problem of the present time.

In the selection of studies for this class of boys, the chief aim of the well-organized German continuation schools, such as those of the large cities, is to enable them to learn the principles governing their industrial environment and the means by which they may advance themselves economically, and, at the same time, to broaden their general education. Appropriate connecting ideas are the entrance of the boy into industrial life, his position in the working community, the activities of factory, workshop, and general traffic, and the system of work and cooperative service. The care of the health and the proper use of spare time are taught. Besides language, religion, civics, and other subjects which apply to all classes of workers, simple courses in domestic and industrial bookkeeping and other business studies are given. Composition and arithmetic are closely connected with vocational and civic affairs, and the endeavor is to fix the instruction by practice and application. The aim is to handle the instruction in such a way that it applies most appropriately to the student's occupation and place in the industrial organization. When practicable this is accomplished by examples from actual life rather than by theoretical discussions. Proper consideration is of course given to the practical experience and intellectual ripeness of the students. Naturally, the plan of instruction covers a wide range, as the intellects of unskilled workers show such extraordinary variation. In this connection one of the most difficult tasks is the organization of these workers in classes in accordance with their widely differing capacities. Where they are mostly employed as helpers or operatives in a town's principal industry, like the manufacture of textiles or small metal goods, the instruction is arranged accordingly. It is said that in localities where the boys seldom change their occupation it is easier to organize the classes according to the kind of business.

CULTIVATION OF CITIZENSHIP.

The making of competent workmen is by no means the exclusive aim of the German industrial continuation schools. The cultivation of intelligent citizenship, patriotism, and the cooperative spirit among the workers is considered quite as essential in the promotion of national efficiency as manual skill and technical knowledge. The ideal sought to be attained by the system is the enlightened citizen who is capable of performing efficiently his social and civic obligations as well as the tasks of his vocation, and who "not only seeks to advance his own welfare through his work, but also consciously

places his labor in the service of the community." As means to this end there has been introduced in the industrial continuation schools of many German cities a course of instruction in civic affairs (Bürgerkunde), including studies designed to teach the connection of the individual calling with the common life in the family, school, and workshop, in the community, State, and Empire; to explain the genesis and system of important public institutions; to cultivate reverence for the constitution and public laws, loyalty to the home and fatherland; and to induce earnest and patriotic cooperation in the affairs of the community and nation. For example, the students are instructed as to the local municipality and its various departments; public hygiene and sanitation; system of taxation; laws for the protection and insurance of workers; the operation of courts of justice; the functions of the chief public authorities; important facts about the organization and administration of the State and Empire, the army, the navy, and the colonies.

PHYSICAL TRAINING AND RECREATION FACILITIES.

Other praiseworthy features of the German continuation schools, designed to promote national efficiency, are the physical training and recreation facilities (Jugendpflege). In the well-organized schools the obligatory studies in this division embrace elementary physiology and personal hygiene (care of the body, bathing, clothing, food, temperance, etc.), and the rendering of first aid to the injured. For the voluntary participation or use of the students many continuation schools, especially in the larger cities of Germany, provide gymnasiums, swimming pools, playgrounds, and other athletic facilities; and regular instruction is given in gymnastics, swimming, and field sports. While prizes are frequently offered and other measures taken to induce the students to participate in the gymnastic exercises, outdoor sports, and games, and in the walking tours arranged by the teachers, the use of compulsion is discountenanced upon the principle that force leads to opposition, and that those who unwillingly take part in athletics would receive little or no benefit therefrom. In addition to these facilities for voluntary physical training, the continuation schools frequently provide for the optional participation or attendance of the students other forms of education, culture, and entertainment, such as lectures, concerts, dramatic performances, singing classes, reading and game rooms, and excursions for visiting museums, factories, and other places of historic or industrial interest. These excursions, which are conducted by the appropriate teachers, are exceedingly interesting and valuable to the students in the concrete examples of civic and technical instruction thus afforded.

ATTENDANCE AND TIME OF INSTRUCTION.

The question of compulsory or optional attendance in continuation schools has heretofore been left to the respective municipalities. The Prussian State Government, however, by conditioning its annual appropriations upon the establishment of compulsory attendance, has succeeded in inducing most of the communities to make the attendance compulsory. In 1910 Prussia had 1,818 industrial continuation schools (gewerbliche Fortbildungsschulen), with 321,226 students; 59 association schools (Vereinsschulen), with 5,831 students; and 285 guild schools (Innungsschulen), with 11,952 students. Of the industrial continuation schools, 1,749 (including 61 work schools) had compulsory attendance and 69 optional attendance. The unskilled workers in the industrial continuation schools numbered in 1910, 66,599; the remainder were trade or factory apprentices as distinguished from mere operatives in factories or helpers in other industrial operations. In the 59 association schools, which are maintained by apprentices, mechanics, manufacturers, etc., the attendance is optional.

After agitation for a number of years a draft of a national law has recently been submitted to the Prussian Landtag, or Legislature, which makes three years' attendance at an industrial or commercial continuation school obligatory on the part of all boys under 18 years of age who are employed in industrial or commercial work in the particular community. The boys usually finish in the common schools at the age of 14 or 15, and, according to the new State law, their compulsory attendance at the continuation school will continue for three years or until the end of their apprenticeship, but not beyond the eighteenth year. It is also provided in this new law that one can be released by the school authorities from the obligation to attend the public industrial continuation school by attendance during the required legal period and for an equal number of hours at a guild or other continuation school or trade school, provided that the instruction at such school has been recognized by the president of the respective government district (Regierungs-Präsident) as an adequate substitute.

As a rule, the annual period of instruction amounts to at least 240 hours, generally extending over 40 weeks, with a weekly average of 6 hours. This has been found insufficient, however, for those trades which require extensive drawing or practical expert instruction. A reduction to four hours per week is allowable for classes which receive supplementary expert instruction for at least two hours per week at a guild or association school recognized by the State. For those who follow the season trades, such as masons, carpenters, painters, etc., the period of instruction may be diminished during

the principal work season, if it be correspondingly increased in the slack season, provided such an arrangement is practicable. The vacation in the continuation schools is usually regulated by industrial requirements and by the practice in the common schools of the locality.

Originally the instruction in the continuation schools was largely confined to week-day evenings and Sunday morning hours. The school authorities, however, now recognize that the fatigue of the students after a day or week of toil in the places of employment, and the listlessness and natural feeling of repulsion toward studies which rob them of well-earned rest and recreation, impair seriously the value of evening and Sunday instruction. The tendency is therefore to abolish Sunday hours and evening hours of instruction after 8 o'clock; and employers are compelled by law to permit the boys to be absent from business, without loss of pay, during those hours of instruction which may fall in the regular working period of the respective store, shop, mill, or factory. For example, in the industrial continuation schools of Prussia during 1911, 78 per cent of the instruction was given week days between 7 a. m. and 8 p. m., 12 per cent week days after 8 o'clock p. m. and 10 per cent Sunday mornings.

TRAINING OF TEACHERS.

In establishing the industrial continuation schools in Germany much difficulty was experienced in getting properly trained teachers. Teachers from the common schools with the required pedagogical ability seldom had the necessary technical or expert training in industrial branches like mechanical drawing and applied mathematics, while the artisans, mechanics, engineers, architects, etc., selected to give the expert or practical instruction often possessed no knowledge of the proper methods of teaching.

To overcome these difficulties, special courses (Ausbildungskurse) of some weeks' duration for the training of teachers have been organized. The principal studies taught are drawing, industrial art, bookkeeping, and practical mathematics. Many of the teachers, in order to prepare themselves thoroughly for the theoretical or technical instruction of apprentices in the continuation school, have spent a few weeks or months in practical study or work in the particular industry represented in the class they expected to teach. Thus the teacher of the shoemaker class in the Erfurt industrial continuation school, while not a shoemaker himself, has made such a special study of the theory and art of shoemaking and has kept in such close touch with the practical side of the trade, that he is peculiarly equipped to give to the members of his class that kind of instruction in drawing and other technical subjects that will be of practical use to them in

the pursuit of their vocation. Furthermore, it is sometimes required that the teacher of drawing or other technical course spend a year or more at an industrial art school or in the appropriate special trade school in order to gain the necessary practical knowledge of the course he is to teach. On the other hand, the expert craftsman who is to give the shop or practical instruction, in addition to a number of years' experience in the industry itself, may be required to have a diploma from a trade school, and perhaps some little training in pedagogy.

B. INDUSTRIAL ART AND MECHANICS SCHOOLS.

INDUSTRIAL ART SCHOOLS.

The industrial art school (Kunstgewerbe-Schule), which is in many cities combined with a school for mechanics, represents the most recently developed phase of industrial schooling in Germany. It is virtually a municipal higher-trade school, generally under State supervision, for the professional and artistic education of master workmen, foremen, managers of technical and art departments of industries, pattern makers, designers, draftsmen, and modelers for the different branches of industrial art and for the fine or highly skilled trades. The studies are arranged in recognition of the particular needs of furniture designers, cabinetmakers, wood carvers, carpenters, plumbers, locksmiths, architectural draftsmen, sculptors, jewelers, chasers, painters on glass and china, sign painters, lithographers, bookbinders, printers, leather workers, upholsterers, paperhangers, interior decorators, textile handworkers, etc. The day or full courses at an industrial art school are intended for the learners and craftsmen of the art trades who can afford to devote one or two years to drawing, technical studies, and workshop practice in the appropriate department of the school. Here the aspiring artisan or mechanic can study the scientific principles and art rules of his industry and cultivate ideas of grace and beauty which can be combined with utility so that his work may be scientifically planned, expertly designed, economically and skillfully executed, and artistically as well as mechanically adapted to the utilitarian purpose intended. This instruction in technics and applied art provided for the craftsmen in practically every German city of industrial importance has exercised great influence not only in increasing the efficiency of the skilled workers but in stimulating their inventive faculties. This is demonstrated by the lavish display of countless beautiful conceptions of industrial art in store windows everywhere in Germany; and thousands of wholesale buyers from other parts of Europe and America come every year to lay in a stock of artistic wares and latest holiday goods of German manufacture.

MECHANICS' EVENING SCHOOLS.

The evening and Sunday schools for mechanics occupy an important position in the German industrial school system. In every community there are men of narrow means who can not afford to leave their work during the daytime or spend several years in a special trade school, industrial art school, or school of technology. Those who have a natural aptitude for the vocation which they have undertaken require only limited instruction in the science, art, and technics of the particular trade in order to develop into master craftsmen and fit themselves for the duties of foremen and other positions of direction and responsibility in industrial undertakings. Thus, in order to enable artisans and mechanics employed during the day to improve themselves in their respective trades, nearly every German city has organized, in connection with the industrial art school, trade classes for attendance, weekday evenings and Sunday mornings. These trade classes constitute the mechanics' school.

In addition to the organization of such mechanics' schools by the municipalities, trade guilds, or industrial associations, the Prussian administration of commerce and industry has succeeded in making the expensive equipment of the special trade schools serviceable to a wider circle of workers by establishing evening courses for the voluntary attendance of ambitious mechanics working at the particular trade taught in the school. Such special courses (Sonderkurse) have been arranged for machinists in the higher school for machinists and shipbuilders in Kiel, in the combined school for machinists in Cologne, and in the trade schools at Remscheid and Siegen; for gunsmiths, in the industrial continuation school at Suhl; for tin workers, in Siegen; and for plumbers in Gleiwitz. Special courses have also been arranged for locomotive engineers in Dortmund, Altona, Posen, Elberfeld-Barmen, Magdeburg, Stettin, and Schneidemuehl.

In arranging the program of instruction in the industrial art and mechanics' schools, the tendency is now especially to enlarge and cultivate the trade classes which are more closely related to the distinctive industries of the particular locality, even though it may result in stinting the other trade classes. This tendency is especially noticeable in connection with the school workshops (Lehrwerkstätte), where specialization in certain branches of mechanics and industrial art is on the increase. For example, the mechanics and industrial art school in Barmen pays particular attention to cabinetmaking and the lithographic industries; the school in Elberfeld to metal working and bookbinding; that in Dusseldorf to the building trades and landscape gardening; in Erfurt to shoemaking, printing, lithography, bookbinding, and cabinetmaking.

In many German cities the industrial art school and the mechanics' school are combined in one institution, and the courses are frequently

conducted in the same rooms and by the same instructors so as to avoid duplication in facilities and equipment.

ADMISSION AND COURSES OF INSTRUCTION.

While both the industrial art school and the mechanics' school provide instruction in drawing, mathematics, modeling, and shop practice in the handling of tools and materials, the practical work is not intended as a substitute for actual apprenticeship in a trade. The object of the school work is rather to make up for the deficiencies of such apprenticeship in theoretical, technical, and art culture; to acquaint the students with the latest discoveries and inventions in their respective trades; and to keep them fresh and up to date in all their methods. As a matter of fact, admission to full courses in most of the industrial art and mechanics' schools of Germany is dependent upon previous practical employment in the industry in which the student desires to perfect himself. The required length of experience varies from a few months to several years, according to the difficulty of the trade and the grade and character of work offered in the school. For full or day students the entrance requirements are more strict than for the evening and casual students.

The Prussian minister of commerce and industry issued a decree in 1912 recommending that in future the industrial art and mechanics' schools, excepting those which have already adopted identical or more far-reaching requirements, should in general admit as full students only those who have had as a foundation at least two years' practice in the particular industry. The admission as full students of those who are unable to show compliance with this requirement is to be dependent upon the decision of the director of the school with the approval of the board of trustees or upon the permission of the latter body alone. This governmental decree refers only to the students taking a full course in one of the artistic crafts; that is, those who devote themselves exclusively for several years to an industrial art and technical course. It does not concern the evening and occasional hour students, namely, those who are employed at their respective trades during the day and attend one of the classes for a few hours a week.

The above decree will make no change, however, in the requirements of admission to the majority of the industrial art schools in Prussia, because the completion of an actual apprenticeship has already been established by many of these schools as a condition precedent to entering as a full-course student. In some of the municipal industrial art schools an average of three years' previous actual employment at the trade is required, on the principle that the more practical experience a student has had in the trade the better the prospect of success from attendance at such a school. The strict

carrying out of this requirement, however, would by its very rigor have lead to the injury of many branches of industry and driven large numbers of talented boys with a good common-school education into the arms of the seductively advertised, but usually expensive and unsatisfactory, private trade schools, to whose proprietors the opportunity for profit is naturally a much more important consideration than the individual interest of the students. Consequently, in many industrial art schools a large number of exceptions are made to the general rule. Thus, the mechanics and industrial art school at Erfurt allows exceptions in the following cases, viz:

(1) Those in the freehand drawing crafts for advertisement and illustration work, book ornamenting, embroidery, etc.;

(2) Artisans in trades where work is practically suspended in winter;

(3) Apprentices who under their contracts of employment are required to work for the master only in summer and are permitted in the winter to pursue a special school training;

(4) Young people who after graduation from the common schools are delayed in entering a suitable apprenticeship and wish to utilize the waiting time in a trade preparatory course;

(5) Learners of art handicrafts whose state of health prevents them from giving all or part of their time to actual apprenticeship or factory work, and hence for their vocational education, are dependent upon the industrial art school; and

(6) Preapprenticeship students or those who require certain technical and art instruction to prepare them for entrance into the particular trade or industry as efficient beginners.

To the above classes of exceptions to the general rule requiring previous practical employment at the trade as a condition of entrance to an industrial art school should be added the professional teachers who desire to get the necessary training to equip them to give instruction in drawing, etc., as well as ladies who wish to develop their talents for household decoration and artistic handwork.

3. SPECIAL TRADE SCHOOLS.

TRADE SCHOOLS AS A SUBSTITUTE FOR APPRENTICESHIP.

Special schools exist in Germany for almost every trade known to the industrial world. It should be borne in mind, however, that the Germans do not believe in the plan of teaching trades wholly in the schools except when the conditions in a particular industry are such that the necessary training of the learners can not be provided. This is peculiarly the case in the textile industry, where the necessity for special technical knowledge and the acquisition of high skill in handwork, as well as in the operation of the complicated ma-

chinery of the trades, led to the establishment of special schools for spinning, weaving, knitting, ropemaking, dyeing, finishing, ribbon and lace making, embroidering, etc. Even in many of these schools a requirement for admission is previous practical employment in a textile factory. Other important institutions which substitute school for apprenticeship training in whole or in part are the special schools for the metal trades (gewerbliche Fachschulen für Metall-Industrie) in the Prussian cities of Schmalkalden, Siegen, Iserlohn, and Remscheid; the school for coppersmiths at Hanover; the tanning school at Freiberg, Saxony; the school for clock and watchmaking at Furtwangen in Baden; the schools for basket making at Litchtenfels, in Bavaria, and Heinsberg, in Prussia; the schools for straw plaiting in the Odenwald and Black Forest, and in Saxony; and the schools for pottery and for woodworkers in various parts of Germany.

Besides the incompleteness of the practical training which the learners in many trades would receive if dependent upon the trade schools, there are certain economical disadvantages in the general substitution of special trade schools for apprenticeship, such as the tremendous expense to the State of providing adequately equipped workshops (estimated in Prussia at $100 to $125 per year for each student), the corresponding cost to the parents of supporting the boys during the period of instruction, now to a large extent borne by the employers to whom they are apprenticed, and the enormous loss to industry that would result from the absence of apprenticeship labor.

COURSES OF INSTRUCTION.

The regulations governing admission to the industrial art schools and mechanics' evening schools have no application to the special trade schools, which fix their own entrance requirements according to the standard of the school and the conditions in the respective industry. If it be a trade preparatory school, or a trade school aiming to take the place of apprenticeship in whole or in part, then the only condition precedent to entrance is in most cases completion of the eight years' course in the common schools (Volksschulen). If, however, it be an advanced trade school designed not to replace but to supplement the learning of the trade under the apprenticeship system, then admission may be confined to those who have already had one or two years' practical experience in the particular industry, or even to those who have passed through the period of apprenticeship and become journeymen. While attendance at an industrial art school, school for mechanics, or elementary trade school will in some German States relieve one of the obligation to attend the industrial

continuation school (gewerbliche Fortbildungs-Schule) for the corresponding period, the special trade schools, as a general rule, can be entered only after completion of the continuation school course or of equivalent instruction. The motive is to insure proper maturity of mind in the learning of a difficult trade.

The curriculum of the typical German special trade school for the highly skilled crafts may be divided into three general parts: First, theoretical or technical instruction; second, business teaching; and third, practical manual training. In the theoretical or technical course the most important studies are drawing, mathematics, and industrial art. In the latter course the most time and attention is devoted to drawing, not only on account of its practical application to the trade taught, but because it trains the mind and eye, cultivates the sense of proportion and mechanical correctness, and develops a taste for the harmonious and artistic. The course in arithmetic is chiefly devoted to technical calculations incidental to the special trade taught in the school; and in geometry, to the practical application of geometrical relations. The purpose of the business teaching is to prepare the student for the practical conduct of the business of his trade. He is therefore taught the principles of production and consumption, computation of cost and fixing of prices, the sources of raw materials, available markets, the method of bookkeeping most suitable to his trade, and the important laws and regulations governing the conduct of the particular trade or industry. The practical manual training is in the form of shop practice in the school itself when the school is equipped with the necessary tools and machines, or in the associated factories or workshops of the locality. Where the manual work is done in the school the instruction is generally given by a master workman, who may be regularly engaged in the industry itself or who at least has kept in touch with the modern conduct of the trade and the latest improvements in tools, machinery, and industrial processes. Thus by affording to factory artisans and the journeymen of the trades the opportunity of learning the use of the best machines and appliances, the most efficient time-saving methods, the highest type of manipulative skill, and the most efficient and economical industrial processes, there is a constant tendency to evolve new ideas and inventions, improve the work, and cheapen the cost of production. Without the special trade schools many apprentices would have made no progress beyond the industrial training possible in an antiquated factory with out-of-date machinery or old-fashioned methods. As it is, the German craftsmen, with their specialized trade school education, have had much to do with the development of the splendidly equipped modern factories and other industrial establishments by means of which Germany in recent years has become one of the leading exporting nations of the world.

SCHOOLS FOR BUILDERS AND WOODWORKERS.[1]

The schools for builders, for the instruction of architects, masons, and carpenters, were among the earliest special trade schools to develop in Germany. They were first organized merely as departments of drawing schools, industrial art, and continuation schools; but during the past few decades the building trades have become so complicated in response to the demands of modern civic, social, and industrial life that it became necessary to erect separate buildings and establish more elaborate curriculums for the instruction of the students.

By reason of the extensive timbered areas of Germany, such as the Odenwald, Thuringian, and Black Forests, with their varieties of excellent hard and soft woods, one of the most important and prosperous national industries has naturally been that of woodworking, including the manufacture of building materials, clocks, canes, toys, woodenware, and furniture, cabinetmaking, etc. The craftsmen in wood, such as carpenters, turners, joiners, cabinetmakers, wood carvers, etc., prior to 1859 had to be satisfied with such theoretical and technical instruction as could be furnished by the industrial continuation schools, the industrial art schools, and the schools for builders. In that year the first German school for woodworkers was established at Berchtesgaden, in Bavaria. Similar schools, principally to meet the needs of the industries of cabinetmaking, turning, and carving, were subsequently established in Oberammergau, Furth, Bischofsheim, Partenkirchen, Koetzting, and Neuhammer, in Bavaria, and Furtwangen, in Baden. Of the woodworking schools in other parts of Germany the most prominent are the school for carpenters at Berlin, the school for turners and woodcarvers at Leipzig, and the school for cabinetmaking and wood carving at Flensburg.

TEXTILE SCHOOLS.

The textile industry is one of the greatest in Germany, and as its products are to a large extent disposed of in foreign markets the continued prosperity of the industry is dependent upon the ability of the manufacturers to hold their own against foreign competition. The supremacy of the German industry in the past has largely depended upon perfection of machinery and the skill and cheapness of the labor. With the development of textile manufacturing abroad and the gradual increase in wages among skilled textile workers at home, the competitive power of the German industry is becoming more and more dependent upon the skill and technical training of its workers. Foreseeing the growing menace of foreign

[1] For a more detailed description of schools for builders, see p. 41.

competition, especially in countries like the United States, with plenty of capital and available raw materials, it was natural that the manufacturers and associations of the textile industry should foster the development of schools to educate and train skilled workers for the most difficult and artistic grades of work. This movement toward a more artistic and technical training of the textile workers has also received the moral and financial support of the governing authorities of the municipalities in which the industries flourish and also of the respective German States.

The schools for hand spinning were the original textile schools in Germany. These were gradually supplanted in the middle of the nineteenth century by the hand weaving schools, most of which were later transformed into schools for machine weaving. In the latter schools the instruction at first was chiefly confined to theoretical work in designing and patterning; but with the progress in the technics of the trades, the specialization in the industry, and the intense competition, the opportunities for learning the textile trades thoroughly in the factories gradually decreased, so that it became necessary generally to substitute the school workshop for the apprenticeship system in the weaving industry. Therefore most of the weaving schools are now equipped with machine looms, and much attention is devoted to the mechanical technics of the trade.

With specialization in the textile industry has come specialization in the organization of textile schools, so that now in many schools the instruction is limited to the particular branch of the industry which flourishes in the respective locality. The requirements of special technical knowledge and high skill in handwork, together with the difficulty in learning to handle the complicated machinery, were the underlying causes of such specialization of textile education in Germany. There are now in various parts of the empire, especially in Saxony and the lower Rhine country, special trade schools for spinning, knitting, weaving, dyeing, finishing, ropemaking, lace, fringe, and ribbon making, embroidering, etc.

The textile schools of Germany can also be divided into two general classes. Lower schools, which are intended to develop the skilled artisan or master workman of the trade; and higher schools, which aim to prepare the students for managerial, supervising, and important technical positions in the factories. There are higher textile schools for the different branches of the silk, cotton, woolen, and linen industries, respectively, and for the making of lace, ribbons, trimmings, etc. The work in these institutions is usually divided into three parts: (1) Theoretical instruction in the drawing and lecture rooms; (2) experimental work in the laboratories; and (3) manual training in the school workshops. A requirement for admission to many textile schools is previous practical employment in

the appropriate textile factory. The annual tuition fees range from $7 to $47 for Germans and $47 to $250 for foreigners. In Saxony the textile schools also discriminate against residents of other parts of the German Empire, and some schools exclude foreigners entirely. Another expense to the students is the cost of school supplies, such as books and drawing materials. In several machine-knitting schools the students also pay for the yarns they use, but have the privilege of keeping or selling their own finished products. On the other hand, some schools sell the products of the students and apply the proceeds to the purchase of raw materials. It is said, however, that the practice of allowing the students to buy the raw fabric and dispose of the products of their individual skill has proved successful in that it operates as a strong inducement to painstaking work and economical use of materials.

4. ENGINEERING AND SCIENTIFIC SCHOOLS.

MECHANICAL ENGINEERING SCHOOLS.

The higher engineering schools provide a course of instruction for those preparing to take positions as constructing and supervising engineers in the larger machine shops, educating them for the management of the very highest class of engineering enterprises. The lower engineering schools, on the other hand, are intended rather to train machinists for positions as foremen or superintendents in the smaller machine shops, foundries, and factories. The chosen career and the capacity of the student will determine which class of school he will attend. Each class of school in its course of instruction fulfills a different set of requirements for the efficient conduct of foundries, machine shops, and other mechanical undertakings, and both have immeasurably contributed to the wonderful development of the German steel and iron industry. The Prussian higher engineering schools are located at Dortmund, Elberfeld, Kiel, Breslau, Aix la Chapelle, Hagen, Stettin, Cologne, Einbeck, Posen, and Altona; the lower engineering schools at Dortmund, Elberfeld, Hanover, Gleiwitz, Duisburg, Cologne, Goerlitz, and Magdeburg. The latter are also designated as special schools for the metal industry, because plumbers, locksmiths, brass founders, and other metal workers can acquire at such institutions the higher technics of their trades, and thus prepare themselves for the direction or management of industrial undertakings in their special lines of work. Schools for metallurgy (Hüttenschulen) are sometimes connected with the mechanical engineering schools. Some of them have evening classes for machinists, locksmiths, tin workers, and other mechanics of the metal trades who wish to study engineering or metallurgy or otherwise gain the technical knowledge necessary to advance themselves.

It is from the mechanical engineering schools and the schools of technology and not from the technical colleges that the German manufacturing industries draw the great majority of their constructing and supervising engineers, factory managers, and shop superintendents. Among engineering and manufacturing concerns it is the preponderating opinion that the course at the technical colleges takes up too much time and is of too theoretical and scientific a nature for the training of men who have to do with the practical management of workmen and mechanical operations in foundries, machine shops, and similar metal industries.

SCHOOLS OF TECHNOLOGY.

AIM AND CHARACTER.

The Technikum, or school of technology, is an institution found in many parts of Germany, where a number of trades, usually closely related to each other, are taught together so as to admit of a duplication of courses, teachers, and equipment. By grouping together such correlated trades as electrical and mechanical engineering, drafting, chemistry, mining and metallurgy, architecture, and the various trades associated with building, good practical results have been attained. Thus under a common organization the subjects of drawing, physics, chemistry, and mathematics can be taught in the same institution to students of different professions and trades. The courses at a Technikum are frequently determined by the character of the technical industries in the same locality, and at some of these institutions arrangements are made for giving the students practical experience in the factories or workshops of the vicinity.

ORGANIZATION AND SCOPE.

An idea of the organization and scope of the German schools of technology can be gathered from the following outline of the various departments of a typical higher school of technology, namely, the Thuringian Technikum at Ilmenau in the Grand Duchy of Saxe-Weimar. This noted institution is under the direct supervision of the grand-ducal government and is divided into three departments as follows:

(1) The department of mechanical and electrical engineers, which has for its object the preparation of students for the practical requirements of industry as constructors, mechanical superintendents, and managing or directing owners of factories and other industrial establishments. Within the scope of this department is the manufacture of steam engines, steam turbines, boilers, gas engines, water-power machines, machine tools, transmission power plants, armatures, pumps, windlasses, motor vehicles, iron bridges, and roofs,

central heating plants, special machines for particular industries like paper mills, spinning and weaving mills, sugar refineries, breweries, gas works, etc., also the construction of dynamos, electric cars, and motors, electric apparatus, light and power plants.

(2) The department for machinists and electricians, the aim of which is to prepare the students for intermediate technical positions, in construction offices, machine shops, and factories; also as independent managers of small machine or electrical plants and of businesses for the installation of light, heat, and water.

(3) The department for foremen, master machinists, machinery erectors and mechanical draftsmen. The object of this department is the theoretical training of foremen, etc., in machine construction and electrical work; of master machinists for the mechanical and electrical plants in shops and factories of every kind; of proprietors of machine shops and repair plants; and of mechanical draftsmen, fine mechanics, blacksmiths, locksmiths, turners, and cabinetmakers who aim to better their technical education.

FACILITIES FOR PRACTICAL WORK.

The association of German engineers has laid down the following objective principles to guide the schools of technology in the practical training of engineering and technical students:

(*a*) Acquirement of a certain skill of hands.

(*b*) Knowledge of the materials and tools of machinery construction.

(*c*) The method of assembling the finished parts.

(*d*) Familiarity with the duties of engine, boiler, and machine attendants.

(*e*) Understanding of the working conditions and methods in a well-ordered factory, also of the practical application of the industrial laws and regulations concerned.

(*f*) Learning proper methods of intercourse with the workers.

In view of the inadequacy of school workshops as a substitute for practical manufacturing experience in the training of a future engineer, shop superintendent, or factory manager, the Thuringian Technikum and other schools of technology in Germany have made arrangements which enable them to offer to the students facilities of study and practical work at suitable factories in the same locality. The industrial establishment thus available to the students at the technical school in Ilmenau is a local factory for the construction of machines, electrical apparatus, and mechanical specialties. There opportunity is afforded for the application of theory to practice; for the study of the factory equipment, the machine tools, mechanical operations, and manufacturing methods; and for the making of

experiments so far as they do not interfere with the business operations of the factory. This practical training includes instruction in the character and properties of the materials employed in machine construction: the manipulation of the material in foundries, blacksmiths' and locksmiths' shops, turning and cabinetmaking shops; and the function and use of the appropriate hand and machine tools. In view of this opportunity to study the operations of an establishment of varied manufacture, the sequence in the processes of production, the economy of time, labor, and material, and the intercourse with the workmen, it is apparent that the factory experience during the student period has great advantages over the narrower scope and less practical operations of a school workshop, upon which technical students were formerly dependent.

At the higher schools of technology the tuition fees vary from 100 marks ($23.80) to 500 marks ($119) a year. At the lower schools of technology the tuition fees are considerably less. These institutions are all under State supervision and receive appropriations from either the State or city in which they are located or from both. The examinations for graduation are regulated by Government commissions, and diplomas are conferred.

TECHNICAL COLLEGES (HOCHSCHULEN).

The technical colleges represent the most advanced grade of industrial education in Germany. To Americans unfamiliar with the German nomenclature the term "Hochschule" (literally "high school") gives a false impression of the character of the school, as it bears no similarity to an American high school either in rank or curriculum. The German technical "high school" is virtually a scientific institution of the highest rank, and can only be compared to the engineering and scientific departments of some of the great American universities. It is really more advanced than most of the latter, in that the standard of admission is generally higher, and research and experiment are carried on by maturer students and along more original and far-reaching lines. The scientific training and investigating spirit of these schools have made possible many of the discoveries in chemistry and electricity by which methods of manufacture have been revolutionized, industrial processes cheapened, natural resources conserved, the waste products of farm, mine, and factory utilized in the production of valuable new commodities, and the foreign trade of Germany thereby increased many millions of dollars annually. At all of these institutions there are departments for architecture, civil, electrical, and mechanical engineering, chemistry, and general science. At some of them there are certain other departments, such as shipbuilding and marine engineering at the Royal Technical High School in Danzig; mining and

metallurgy in Aix la Chapelle; pharmacy in Brunswick, Stuttgart, and Darmstadt; naval architecture in Berlin; forestry in Karlsruhe; agriculture in Munich; and a railway, post, and telegraph course in Stuttgart. In the department of chemistry at the school in Brunswick there are special courses for the study of food stuffs, sugar, and ferments.

In civil and electrical engineering, chemistry, and pharmacy, mathematics and general science the technical colleges occupy an indisputable position in Germany. On the other hand different investigators have expressed the opinion that for mechanical engineering, mining, and the building industry the courses at a technical college are too theoretical and, owing to the length of time away from practical work, tend to unfit the student for the management of workmen and the active direction of industrial enterprises. It is claimed that outside of the field of chemistry and of civil and electrical engineering, the great majority of engineering, managerial, and techincal positions in the industries are filled by graduates from the schools of mechanical engineering, foundry schools, mining schools, schools of technology, schools for builders, and the more advanced special trade schools.

5. AUXILIARY EDUCATIONAL FACILITIES.

SCHOOL WORKSHOPS (LEHRWERKSTÄTTE).

The school workshop is of course a part of every special trade school. It is also connected in many cities with those classes in the industrial art school and mechanics' evening school which are organized for the better training of workmen in the distinctive local industries. The school workshop offers practical experience in the pursuit of a trade, and is modeled after the shop, factory, or department of the industry for which the student is to be trained. During the past decade the great majority of industrial art and mechanics' schools have also been equipped with workshops.

Among the employers of skilled labor, the guilds, and industrial associations generally in Germany there was much hostility at first to the idea of school workshops, because of the fear that the State intended to use them as a substitute for apprenticeship to master craftsmen or to manufacturers. But this opposition is dying out as the employers and guilds realize that the object of these workshops is not to supersede, but to supplement, the process of learning under the apprenticeship system. In the industrial art school the workshop instruction is preparatory or supplementary to the practical experience of the artisan in learning or plying his trade, as the case may be. In the mechanics' evening school it is complementary to the daily tasks of the journeyman at his trade.

SCHOOL EXHIBITIONS.

Many of the continuation schools, industrial art and mechanics' schools, and special trade schools once or twice a year hold local or provincial exhibitions (Schulausstellungen) of the drawings, models, patterns, and other work of the students. The main objects are to stimulate competition among the students for the prizes, which are frequently offered, and to show the public, especially the manufacturers and tradesmen, what is actually done in these schools that are so closely bound up with the industrial welfare of the nation. The opportunity to see the various specimens of work produced under the instruction of specially trained teachers and of leading experts direct from the trades is of great value, not only to the students themselves, who can thus recognize the defects of their individual work, but to the journeymen and master artisans who wish to keep abreast of the progress in theory, technique, and art in their respective trades. For the distribution of prizes a fund is usually created by contributions of the State and municipality, and by the donations of guilds, industrial associations, and private benefactors. In Erfurt, for instance, 133 students of the industrial continuation school were rewarded during the year 1911 with prizes consisting chiefly of technical books, working tools, cases of mathematical instruments, and small sums of money.

WORKMASTER COURSES.

The original chief purpose of the "workmaster courses" (Werkmeisterkurse) was to afford independent or master mechanics, who during their experience as apprentices and journeymen had had no opportunity for technical and theoretical training, the kind of instruction that the present-day learner can get in the special trade schools and industrial continuation schools. In the past decade, however, the courses of instruction have been somewhat altered to meet changed conditions. Almost everywhere now the master mechanics constitute only about one-third of those attending the workmaster courses, while the remainder are journeymen, most of them young men who have received a certain amount of technical education in the industrial continuation schools and the mechanics' schools or special trade schools, but after working at their trade for a while take supplementary courses for the purpose of mastering the more difficult problems of their trade and keeping informed on its latest improvements and most modern methods. In all the Provinces of the Kingdom of Prussia, especially in the important industrial centers, there have been established, mostly by chambers of trades (Handwerkskammern), various workmaster courses of six to eight weeks duration, open to all mechanics who can afford the time. Workmaster

courses are regularly held in different parts of Prussia for cabinetmakers, joiners, locksmiths, goldsmiths, silversmiths, carriage builders, decorators, saddlers, and leather workers, bookbinders, painters, paperhangers, building mechanics, watchmakers, plumbers, gas and water installers, glaziers, wheelwrights, shoemakers, and tailors. The theoretical part of the workmaster course generally includes such studies as bookkeeping, business affairs and customs, trade practices, banking, credit, contract estimating, and price calculation. The total number of important workmaster courses in the year 1910–11 in Prussia amounted to 164, and the participants 1,570, of whom 570 were master mechanics and 1,000 journeymen. Besides, there were not less than 1,210 small master courses with technical or theoretical instruction for 28,984 artisans. Part of the expenses of these courses is defrayed from State appropriations; the balance is assumed by the students, guilds, and chambers of trades.

EXPERIMENTAL SHOPS.

The experimental shop (Versuchsanstalt) or laboratory is an important department of many of the large manufacturing establishments. By it facilities are provided for research, tests, and experiments which help to solve the problems of the industry and eventually result in the improvement of technical methods, the discovery of new processes, and the invention of valuable commodities, all of which constitute fresh sources of national trade and wealth. Laboratories and experimental shops are also connected with the engineering and scientific schools and the more advanced special trade schools, and are intended to aid them in the practical elements of the work. In the technical schools they are primarily for the application of acquired knowledge to concrete objects, for research, experiments, and inquiry into the unknown. This experimental and research work as carried on in factory and technical school results in numerous mechanical inventions and improvements, scientific discoveries, new methods of utilizing the waste of farm, factory, and mine, and the placing on the market from time to time of new by-products and other articles of commerce. Of the many important German industries developed by this laboratory work, those most familiar to Americans are probably the manufacture of drugs, chemicals, benzol, creosote, aniline dyes, and other coal-tar products. Germany's present unrivaled position in the manufacture and export of drugs and chemicals is chiefly due to the thorough instruction and extensive practical investigation in the technical colleges and the continuation of this study and experimenting by chemistry and pharmacy graduates in the splendidly equipped laboratories of the German chemical factories. Thus the experimental work of the scientific investi-

gator cooperates with the enterprise of the manufacturer and the technical ability of his workmen in the extension of Germany's industries and commerce.

6. VOCATIONAL SCHOOLS FOR GIRLS.

In the German common schools, which girls as well as boys are compelled to attend until they reach the age of 14 or 15, the girls receive needlework instruction in addition to the general studies. In Germany, prior to 1860, continuation or part-time schools existed only for boys, because the factory system had not developed to the extent of employing many women, and the domestic duties were supposed to be learned at home. However, with the change in the social relations brought about by the employment in the industries of such a large proportion of women with little or no opportunity to learn household duties at home, movements were started in various parts of Germany for the establishment of industrial continuation schools for girls (Mädchen-Fortbildungsschulen). Naturally, the course of instruction in these schools was chiefly confined at first to domestic duties, such as sewing, darning, mending, tailoring, cooking, baking, and serving. Subsequently, the course in domestic science was broadened to include household economy and hygiene and elementary training in the care of children and the sick. Of more recent growth are the special trade schools for girls, in which they are wholly or partly trained to be milliners, dressmakers, hairdressers, art embroiderers, lace makers, and other textile handworkers. Of these special trade institutions the most important are the textile schools. The textile industries employ a large number of women, who work alongside of the men in the making of suits, underwear, gloves, stockings, lace, trimmings, and other textile goods. Departments for women have been organized in some of the lower textile schools already existing, and in many localities, particularly in Saxony, special trade schools have been established for teaching girls hand lace making and other branches of textile handwork.

The early domestic science and trade schools for girls were mostly established by philanthropic associations and wealthy manufacturers. Subsequently, when their value and effectiveness in improving the home and promoting the industrial welfare of the women were generally recognized, the municipal, district, and State authorities also interested themselves in the movement, so that there are now in Germany a large number of schools for the training of girls in commercial and industrial pursuits as well as in domestic science. However, it is generally recognized by the German educational authorities that the most unsatisfactory feature in the organization of the girls' continuation schools has been the optional attendance, as the schools

thereby fail to reach those most in need of training, and the courses and period of instruction have to be arranged to suit the wishes of the students rather than to accomplish the true purpose for which the schools were established. Hence the agitation for the new law recently passed by the Reichstag, requiring municipalities to extend the industrial regulations for compulsory continuation-school attendance to include the female workers.

Considering the activities of the housewife as an occupation, the leading educational authorities in Germany regard the training of the girl in housekeeping as the principal aim of the industrial continuation school. Some observers go so far as to contend that instruction in the management of the home and in the raising of children is the absorbing task of the continuation school, and that every other pursuit must give way before it. These people claim that, as most girls within a short time leave their chosen occupations to get married, the cost of their vocational training is in the great majority of cases practically lost to the industries. Hence, they contend the course of instruction in the continuation schools for girls should be restricted to practical domestic duties, together with improvement in general education through enlargement of the knowledge acquired in the common schools. The Royal Prussian Department of National Industry (Königliches Preussische Landesgewerbeamt) holds a different opinion, however, as is evident from the following quotation from its Administration Report for 1912 (p. 222):

> There remains now to consider whether the instruction in domestic science shall in all cases constitute the only educational matter of the continuation school. Such a limitation would not be justified, because between the entrance into industrial employment and marriage there is a considerable space of years in which it would be unjust to exclude the girl from the vocational instruction required for the enhancement of her earning capacity. Moreover, not all marry; many continue their vocational activity during marriage or take it up again as widows or deserted wives. Also many girls marry men who pursue the same occupation as their wives. The wives can then make use of their acquired knowledge without pursuing a regular vocation. This refers especially to commercial occupations. From the foregoing it follows that the continuation school should offer to working girls the opportunity for vocational as well as household education, and the difficult question is how best to accomplish this. * * * The solution is simplest for the unskilled working girl. Here the domestic-science training can properly constitute by far the largest proportion of the teaching matter. Through a particular subject of instruction, which may perhaps be defined as science of living (Lebenskunde), connections between occupation and home may be established. In this way approximately 100,000 unskilled working girls from the industries and 31,000 from commerce and trade could be reached. The suggestion that the unskilled working girls should, by instruction in the continuation school, be trained for a skilled vocation goes beyond the aim of a continuation school. For this the few hours of instruction are insufficient. Furthermore, in such cases it would be necessary to provide extensive and expensive school workshops, which nevertheless can not stand as a complete

substitute for the actual business workshops in which the skilled workers are regularly employed the entire day. On the other hand, it is practicable in such a school to train unskilled working girls for the occupation of a housemaid. For this, however, no special provisions are required in a continuation school in which the domestic-science instruction preponderates. * * *

Training in household duties is of so great importance to the health and increase of the German people that it must find its place in the continuation school. It is also to be borne in mind that in classes for the exclusively female vocations (and these will be in the majority) any of the subjects of the domestic-science course can be dropped if they are incident to the vocation in question. For example, in many cases the needlework can be omitted from the course of instruction. If the establishment of compulsory domestic-science schools with full-day instruction can not be thought of at the present time, still the organization of such institutions with optional attendance is to be desired. From the popularity which the present schools of this kind enjoy, it is to be expected that the attendance will increase when the compulsory continuation schools are established and attendance at the former (optional schools) relieves one of the obligation subsequently to attend the latter. For this reason many girls upon graduation from the common school would be deterred from immediate entrance upon an industrial pursuit, a postponement which is to be welcomed in their own interest. Naturally, the expenses for the girl students must be materially reduced so far as practicable. The establishment of schools with half-day instruction is recommended, whereby the girls may spend their free time in earning money or at home in the pursuit of domestic duties.

As most girls take industrial positions merely to bridge over the time between graduation from the common schools, usually at the age of 14, and marriage, the special trade schools for girls are, as a rule, elementary institutions in which the training is chiefly manual, as distinguished from the more advanced schools, such as the higher textile schools, in which the instruction is less manual and more theoretical and technical. Since separation of the sexes is a distinctive characteristic of the German educational system coeducation in the continuation and special trade schools has not made very rapid progress, although it is said that in schools where it has been tried the presence of girls spurred the boys on to better work.

7. RELATION OF SCHOOLS TO NATIONAL INDUSTRY.

DEVELOPMENT TO MEET REQUIREMENTS OF DIFFERENT GRADES OF WORKERS.

A distinguishing characteristic of the German industrial schools is their development to meet various conditions and requirements in the industries for whose advancement they were established. Originally there were only two general grades: Lower industrial schools, such as the continuation schools, mechanics schools, and the special trade schools; and higher industrial schools, such as the technical colleges for the education of chemists, scientists, architects, civil, electrical, mining, and mechanical engineers, etc. It was

found, however, that for many supervising positions involving the practical management of workmen and the superintendence of mechanical operations, the instruction in the lower grade was inadequate, and in the technical colleges too theoretical, expensive, and time consuming for the majority of aspirants. To meet this demand for a middle grade of industrial schools there were established the schools of technology (Technika), mechanical engineering schools (Maschinenbauschulen), schools for builders (Baugewerkschulen), mining schools, schools of metallurgy (Hüttenschulen), higher textile schools, navigation, shipbuilding and marine engineering schools, etc. These middle industrial schools, as a general rule, are equipped with workshops or have arrangements with appropriate local industries for practical work by the students. The school workshops are models of the factories or machine shops for the technical management of which the students are being trained; and, as they usually contain the most modern tools and machines and are conducted along up-to-date lines by practical instructors direct from the trades, the students are made familiar with the technical and mechanical operation of the respective industries for which they are preparing.

ADAPTATION OF SCHOOLS TO LOCAL REQUIREMENTS.

Another special feature of the German general and special trade schools is their adaptation to the needs of particular localities. The general trade schools have their classes organized and courses of instruction planned to meet the requirements of the industries which flourish in the locality in question. If cabinetmaking, metal working, or book publishing, for instance, are the principal industries of a certain community, then special classes will be organized in the industrial continuation school, industrial art school, and mechanics' evening school, for the different woodworking, metal working, and bookmaking trades, respectively, in which the workmen of that locality are chiefly employed.

The special trade schools are located, as a general rule, in the locality or region where flourish the particular branch of industry in which the students are or will be employed. That the specialized trade schools are so generally local in their organization and government is perfectly natural in view of the tendency of many industries in Germany to concentrate in certain towns or districts, so that the steady employment and material welfare of the inhabitants of a particular locality is often dependent upon a single industry. For example, in certain parts of Thuringia local prosperity largely depends upon the making of toys and dolls; in other places, upon the manufacture of glass, optical goods, and scientific instruments; in other sections, upon the china and pottery industry.

By establishing the school in proximity to the related industries the institution is conveniently accessible to the workers, becomes responsive to the special requirements of the local manufacturers, and can avail itself of the services of experts direct from the appropriate factory or workshop. On the other hand, the local industry is continually reenforced by technically trained recruits, thereby leading to the frequent introduction of new methods and processes learned through the scientific studies and experimental work of the trade school. These reciprocal relations between the industrial schools and factories in the same community or district tends to keep the local industries in a progressive and flourishing condition and to counteract the movement toward concentration of manufacturing and population in the big cities at the expense of the smaller cities and towns.

COOPERATION BETWEEN TECHNICAL SCHOOLS AND RELATED INDUSTRIES.

The mechanical engineering schools, metallurgical schools, mining schools, and schools of technology are generally located in the center of industrial regions where machine shops, glass and metal foundries, mines, or other related industries are accessible to the students for such practical experience as they are required to have in conjunction with the school work. For example, the famous Clausthal school for mining is conveniently located in one of the greatest mining regions in Germany, so that students in the practical preparatory course can spend their mornings in active work in some branch of the local mines and their afternoons at the lectures designed to explain such actual work in the industry. In the regular course one day a week is devoted to excursions to neighboring mines and smelting works. This plan of dividing the time between theoretical study in the lecture rooms, experimental work in the laboratories, and practical execution in the school workshops or neighboring industries is also pursued by many of the technological and engineering schools.

PUBLIC CONTROL AND NATIONAL COOPERATION.

Private industrial schools, or those organized and managed for profit, are comparatively rare in Germany. The industrial continuation schools, mechanics' schools, and industrial art schools are, as a rule, conducted by the local authorities in municipal buildings, the State having certain rights of supervision and control where, as is usually the case in Prussia, it shares with the municipality the expenses of operation. The special trade schools are either conducted by the municipality or by the guilds or other industrial associations interested in the particular trade taught. While schools conducted by guilds or other trade associations may impose certain restrictions as to attendance, they are considered as public institutions because

conducted in the interest of a local industry and not for the sake of financial profit; and they frequently receive appropriations from the local or State government upon condition of complying with certain requirements for the benefit of the general public. The mechanical engineering schools, schools for builders, and schools of technology, although mostly State institutions, are sometimes housed in municipal buildings or receive other support from the communities in which they are located.

While conceding the advantages of a local administration of industrial schools which peculiarly applied to distinctive local industries, national educators early recognized the necessity of more uniformity in the educational systems throughout the Empire in order that the schools could more efficiently cooperate for the upbuilding of German commerce and industry. In the effort to create analogous systems of industrial schools the various State governments have received invaluable assistance from the national associations for the promotion of industrial education, such as the German association for continuation school affairs (Deutsche Verein für das Fortbildungsschulwesen), the association of German industrial schoolmen (Verband deutscher Gewerbeschulmänner), and the German association for commercial education (Deutsche Verband für das kaufmännische Unterrichtswesen). These national associations have branches in nearly all of the important German cities, and frequent local meetings are held to discuss school measures and reforms and to hear lectures on appropriate subjects. In the five meetings held in the fiscal year of 1911–12 by the Erfurt association for continuation school affairs (Erfurter Verein für das Fortbildungsschulwesen) five lectures were delivered: "Higher courses for bakers at the grain-converting institution in Berlin;" "The youth and apprentices' recreation home;" "The imperial insurance regulations;" "The Panama Canal and its importance;" "The scheme of organization of the trades in Germany." Among the topics that will be discussed by the local association during the coming winter are "Explaining sexual matters in the continuation school," "Industrial bookkeeping," and "The practical preparation of continuation school teachers."

As a result of the unifying influences above mentioned, there is now systematic relation in general aims, rank, entrance requirements, and courses of instruction in German industrial schools of the same kind. Students of schools in one State are, under a system of mutual accrediting, admitted to equivalent schools in other States of the Empire. Another advantage is the similarity in nomenclature, which facilitates discussion and reform in school affairs. The association of German engineers, by its recommendations concerning curriculums, entrance and graduate requirements, etc., has exercised considerable influence in establishing the high standards of the engineering and

technological schools. In Prussia the reform, extension, and unity of the textile schools have been largely brought about through the efforts of an official organization, with headquarters in Berlin, styled the Central Technical Bureau for the Textile Industry. Its principal duties are to make tours of inspection, to formulate instruction as to curriculums, examinations, etc., for the textile schools of Prussia; to advise the Prussian Minister of Commerce and Industry on matters relating to textile education; and to conduct mechanical and chemical experiments in textile manufacture. As the prosperity of such a large proportion of the German people is dependent upon the textile industry, the value of a uniform and progressive system of textile schools is incalculable.

UTILITY OF ART IN INDUSTRIAL EDUCATION.

The aim of industrial education in Germany is not merely to teach the craftsmen to produce that which is serviceable, durable, and mechanically correct, but also that which is artistic and in accordance with good taste. The existence in museums, churches, and elsewhere of innumerable and varied art objects produced by the handicraftsmen of the Middle Ages before the introduction of machinery had largely sacrificed art to utility; and the survival to this day of the traditions, pride of vocation, and esthetical standards of the medieval craftsmen and of the powerful guilds into which they were organized are important factors in the cultivation of the public taste and in the education of artisans in those trades of which the products may be ornamental as well as useful. In spite of the introduction of machinery and the factory system, there is still opportunity for artistic handwork in many of the trades, such as cabinetmaking, stone and metal work, upholstery, leather-goods making, bookbinding, printing, pottery, painting and interior decorating, shoemaking, and the various branches of the textile industry.

Through the utilization of art, old industries have from time to time been revived as well as new industries created. An illustration of this is seen in the clock industry of the Black Forest and the Tyrol, which was at one time threatened with destruction by the competition of machine-made clocks. Through the establishment of the schools for woodworkers at Furtwangen and elsewhere in the forested regions of Germany, and the excellent art training received at these institutions, the carved woodwork with which the clocks are made in those regions became so celebrated that the industry has been able to hold its own in the world's market.

Not only the handicrafts, but the factory industries, have received invaluable aid from the technical and artistic education of the workers, made possible by the industrial art schools. The progressive

German manufacturers, as well as the leading public educators, foreseeing that the export of low-priced ordinary goods would gradually diminish as other countries with sufficient natural resources and capital establish competing industries, have endeavored to improve the artistic and technical capacity of the factory workers. Therefore they have encouraged the establishment of special courses in industrial art and trade schools, so that factory mechanics could receive the proper technical and art education suitable for their respective trades; develop their taste and ingenuity; learn the use of the latest machines, tools, and appliances; and acquire new ideas capable of practical application in the factory for improving the standard products or for designing or preparing new specialties. The German industries now impress the artist into their service as they have the inventor, technician, and scientific investigator.

An industrial art school under municipal or State control and largely maintained by public funds is to be found in nearly every industrial city and town of Germany. Of these popular institutions the most celebrated are the Royal School of Industrial Art at Munich, Institute of the Industrial Art Museum at Berlin, and the Royal Academy of Graphic Arts and Bookmaking at Leipzig.

SERVICE OF SCHOOLS IN PROMOTING GERMANY'S EXPORT TRADE.

No single cause has contributed more to the industrial development and efficiency of the German nation than the trade schools. Their close connection with the associated industries and their vital importance to the well-being and prosperity of Germany, which is so largely dependent upon manufacturing for the employment of its people, confirms the truth of the famous declaration of Bismarck, that "The nation that has the schools has the future." While cheap labor in certain German industries has in the past undoubtedly enabled their products to be marketed abroad in spite of high tariffs and the competition of protected industries in foreign countries, the advantage formerly derived from such cheaper production is gradually being eliminated by rising wages in Germany, necessitated by the increasing cost of living and burden of taxation, by the world-wide growth of the factory system and the incidental passing of the small workship and cottage industry, by the substitution of machinery for hand labor, and by the establishment in foreign countries of competing industries in many lines having the advantage of cheaper and more plentiful raw materials. The inevitability of these conditions has been long recognized by the leading German statesmen and public educators, as well as by the business organizations, trade guilds, and exporting manufacturers, all of whom have been working together to overcome the natural disadvantages under which Germany labors in international-trade competition. As in

France and Switzerland, the solution of the problem in Germany has been a better scientific, artistic, and technical training of the workers, with the object of raising the standard of German products by the introduction of more originality, skill, art, and economy into their manufacture.

Owing to the technical advancement and the complicated mechanical processes in many trades, there is neither time nor opportunity for learners to get the required fundamental instruction in the factory or workshop. Therefore the training for the manufacture of high quality and artistic goods would not be possible without the excellent system of industrial schools established in Germany during the past half century. Germany's export trade is largely dependent upon the efficiency, high standards, and progressiveness of her industries, for which these schools are indispensable. For example, the numerous German textile schools where spinning, weaving, dyeing, ribbon making, embroidering, lace making, designing, etc., are taught have made the most efficient and artistic textile workers in the world; so that the German fabrics of cotton, wool, linen, and silk have a high reputation everywhere and extensive sales even in those foreign markets whose own textile industries enjoy the important advantages of a protective tariff and of cheaper and more accessible raw materials. As the profit on high grade and artistic products is naturally much greater than on the low-grade goods, it can readily be understood to what extent the vast and growing export trade and the prosperity of the manufacturing industries is dependent upon the highly skilled artisans and mechanics who have received technical and artistic as well as, in many cases, practical training in the progressive industrial schools of Germany.

No better proof of the magnificent development and efficient condition of the German manufacturing industries can be offered than the fact that Germany is no longer a land of emigration, but a land of immigration, for the number of immigrants who have become German subjects or permanent residents of the country has averaged during the past 15 years 9,000 more annually than the emigrants. Besides the Germans who return to their native land after accumulating a fortune or competence abroad, there are thousands of people from other parts of Europe who settle in Germany each year because of the superior economic opportunities.

II. GERMAN SCHOOLS FOR BUILDERS.

By Ralph C. Busser.

ORIGIN AND DEVELOPMENT.

The original school for builders in Germany was established at Munich in 1820 as a private school with State and city appropriations, and reorganized as a State institution in 1823. Other schools of the same kind were organized from time to time in various parts of Germany, and a school for builders is now to be found in nearly every German city of 40,000 inhabitants or over. They were originally organized as branches of drawing schools, of industrial art schools, of mechanics' evening schools, and of industrial continuation schools. In the first stage of development the studies were principally confined to drawing and mathematics, as the purpose at that time was merely to provide carpenters, masons, and other building mechanics with the theoretical instruction that would enable them to plan, undertake, and conduct building operations under their own management. Subsequently, as the art of building took on more of the character of a profession and less that of a mere trade, there was added to the curriculum of these schools instruction in the common principles of architecture, in the materials entering into construction, and in the methods of cost calculation. At first the teachers were mostly master carpenters, master masons, and builders—practical men, who gave a few hours a week of their time to school instruction.

This modest arrangement was sufficient for the needs of the early part of the nineteenth century; there were then few large buildings outside of churches and Government edifices, and the architectural problems had not yet become complicated by the innumerable demands of modern social and industrial life and the invention of various mechanical improvements and conveniences connected with buildings and construction work. In the latter part of the nineteenth century, however, the use of iron, steel, and concrete in above-ground and underground construction, the increased height of business buildings, the new architectural and engineering problems connected with light, heat, ventilation, elevator service, fireproofing, the factory system, department stores, hotels, flats, office buildings, thea-

ters, etc., together with more complex police, fire, and sanitary laws and regulations, called for builders with more varied and extensive training of a professional nature than under the old system. Therefore, a knowledge of stone and brick masonry, carpentry, and simple architecture no longer sufficed for the making of a competent builder, and it was found necessary to establish independent institutions organized into various departments, with special equipment for each branch of the trade. Professional teachers, many of them, however, with practical training and experience, have been substituted for practical builders who merely taught evening classes as a side issue; for such part-time instruction was no longer adequate for those who aspired to become independent builders and managers of construction operations under modern conditions. In addition to a common-school education and a certain length of time spent in practical building work, two to two and one-half years' instruction in a builders' school is now considered necessary to qualify one to practice the vocation of a builder or contractor for above-ground or underground construction.

In Germany the building-inspection authorities pass upon the qualifications of the builder as well as upon the building plans and designs. The builder must have a diploma or certificate that will be recognized by the local authorities, to whom the plans and specifications of a proposed construction undertaking must be submitted for approval before the necessary building permit is issued. Upon completion of the work the building must be inspected and approved by the proper expert officials before it can be occupied or used for the purpose intended. Thus the public authorities see to it that the building or other construction work is suitable for the object designated and complies with all the laws and regulations designed to insure safe and workmanlike construction, reasonable protection against fire risks, proper sanitation of the premises, and the hygienic and habitable condition of the interior. This preliminary inspection of the completed structure as well as of the building designs, and the subsequent periodical inspection of buildings used for commercial and industrial purposes, is conducted by experts also trained in the German schools for builders or in the higher architectural or engineering schools. Thus the service of enforcing the building and building-inspection regulations is taken entirely out of politics and placed in the hands of expert officials, protected in the performance of their duty by the strict civil-service laws of the German State or municipality. Strict, impartial, and competent governmental supervision and inspection of buildings and building operations naturally tend to exclude negligent, slovenly, and unsafe construction; so that in Germany there are very few building accidents or fires

that can properly be attributed to incompetent builders or to evasion of the building regulations. The building and building-inspection laws are continually being amended to keep up with the march of progress; and every reasonable precaution is taken, especially in the building and inspection of factories, theaters, and similar structures, to prevent disasters.

AIMS.

The German building schools never aimed to supersede the architectural and engineering departments of the technical colleges. The period of instruction in the former is only two and one-half years, and the four years' course in the latter institutions naturally offers more extensive and advanced work in the theory, art, and science of architecture, engineering, and the materials of construction. For the management of workmen and the active direction of construction operations, however, it is claimed in Germany that the building schools and similar middle-grade technical institutions provide most satisfactorily.

The primary objects of the German schools for builders, as now constituted, are as follows:

(1) To provide those in the building industry who wish to educate themselves for master builders or building contractors, especially carpenters and brick and stonemasons, with the opportunity to acquire the theoretical knowledge and skill in drawing and designing which are necessary for the independent pursuit of their vocations.

(2) To turn out engineers, draftsmen, and other technicians for office and operating work in aboveground and underground construction.

(3) To prepare for the middle-grade technical positions under the Government, military, railroad, and municipal authorities.

During the past few decades the building schools, starting as institutions for the higher technical education of building mechanics, have really developed into middle-grade professional schools for the turning out of architects and engineers in aboveground and underground construction. Thus, the highest aim of the German schools for builders is to enable those students with the necessary preparation and capacity to fit themselves for the exacting labors of a builder or contractor who is at the same time a construction engineer.

ORGANIZATION.

In Prussia, except in the city of Berlin, the schools for builders are State institutions, to which the cities in which they are located also contribute. The purpose of organization under State laws is uni-

formity in organization, guarantee of State appropriations, and the maintenance of a uniform high standard in entrance requirements, in the appointment of teachers, in length and courses of instruction, and in the tests and qualifications necessary to secure a diploma. Uniformity in organization, entrance requirements, curriculum, and grade of work was largely brought about in Prussia and other German States by the recommendations of the Government departments of commerce and industry, State aid to a particular school being contingent upon its efficiency and standardization. As a result of these unifying influences, there is now systematic relation in general aims, rank, entrance requirements, and courses of instruction in German schools for builders. Students of these schools in one State are, under a system of mutual accrediting, admitted to similar schools in other States of the Empire. The State building schools in Prussia recognize in this way the schools for builders in Munich, Nuremberg, Augsburg, Regensburg, Wurzburg, Kaiserslautern, Dresden, Leipzig, Plauen, Zittau, Stuttgart, Karlsruhe, Hamburg, Bremen, Lubeck, Darmstadt, Gotha, Zerbst, Holzminden, Strassburg, Chemnitz, Bingen, Coburg, Hildburghausen, and Weimar.

Many of the German building schools started as private, guild, or municipal institutions, but have been brought under State control by means of State appropriations, which they could not receive without having first accepted State supervision and regulation of their affairs. Financial support is also received from the cities in which the respective schools are located. The State having prescribed the regulations governing the erection, maintenance, improvement, and inspection of buildings, it seemed perfectly logical, from the German standpoint, for the State also to regulate the vocational education of those who would be called upon either to carry out as builders, engineers, and contractors, or to enforce, as Government inspectors, the multitude of intricate regulations relating to building location, height, materials, sustaining power, light, heat, sanitation, crowding, harmony with surroundings, adaptability to purpose, protection against fire and accidents, industrial and residential restrictions, etc.

Many of the German building schools have also a department for underground construction (Tiefbau) which comprises road building and maintenance, bridge building, railway construction, irrigation, water supply, filtration, canalization, sewage disposal, conduit laying, street paving and cleaning, etc.

In the Prussian schools for builders the course has been fixed at five semesters or half years. During the first three semesters the curriculum is the same for the students in both underground construction and aboveground construction. During the last two semesters, however, each department has its own special courses of instruction.

There is a class for each semester, the entering class being known as the fifth. New students who wish to enter a class higher than the fifth must present proofs of such knowledge and practice as are required in the preceding class or classes. For this purpose they have to take an entrance examination and exhibit specimens of their drawing and other practical work.

For building mechanics who can not spare the time or money to attend a building school other opportunities for theoretical and technical instruction in their respective trades are provided either by the State or municipality. Those who have a natural aptitude for one of the building trades require only limited instruction in the science, art, and techni[illegible] of the particular trade in order to develop into master craft[illegible] and fit themselves for the duties of foremen and other positions of direction and responsibility in construction operations. With this object in view the Prussian Administration of Commerce and Industry has made the elaborate and expensive equipment of the State building schools serviceable to a wider circle of students by establishing evening courses for the voluntary attendance of ambitious building mechanics. In German cities having no building school the mechanics in question can attend the evening trade classes—mechanics' schools—which are generally organized in connection with the local industrial art school.

While the evening school for mechanics provides instruction in drawing, mathematics, modeling, and shop practice in the handling of tools and materials, the practical work is not intended as a substitute for actual apprenticeship in a trade. The object of the school work is rather to make up for the deficiencies of such apprenticeship in theoretical, technical, and art culture; to acquaint the students with the latest discoveries and inventions in their respective trades; and to keep them fresh and up to date in all their methods.

Of course, it is in the special schools for builders that the students receive the most thorough and practical training for architectural and constructive work, and it is chiefly to these excellent institutions that Germany owes the host of highly efficient building architects, structural engineers, and master workmen who have built the roads, streets, bridges, conduit and drainage systems, waterworks, industrial plants, and other utility works, as well as the substantial, convenient, and dignified public and private buildings which ornament the cities of modern Germany. They have also furnished the railroad, military, highway, and municipal authorities with a large proportion of their construction engineers, technicians, supervisors, and expert inspectors. In the architectural and engineering professions the very highest positions are generally filled by graduates of the celebrated technical colleges.

ENTRANCE REQUIREMENTS.

In a typical Prussian school for builders the instruction usually commences about the middle of October and terminates about the middle of March, with a Christmas vacation of two weeks. This is called the winter semester. The summer semester lasts, as a rule, from April 1 until the latter part of August. The hours of instruction are, generally, in summer from 7 to 12 and 3 to 7, and in winter from 8 to 1 and 3 to 7. To obtain admission as a student into a State school for builders in Prussia the applicant must be at least 16 years old; he must have completed the common-school course of 8 years; and he must have spent at least 12 months in the practical pursuit of his trade as an apprentice or assistant to a master carpenter, master mason, architect, structural engineer, or underground contractor. The applicants for admission are examined in drawing, arithmetic, plane geometry, and German. In exceptional cases young persons may be admitted who have but six months' practical work, provided they obligate themselves to get the other six months of actual work at the trade before entering the fourth class. For those who can not comply with the strict entrance requirements, special preparatory classes (Vorklassen) are provided. The object of severe entrance requirements is to exclude students not qualified by education, manual skill, and preparatory training for the exacting work of a builder or contractor under modern conditions.

COURSES AND SYSTEM OF INSTRUCTION.

In a Prussian school for builders the two and one-half years' course is divided into five semesters, and there is one class for each semester or half year, the new students, as a rule, entering the fifth class. It is not necessary that the students attend the semesters consecutively. As a matter of fact, owing to the greater quantity of construction work going on in summer than in winter, attendance at the winter semesters is much heavier than during the summer semester. The following is an outline of the courses:

Fifth class.—German; business science (written lessons in building technique and business principles); *algebra; plane geometry; stereometry; natural science* (the important common characteristics of bodies, volume and weight, and the most important phases of chemistry with special reference to the science of building materials); *science of projection; practical building* (walls, pillars, chimneys, arches, doors, and windows, floors in stone and wood, plastering, the simple elements of building, wooden supports, balconies and intervening ceilings and floors, partition walls, tile roofing, Prussian copings, etc.); *architectural drawing; science of architecture; architectural styles* (exterior form of small, independent buildings, purpose and nature of the architectural superstructure, distribution of the building substances, location and size of the openings, selection and treatment of the building materials, demonstrations with models and pictures); *free-hand drawing;* and *modeling.*

Fourth class.—German; business science (exercises in business letters, reports, and estimates, the most important postal, telegraph, telephone, and railway regulations, contracts, dunning procedure and complaints, dealings in checks); *arithmetic; algebra; trigonometry; stereometry; natural science* (mechanics of solid liquid and gaseous bodies, lights and shades, simple machines); *science of building materials* (natural and artificial stones, concrete); *science of projection; statics; practical building* (circular and cross vaults, Bohemian copings, roof construction of all kinds in wood for middle arch spans, rafters, slate and board roofing, interior and exterior doors, windows, and shutters); *architectural drawing; science of architecture* (laying out of small country dwelling with appurtenances, ground-plan studies, general building and building-inspection regulations—particularly those for rural communities); *architectural styles; calculation and estimating; free-hand drawing;* and *modeling.*

Third class.—German; business science and law (business letters, reports, estimates, contracts, opening and keeping the important books for a building business, provisions of the industrial regulations which are most important for business mechanics and technicians, relations of the masters, journeymen, helpers, and apprentices, guild affairs, chambers of trades, industrial courts, sickness and accident insurance, oldage and disability insurance); *algebra; geometry; natural science* (the most important elements of magnetism and electricity); *science of building materials* (iron and related substances); *surveying and leveling* (adjustment and use of the most important instruments, logarithms, leveling and setting out the plans of a building); *statics; practical building* (dwelling roofs in wood, various roof styles, scaffoldings, iron connections, girders and columns, ceiling construction in iron, stairs and steps, metal and prepared roofings, house eaves and spouts, cornices, investigation of the building ground, foundation work, piling, caissons, and drilling wells); *architectural drawing, science of architecture* (ground-plan formation and execution of independent and connecting city flats and one-family houses, barns, coach houses, stables, outhouses, building and building-inspection regulations for municipalities); *architectural styles; estimating and bookkeeping; modeling.*

In the curriculum of the third class is also the so-called *Samaritan course*, which covers instruction in the human anatomy, the physical injuries, measures of prudence for the prevention of accidents in building operations, first aid to the injured, the handling of injured persons, and the treatment of wounds. The lessons in this valuable course are illustrated by demonstrations.

Beginning with the second class the courses for aboveground and underground construction are differentiated. The following curriculum covers the last two semesters or classes for the department of aboveground construction:

Second class.—German; business science; mathematics; science of projection; statics; practical building (double windows, show windows, inside shutters, wall linings and ceilings, girders and pillars, iron steps and stairs, roofs of metal and glass, skylights, balconies, bay windows and projections); *architectural drawing; science of architecture; designing* (plans for city and country dwellings, execution in every detail, preparation of working drawings for the more important constructions and the architectural details of the exterior and interior as well as a cost estimate); *architectural styles* (development of architectural styles and explanation of their characteristic marks, with par-

ticular consideration of dwelling construction from illustrations or photographs relative to the development of the style to suit the purpose, construction, and material. In connection with this course, country and city buildings of historical value are visited, sketched, and measured, and then worked out in the class); *free-hand drawing;* and *modeling.*

First class.—Science of projection; statics; practical building (reviews and explanations of the lessons of the preceding classes, particularly relative to solid ceilings and concrete construction, foundation building, and work in connection therewith); *architectural drawing; science of architecture* (with special reference to heating, lighting, and electrical plants, lavatories, water supply, and removal of sewage); *designing* (14 hours weekly); *architectural styles; free-hand drawing; estimating* (static calculations and preparation of estimates and specifications).

In the different classes of the building schools the studies in construction and style are taught by means of informal lectures appropriate to the subject and suited to the understanding of the students. The textbooks are generally subordinate to the matter dictated by the instructors, who strive to make the lessons as practical as possible. These lectures are explained by means of blackboard sketches, which the students copy into their notebooks. In the general educational and theoretical studies the instruction is given in a similar thorough manner in closest connection with the practice, and only so far as it has importance for the future vocation of the students.

SCHOOL EXPENSES.

The tuition fees in German schools for builders vary from 30 marks ($7.14) to 100 marks ($23.80) a semester. The standing of the school can not always be judged from the amount of the tuition fee, as some schools are enabled to charge less through the advantage of very liberal appropriation from the cities in which they are located. For example, at the Royal School for Builders in Munich, which is a State institution with a large annual contribution from the city, the students enjoy the advantage of the minimum charge. At the Builders' School in Berlin, which is still a municipal institution without State aid, the tuition fee is 100 marks ($23.80) a semester. At the Royal School for Builders in Erfurt, which is a typical State institution organized under the laws of Prussia, the fee is 80 marks ($19) a semester, and hence 400 marks ($95) for the full course of two and one-half years. In a Prussian school for builders a foreign student—that is, one who is not a German subject—must pay five times the regular tuition fee. Each student must also pay each semester 80 pfenniga (19 cents) insurance premium, for which he is insured against the consequences of all accidents that may happen to him during his school attendance in the rooms of the school or upon the way to and from the school. For this premium the indemnities are as follows: Death, $714; permanent disability, $3,574; temporary

disability, 75 cents daily from the fourth day on. The insurance also covers participation in the modeling and surveying practices and in the fire-brigade drills.

By joining the society of architectural students for free medical attention and paying $1.07 a semester, a student is entitled to free remedies and free hospital treatment within certain limits.

The students usually have to supply their own textbooks, writing and drawing materials, etc. They also pay their own expenses incident to the study excursions, which average about $6 a semester. In a State school for builders in the average Prussian city (outside of Berlin), a careful student's total necessary expenses, including tuition fee, board, lodging, textbooks, etc., will range from $125 to $150 a semester or school half year. In some German cities needy students can be excused from the payment of tuition fees in whole or in part if they have attended at least one class with good success and conducted themselves blamelessly. There is also placed at the disposition of a regularly organized Prussian school for builders a State appropriation from which are loaned to worthy and necessitous students half-yearly sums of $35.70. Students who can not afford to defray the expenses of the instruction trips may also receive assistance in a modest way out of the school funds.

III. PREPARATORY COURSES FOR MASTER CRAFTSMEN.

By GEORGE NICHOLAS IFFT, *United States consul at Nuremberg.*

Under the imperial German law of January 1, 1873, no one may style himself a "master craftsman" in any trade or craft who is not of the full age of 24 years and who has not successfully passed a mastership examination as provided by law. Only such persons are admitted to such examinations as have served a lawful apprenticeship or attended an official trade school, successfully passed a journeyman's examination, and been employed for at least three years as journeymen workmen at their special trades. In Nuremberg the provisions of the law are administered through the Chamber of Handicrafts or Trades (Handwerkskammer). This body recommends a board of examiners for appointment by the royal Government, and, subject to the approval of the Government, prescribes rules and regulations for the examinations—date, place, fees, scope, etc. It also provides for special instructions and practical school courses in preparation for these examinations.

The chamber of handicrafts in Nuremberg is an official Government corporation for the district of Middle-Franconia. Its "preparatory courses for master craftsmen" are held, with the exception of the summer months, throughout the entire year in the rooms of the chamber's headquarters in Nuremberg. Each course consists of a minimum of 40 hours' instruction, held as a rule between the hours of 7 and 10 p. m., and under the direction of an expert in the particular subject who is employed and paid by the chamber. The instruction is mainly in industrial bookkeeping, pay rolls, calculations and estimates, properties of materials, laws and forms in regard to checks, drafts, exchange, etc., industrial law, and the imperial insurance laws. A fee of 5 marks ($1.19) is charged for each course. Journeymen workmen living out of the city are granted reduced rates on the Government railways to attend these courses.

During the year 1911 there were nine such preparatory courses for master craftsmen—two special courses for the building trades, two for the book-printing trade, and five mixed courses. Each course extended over a period of three months and was attended by from 23 to 38 persons, the total attendance being 276 for the nine courses. The following are the subjects of instruction for some of these

courses, Section I being from the special course for the printing trade:

I. INDUSTRIAL ARITHMETIC, CALCULATION.[1]

1. Discussion of the Book Printer's Wage Scale.
2. Determination of the cost of operating and general expenses in typesetting.
3. Same in printing.
4. Computation of manuscript with straight page and with page interspersed with cuts.
5. Calculation of "jobs" with straight and with mixed page.
6. Calculation of scientific and tabular works, newspapers, magazines, catalogues, prospectuses, stereotypes, electrotypes, zinc etchings, halftones, job composition in all its branches.
7. Calculation of the composition and printing of newspapers; illustrations; printing in colors; three and four color printing; job printing.
8. Computation of special kinds of printing, such as negotiable paper, lottery tickets, envelopes, posters.
9. Computation of paper, waste, and folding.
10. Computation of distributing of sheets and binding.
11. Computation of machine types and rotary printing.

II. BOOKKEEPING.

1. Beginning the necessary business books.
2. Opening inventory at establishment of business.
3. Booking of a business lasting two months.
4. Closing the cashbook and ledger.
5. Final balance and adjustment of fluctuations in inventory.
6. Recapitulation.

III. INDUSTRIAL AFFAIRS.

1. Legal relations of tradesmen with their laborers. The basic laws; persons concluding contract; contents of a valid work contract; obligations of employers and employed resulting from a valid work contract; dissolution of work contract; consequences of an illegal dissolution of contract.
2. Apprentices and examinations with particular reference to the regulations of the Middle Franconian Chamber of Handicrafts. Keeping and training of apprentices; withdrawal of permission; dissolution of apprenticeship; apprentice certificate as preliminary of permission to train apprentices in a trade; training in mixed enterprises and related trades; regulation of maximum number of apprentices; duration of apprenticeship; examination for assistant workman; title of master and examination to become master.
3. Taxation, especially industrial tax laws.
4. Police regulations of industry.
5. Law procedure, especially on the industrial courts law.

IV. IMPERIAL INSURANCE LAW.

A. Sickness insurance.

1. Duty of insuring.
2. Voluntary insurance.
3. Procedure in taking out insurance.

[1] The Book Printer's Wage Scale and the German Book-Printing Price Rates are the basis of the exercises in estimating book-printing work.

A. Sickness insurance—Continued.
4. Sick benefits.
5. Death payment.
6. Assistance of family.
7. Usual regulations.
8. Kinds of sick funds: Local sick funds and national sick funds; industrial and labor union sick funds.
9. Beginning and end of membership.
10. Notification.
11. Dues.
12. Criminal procedure.

B. Accident insurance.
1. Scope and object of insurance.
2. Membership.
3. Notification of industries.
4. Supervision.
5. Regulations for prevention of accidents; supervision of industries.
6. Responsibility.
7. Criminal procedure.

C. Invalid insurance and survivors' insurance.
1. Duty of insuring.
2. Voluntary insurance.
3. Wage classes.
4. Income to invalids.
5. Payments to survivors.
6. Care.
7. Expectation of life.
8. Computation of insurance payments; cessation of payment.
9. Withdrawal of earnings; redeposit of earnings; cash settlement.
10. Procedure in collecting dues: Receipt card; invalid dues; wrongfully paid dues; confiscation of dues.
11. Criminal procedure.

V. LAW OF BILLS OF EXCHANGE.

Section I, which is the special course for book printers, illustrates the scope of the special courses offered in the various trades. Sections II to V are the general or mixed courses and are applicable to all trades. No attempt is made to offer during any single year special courses in all the 60 trades in which journeyman and mastership examinations are held. The number of these special courses is, however, added to every year, and the attendance, especially of the mixed or general courses, is steadily increasing.

Preparatory courses for master craftsmen, either general courses or courses for some special trade, are also given in the cities of Ansbach, Burgbernheim, Weissenburg, Gunzenhausen, Rothenburg, Dinkelsbuehl, and Uffenheim, all in Middle Franconia. These are mostly organized and financed by the local industrial associations, but in one case by a local guild and in another by the municipality, with the approval of the chamber of handicrafts and usually some financial support from the chamber. The efforts of the chamber are constantly directed toward uniformity in the courses as given at different

points. The expense of these courses is trifling. Free quarters are always provided, and in very many instances officers of the chamber, association, or guild give their services as instructors without charge, or the instructor of some trade school is willing to give his services for a merely nominal compensation.

During the year 1911 the chamber of handicrafts also conducted nine traveling-school courses in as many different cities of the district. These were also in each instance night schools, continuing over periods from 30 to 60 days. They were attended by from 20 to 38 persons each, and the average cost was about $85. In two cases the participants paid small tuition fees, but in all others the entire expense was paid by the State. Of these nine courses six were especially for woodworkers, two for the building trades, and one was a mixed course.

The chamber of handicrafts occupies the position of an executive department of the State government, with broad and clearly defined functions and authority. The local chamber has a president and a vice president, a treasurer, and two associate presidents who form the directorate, and 25 regular members. Fifteen of the latter are chosen by the trade guilds and 10 by the various trade associations and other trade corporations. These must all be master craftsmen; they serve for six years. In addition there is a committee from the journeymen, consisting of chairman, vice chairman, and secretary, and 8 members chosen by the guilds and 4 by the trades associations and other trade corporations. These must all be journeymen workmen; they serve for three years.

The chamber of handicrafts, with the approval of the State government, enacts the regulations governing apprenticeship, the duration, hours of work, number of apprentices, etc.; conducts and establishes the rules, scope, etc., of journeymen and mastership examinations; oversees and directs the trade schools, as well as the guilds and industrial associations; and in many other ways has a voice in government, so far as trade and industrial interests are concerned. The local chamber, for instance, has a voice and vote in—

1. The German handicraft and industrial congress.
2. The free association of Bavarian chambers of handicraft.
3. The central bureau of industry, manufacture, and commerce at Munich.
4. The statistical council at Munich.
5. The water-preservation council in Munich.
6. The committee for the advancement of industry of the State Industrial Institute in Nuremberg.
7. The district committee of the Wittelsbach foundation.
8. The international association for the betterment of the middle classes.
9. Central union of German industrial associations.
10. Association of German extension schools.
11. The associated shelter homes of Middle Franconia.
12. The association for the protection of the youth in Nuremberg.

IV. "MEISTERKURSE" AT FRANKFORT ON THE MAIN.

By WILLIAM DAWSON, Jr., *Vice Consul General at Frankfort.*

Courses for master artisans, or "Meisterkurse," were inaugurated at Frankfort on the Main September 9, 1912. Similar courses were, however, already in existence in the following Prussian cities: Hannover, Posen, Cologne, Gumbinnen, Dortmund, Magdeburg, Breslau, and Stettin, as well as at Nuremberg, in Bavaria. It is planned to hold two or three series of Meisterkurse a year at Frankfort, according to the necessities of the artisans of the district.

ORGANIZATION.

The Meisterkurse at Frankfort, as in other Prussian cities, are placed under the general supervision of the "Landesgewerbeamt" in Berlin, a body composed of members of several ministries, representatives of the Prussian Landtag, cities, commerce, and industries, artisans' organizations, and trade schools, and having for its object, as the name "trade office" indicates, the supervision and promotion of trade and industry.

The Meisterkurse at Frankfort on the Main are under the immediate supervision of a board of governors (Kuratorium)[1] of eight members, composed as follows: First and second mayors of Frankfort on the Main, one member of board of aldermen of Frankfort on the Main, one member of elective city council of Frankfort on the Main, one member of the Government board (Prussian administrative authorities) of the district with headquarters at Wiesbaden, a representative of the so-called "Bezirks-Verband" (a sort of self-government board for the Wiesbaden district), a representative of the Handwerkskammer of the Wiesbaden district, and the director of the trade school of Frankfort on the Main, who is at the same time director of the Meisterkurse.

It will be seen that the central authorities exercise a certain control over the Meisterkurse through their representatives at Wiesbaden (Frankfort on the Main belonging to the Wiesbaden government district) in addition to the supervision of the "Landesgewer-

[1] See p. 10.

beamt" at Berlin. Furthermore, local authorities, the "Bezirks-Verband," and the chamber of artisans, and particularly the city of Frankfort on the Main, with four members, are represented on the board of governors, and thus supervise the courses to a certain extent.

The courses are inspected by officials of the Landesgewerbeamt in Berlin. In his last inspection the Berlin official was accompanied by a representative of the Government board at Wiesbaden, although this is not a necessary feature of the inspection.

The relations between the Meisterkurse and artisan organizations are very close. The chamber of artisans is an officially recognized body representing all classes of artisans throughout the entire district. The director and board of governors of the Meisterkurse are also in close touch with the different guilds of artisans, which are consulted with respect to organization and instruction and have cooperated to a considerable extent in furthering the courses. Relations to industrial establishments, properly speaking, are not regularly maintained, not coming within the scope of courses for artisans. However, in certain cases where students could derive benefit from visits to factories, this has been included in the instruction. The course for upholsterers included a visit to a large furniture factory at Darmstadt. The joiners were shown a veneering plant at Rodelheim and a large building concern with woodworking machines. It is planned to conduct students taking the course for locksmiths to Wetzlar, where they will see iron in the process of making.

While the Meisterkurse at Frankfort on the Main are held in the trade school building and conducted by the director of the trade school, both institutions are in reality separate and have separate budgets. In some Prussian cities Meisterkurse are held quite independently of any other schools, although in most instances there exists the same relation between trade school and Meisterkurse as at Frankfort. The Meisterkurse form the last stage in the now well-perfected system of technical training, which includes the common schools, trade and continuation schools, and courses for master workmen.

BUILDING AND EQUIPMENT.

The Meisterkurse at Frankfort on the Main are held in the building of the Municipal Trade School. This is a remarkably fine building, erected in 1911 at a cost of about $300,000.

Six workshops, one for each course—that is, joiners, locksmiths, upholsterers, shoemakers, tailors, and painters—have been fitted up in the trade school for the exclusive use of the Meisterkurse. The workshops are planned to accommodate a master and 8 to 10

assistants. They are equipped with the newest and most highly perfected machines and apparatus required by artisans in the respective trades. Machines are driven by electric motors. While a detailed statement is not available, the shop for joiners, with apparatus, cost approximately $2,500, and that for locksmiths $2,000. The remaining shops were less expensive.

The trade school library, including some 600 works on technical subjects, as well as a reading room with about 1,000 volumes, both technical and general, are placed at the disposal of the students of the Meisterkurse.

INSTRUCTION.

The Meisterkurse at Frankfort on the Main are divided into five full courses and one partial course. Full courses are offered for the following handicrafts: Joiners, locksmiths, upholsterers, shoemakers, and tailors. A partial course is offered for painters and workers in allied trades. The duration of the courses is as follows: Joiners, 8 weeks, with 54 hours per week; locksmiths, 8 weeks, with 54 hours per week; upholsterers, 8 weeks, with 54 hours per week; shoemakers, 6 weeks, with 54 hours per week; tailors, 6 weeks, with 54 hours per week; painters, 8 weeks, with 22 hours per week.

The following are outlines of the courses from the official program:

A. COURSE FOR JOINERS.

Full course, 54 hours per week, lasting 8 weeks; 8 subjects.

(1) Technical drawing, 20 hours per week.

(*a*) Measuring and drawing parts of furniture from models; drawing furniture from sketches; preparation of working plans; various kinds of sketching; designing.

(*b*) Measuring and drawing windows, doors for dwellings and stores, woodwork, and ceilings from models and sketches.

(*c*) Measuring and drawing stairs from models; calculating height and width of steps and drawing stairs for given purposes; stenciling curves of string pieces.

(2) Tools and machine tools, 2 hours per week.

Principal power motors for small industry and their industrial importance; working expenses; organization and equipment of a joiner's shop; tools and machine tools; use of power transmission and machines with own motor power; appliances and regulations for prevention of accidents.

(3) Raw materials, 2 hours per week.

Means of detecting sound and unsound trees; felling, cutting, and drying timber; native and foreign lumber, characteristics and uses for building and furniture; destruction of wood through external agents and its prevention; preservatives; accessory materials—mother-of-pearl, ivory, glue, shellac, polish, metal trimmings, glass.

(4) Shop work, 18 hours per week.

(*a*) Making furniture and parts with tools and machine tools from working plans prepared by students; veneering and inlaying on straight, arched, hollow, and curved surfaces; finishing, polishing, staining, varnishing, deadening.

(b) Making and nailing in doors and windows with straight and curved cross-bars; woodwork, and solid, veneered, decorated, and inlaid wooden ceilings.

(c) Making parts of a stairway in one-half ordinary size.

(5) Bookkeeping and business correspondence, 4 hours per week.

Original inventory; opening ledger; entering business transactions in cash and day books; supplementary books; pay roll; closing books and taking account of stock, balance, profits; correspondence in connection with business transactions; elements of bills and notes.

(6) Arithmetic and estimates, 4 hours per week.

Use of four first rules, with easy methods; figuring percentage in connection with expenses, commissions, discounts, etc.; German measures and those of lumber-producing countries; reduced scale; calculating surfaces and bodies; determining price of raw materials; productive and nonproductive wages; general expenses; price estimates of joiner's products.

(7) Business law, 3 hours per week.

Industrial legislation status of artisans as regulated in 1897; legal relations of employer and employees; labor contracts; industrial courts; labor organizations and cooperatives; imperial labor insurance laws; exchange, rental, and leases in common law; civil procedure for collection of debts and seizure; legislation concerning bills, notes, and checks.

(8) Instruction in first aid to injured, 1 hour per week.

B. COURSE FOR LOCKSMITHS.

Full course, 54 hours per week, lasting 8 weeks.

(1) Technical drawing, 20 hours per week.

(a) Drawing principal building parts from models; working plans for factory and dwelling windows, shop doors, show windows, sliding doors and windows, fireproof doors, dumb waiters and simple freight elevators; plans and calculations for projecting windows, balconies, glass roofs, with detailed drawings based on computed thickness of iron, number and thickness of bolts and screws; plans for simple and complex piping for ventilators, carriages of winding and other stairways.

(b) Making patterns for metal trimmings, plates, rosettes, illuminating appliances (bulbs, lanterns, etc.), parts of heating apparatus; tracing window gratings, top-lights, doors, and gates according to given measurements and sketches; drawing and modeling details based on natural flowers and leaves.

(2) Tools and machine tools, 2 hours per week.

Principal power motors for small industry and their industrial importance; working expenses; organization and equipment of a locksmith's shop; tools and machine tools; metal working; use of power transmission and machines with own motor power; appliances and regulations for prevention of accidents.

(3) Raw materials, 2 hours per week.

Production and properties of iron; cast, wrought, ingot, and welded iron and steel; hardening steel; production, properties, and uses of copper, tin, zinc, lead, and aluminum, pure and in alloys; oxidation of metals and its prevention.

(4) Shopwork, 18 hours per week.

Practice in welding and piercing different kinds of iron; forging simple parts and tools, such as wagon and door parts, bars, pincers, chisels, etc.; forging, cutting, and ribbing leaves, welding together parts of festoons, etc.; forging plates, rosettes, door and furniture trimmings, etc., in iron, copper, brass, and bronze from working patterns; forging flowers, leaves, and fruit from models and from nature, also gratings, brackets, illuminating appliances, trimmings, etc., from working plans prepared in the course in technical drawing; forging

and cutting out of one piece heads and small animals in iron, copper, brass, and bronze from models made by students.

(5) Bookkeeping and business correspondence, 4 hours per week.

(6) Arithmetic and estimates, 4 hours per week.

Use of four first rules, with easy methods; figuring percentage in connection with expenses, commissions, discounts, etc.; weights and measures; contraction rules; reduced scale; calculating surfaces, bodies, and weights; determining prices of raw materials; productive and nonproductive wages; general expenses; price estimates of locksmiths' products.

(7) Business law, 3 hours per week.

(8) Instruction in first aid to injured, 1 hour per week.

C. COURSE FOR UPHOLSTERERS.

Full course, 54 hours per week, lasting 8 weeks.

(1) Technical drawing and cutting, 12 hours per week.

Measuring rooms; drawing ground plan and plan for furnishing; drawing and cutting hangings according to measurements of doors and windows; lambrequins; measuring and drawing frames for upholstered furniture; pencil, ink, and color designs for holiday decorating.

(2) Raw materials, 4 hours per week.

Animal and vegetable upholstering materials; leather, imitation leather, oilcloth, linoleum, and wall paper—different grades and makes; woven goods and their component parts—jute, hemp, flax, cotton, wool, silk, artificial silk; trimmings.

(3) Decorating, 9 hours per week.

Curtains and draperies, festoons, window and door decorating; holiday decorations for houses and streets—flags, emblems, etc.—according to sketches; practice on crank embroidering machines; making lambrequins according to designs prepared in course in drawing.

(4) Shopwork, 18 hours per week.

Making horsehair, wool, and other mattresses, cushions, spring frames, chair, armchair, chaise longue, divan, drawing-room chair, and leather furniture; use of tools and machines.

(5) Bookkeeping and business correspondence, 4 hours per week.

(6) Arithmetic and estimates, 4 hours per week.

Review of four first rules, with easy methods; figuring percentage; calculating surfaces and materials; profitable division of materials for hangings, awnings, etc., and estimates; computing cost of materials, wages, general expenses, and prices of upholstered furniture, decorating, and other upholsterer's work.

(7) Business law, 3 hours per week.

D. COURSE FOR SHOEMAKERS.

Full course, 54 hours per week, lasting 6 weeks.

(1) Technical drawing, pattern making and cutting, taking measure, and preparing lasts; 35 hours per week during the first 3 weeks.

Drawing uppers for string, button, and shoes with elastic sides, hunting and tourist boots, button and low shoes with elastic sides, top and riding boots; cutting patterns for the above; advantageous division and use of different kinds of leather and linings; taking measure, outlines, and footprint; calculating elevation and heel angle from measurements and sketches for making lasts.

(2) Molding feet for last, 2 hours per week.

Practice in molding feet and making plaster molds.

(3) Shopwork, 37 hours per week during the last 3 weeks.

Cutting, scraping, bending, and fitting uppers; instruction in use and preparation of different kinds of leather; slippers, etc.; sewn heels, cork edges, etc.; making different kinds of shoes for normal, misshapen, and crippled feet.

(4) Materials, 2 hours per week.

Different sole leathers and tanning methods, upper leather, cow, horse, box calf, chevreaux, shammy, buckskin, morocco, leather for linings, patent leather; upper cloths, plush, lasting, satin; linings, line, and cotton; accessories, including rubber, twine, thread, silk, fasteners, ornamental trimmings; grease, oil, tanning and dyeing products.

(5) Bookkeeping: nl business correspondence, 6 hours per week.

(6) Arithmetic and estimates, 4 hours per week.

Review of four first rules; figuring percentage in connection with expenses, commissions, discounts, etc; calculating surfaces; estimating selling price of shoes according to cost of raw materials, wages, general expenses, and profits.

(7) Business law, 3 hours per week.

(8) Anatomy, 2 hours per week during the first 3 weeks.

General instruction concerning structure of human body, especially bones and articulations of the lower extremities; normal and misshapen feet and toes.

E. COURSE FOR TAILORS.

Full course, 54 hours per week, lasting 6 weeks.

(1) Technical drawing, 12 hours per week during the first 3 weeks.

Instruction and practice in preparing drawings of men's clothes.

(2) Taking measure, drawing patterns, and cutting, 25 hours per week during the first 3 weeks.

Practice in taking measure; making patterns for trousers, vests, coats, morning coats, dinner coats, evening dress, sporting clothes, uniforms; patterns for normal and misshapen bodies.

(3) Raw materials, 2 hours per week.

Tailor's cloths and their manufacture; different kinds of textile fabrics; weaving processes and common imperfections; finishing; principal textile districts; yarn; thread; tape; braid; use of tailor's cloths, including cotton, linen, carded, and worsted woolen, and silk; velvet and ribbons.

(4) Shopwork, 30 hours per week during the last 3 weeks.

Cutting, testing, altering, and making trousers, vests, jackets, coats, frock coats, dinner coats, etc., according to given measurements; advantageous division and cutting of materials.

(5) Bookkeeping and business correspondence, 6 hours per week.

(6) Arithmetic and estimates, 4 hours per week.

Review of four first rules; figuring percentage in connection with expenses, commissions, discounts, etc.; German and English measures; estimating selling prices of men's clothing from cost of materials, wages, and general expenses, with profits.

(7) Business law, 3 hours per week.

(8) Anatomy, 2 hours per week during the first 3 weeks.

F. COURSE FOR PAINTERS.

Decorative and House Painters, Whitewashers, Sign Painters, and Varnishers.

Partial course, 22 hours per week, lasting 8 weeks, with 5 subjects:

(1) Drawing and painting, 10 hours per week.

The instruction varies according to the profession of the students: (*a*) For decorative and house painters: Drawing and painting natural forms (flowers, leaves, fruit) used in decorative painting; drawing and cutting stencils.

(b) For whitewashers: Practice in all kinds of latest technical methods; imitating cloth; staining woods, etc. (c) For sign painters and varnishers: Drawing and painting letters and objects used in sign painting; gilding and bronzing.

(2) Composition and coloring, 2 hours per week.

Lectures on different historical styles, illustrated with lantern slides; sketching; elements of color harmony.

(3) Technical course (Fachkunde), 2 hours per week.

Calculating surfaces and outer surfaces of bodies; measuring interiors and façades; interior and exterior decoration and materials used; scaffolding; building regulations.

(4) Materials, 4 hours per week.

Natural earth and mineral colors; natural organic colors, animal and vegetable; binding mediums; adulterations and their detection; effect of external influences on colors.

(5) Bookkeeping and estimates, 4 hours per week.

Simple bookkeeping, inventory, cashbook, daybook, ledger; entering a month's business transactions, closing with a statement of profits; estimating prices from materials, wages, general expenses, and profits.

Hours of instruction are from 8 to 12 and from 2 to 7, except for painters and allied trades. This course is given on certain afternoons and evenings. Artisans taking these courses are expected to give up temporarily the practice of their trade. Regular attendance is required of all students. Machines, drawing and other apparatus, tools, and materials are furnished free of charge.

The finished products are the property of the Meisterkurse, although if the students so desire they can be kept against reimbursement of cost of raw materials. Some of the products will be used to furnish the trade school. It is probable that products not otherwise disposed of will be sold to artisans at low prices, enabling them to resell them at a profit to customers, although this point has not yet been settled. This would have the advantage of obviating any competition between Meisterkurse and artisans.

No diploma is granted students. In case it is desired, a certificate is issued to the effect that the bearer has attended the Meisterkurse.

STUDENTS.

The preparation of students who have thus far taken the Meisterkurse at Frankfort on the Main shows great diversity. In all instances they have had a common-school education and considerable practical experience in their respective trades, this being a requisite. In general, master artisans and journeymen who intend to set up for themselves are admitted. In most instances, especially when they come from larger towns and cities, students have also received training at continuation schools. The age varies from 23 to 40 years.

The attendance at the Frankfort Meisterkurse has been small. It must be remembered that the courses are in their infancy here, and the artisans of this district have not yet familiarized themselves with

the purpose and advantages of the courses. By the regulations Meisterkurse can not be held unless at least 6 students are registered for each course. Except in special instances not more than 10 will be admitted to any one course. At the first series only two courses could be held, those for locksmiths and upholsterers, with 7 and 10 students, respectively. Registration in remaining courses had not attained the minimum of 6 students. A partial course for painters and allied trades was opened in December, with an attendance of 15. The second series of full courses commenced January 7, 1913. The course for shoemakers could not be held on account of lack of participants. Attendance at other courses was as follows: Upholsterers 10, tailors 6, locksmiths 6, joiners 6. Slightly over half of these students are from Frankfort or other parts of the Wiesbaden government district, the remainder being from other parts of the Empire.

TEACHERS.

The faculty is made up of experts in the several lines and teachers especially fitted to give instruction in connection with the Meisterkurse. Their training is both practical and theoretical. In the case of experts who are not regularly engaged in educational work, special attention is given to occasional educational training, such as may be acquired through shopwork with apprentices, for example, and ability to teach. The following data from the official program will give an idea of the sources from which the faculty is recruited:

Course for joiners: Courses in technical drawing and raw materials are given by an architect who is a member of the faculty of the trade school. The course in tools and machine tools is given by a mechanical engineer who is the proprietor of a technical bureau and also teaches in the trade school. Shopwork is conducted by a master joiner. Bookkeeping and business law are taught by a regular member of the trade-school faculty. The arithmetic course is given by an architect, who also teaches in the trade school. Instruction in first aid to injured is given by a physician.

Course for locksmiths: Technical drawing is taught by a master locksmith, who has also the title "Ingenieur." The course in tools and machine tools is given by a mechanical engineer, who is the proprietor of a technical bureau, and also teaches in the trade school. The course in raw materials is given by a regular teacher of the trade school. Shopwork is conducted by a master locksmith. Bookkeeping and business law are taught by a regular member of the trade-school faculty. Arithmetic is taught by an architect, who also teaches in the trade school. Instruction in first aid to injured is given by a physician.

Course for upholsterers: Courses in technical drawing and cutting, raw materials, and decorating are given by a decorator. Shopwork is conducted by a master upholsterer, who also gives course in arithmetic. Bookkeeping and business law are taught by two members of the trade-school faculty.

Course for shoemakers: Courses in technical drawing, measuring, cutting, etc., molding feet, and shopwork are given by a master shoemaker, who also teaches in the trade school. Courses in raw materials and arithmetic are given by a manufacturer. Courses in bookkeeping and business law are given by two members of the trade-school faculty. The course in anatomy is given by a physician.

Course for tailors: Courses in technical drawing, measuring, cutting, etc., and shopwork are taught by a cutter. Courses in raw materials and arithmetic are given by an expert in textiles. Courses in bookkeeping and business law are taught by a regular member of the trade-school faculty. The course in anatomy is taught by a physician.

Course for painters and allied trades: Drawing and painting are taught by a painter; composition and coloring by an artist. The technical course is given by an architect, who also teaches at trade school. Course in raw materials is offered by a chemist, who also teaches in the trade school, and bookkeeping is also taught by a regular member of the trade-school faculty.

While a considerable number of Meisterkurse teachers are at the same time members of the trade-school faculty, this is by no means true in all cases, and a number of the most important, particularly technical, courses, are given by experts who have no connection with the trade school whatever.

Except in case of business law, subjects which are common to several courses, such as bookkeeping, anatomy, etc., are taught separately, thus permitting teachers to lay special stress on the needs of the students in the several trades.

No financial report of the Meisterkurse at Frankfort on the Main has as yet been published, and the director does not consider himself at liberty to furnish information as to salaries. The teachers of the Frankfort Meisterkurse are remunerated by the hour, whereas in some other cities they receive a fixed salary.

COST.

Complete tuition for the full courses is 30 marks ($7.14); and for the partial course for painters, 20 marks ($4.76). Further, students must pay 1.40 marks (33 cents) for accident insurance. An agreement has been made with a local company which contracts, in exchange for above premium, to pay $714 in case of death, $2,142 for total disability, and 71 cents per day in case of temporary disability caused by accidents during work in the Meisterkurse.

In case of necessity scholarships may be granted to master artisans and journeymen resident in the Wiesbaden government district, in order to permit them to attend the courses. Scholarships may not exceed the following amounts:

For master artisans resident at Frankfort	$23.80
For journeymen resident at Frankfort	14.28
For master artisans resident elsewhere in district	35.70
For journeymen resident elsewhere in district	19.04

Thus far about one-third of the students at Frankfort have received scholarships.

In addition to small receipts from tuition, the expenses of the Meisterkurse are met by contributions from the Prussian government, the city of Frankfort, and the chamber of artisans of the Wiesbaden government district.

RESULTS.

The Meisterkurse are still in their infancy at Frankfort on the Main, and it is impossible to draw definite conclusions as to their results. The fact that attendance has thus far not been satisfactory has been noted. At the first series only two courses could be held, and at the second series only two of the five courses were attended by more than the minimum number of students.

The small attendance is attributed by the director to the fact that artisans do not appreciate the value of the courses until they have taken them. While tuition is very low and scholarships are granted in many instances, it is not always easy for an artisan to give up his trade for six or eight weeks. Those who have taken the courses agree that the instruction enlarges their ideas by showing them the full possibilities of their trade. It appears reasonable to assume that, in view of the satisfaction of the students, future courses will be better attended, as the purpose and scope of the Meisterkurse become better known among the artisans of the district.

The Meisterkurse have their opponents among the artisans; it is frequently urged that it is useless to attempt to make a master in six or eight weeks. This is, of course, not the object of the courses, the aim being only to perfect and supplement a long practical training. In general, however, the courses receive the support and encouragement of the official artisan organizations.

V. THE TRADE INSTITUTE AT COLOGNE.

By W. G. Dunor, *United States consul at Cologne.*

The school in this city which is officially known as the "Gewerbeförderungsanstalt" (Institute for the Advancement of Trades) does not profess to take students and teach them trades, but takes men not less than 24 years of age, who have already served as apprentices, workmen, and masterworkmen in factories, but who now propose to fit themselves for carrying on independent business. Unlike the graduate of an American college or technical school, the German does not "look for a job," but goes into business for himself.

The school was opened October 5, 1907, with classes for cabinetmakers, locksmiths, tailors, shoemakers, installers of gas, water, and electric works. Classes in bookbinding, saddlery, galvanism, and other subjects have since been added. The director explains that the object of the school is to teach only those subjects which will enable the handworker to retain a part of the prestige lost to him since the establishment of the large factories. The hand manufacture of such articles as furniture, shoes, clothing, locks, etc., is no longer profitable. Accordingly the present idea is to instruct the pupils in individual work that is not profitable for the factories; for instance, making special designs of furniture, fancy locks, and artistic smith work, designing clothes, and making special forms of boots and shoes.

In general each course occupies 8 weeks, and only 10 students are permitted in a class. That number, according to the director, is all that one teacher can profitably handle. More would be in each other's way and could not be given the personal attention necessary. On completion of the course no examination is made, but a certificate of qualification will be given each student.

There is no connection whatever with other schools; the pupils are drawn from factories and shops instead of schools. No especial preparation is necessary as to studies. The officers consist of the usual director, secretary, and advising board, the latter consisting in this case of the city officials, heads of departments, and officials of various industrial associations.

TUITION AND EXPENSES.

Tuition for the course is $11.90. In the case of needy students this may be remitted, and, in addition, the following sums may be donated to such students:

To masterworkmen living in Cologne	$23.80
To masterworkmen living outside Cologne	35.70
To workmen living in Cologne	14.28
To workmen living outside Cologne	19.04

Material for the use of students is in most cases furnished free. Completed articles are sold to the students at the bare cost of the raw materials.

Teachers are secured from various sources. There are no special schools for them. Their training and educational qualifications must be acquired by practical experience. Salaries paid range from $952 to $1,190 per annum, but teachers are not allowed any additional for residence, nor are they eligible to pensions as with teachers in public schools. The hours of work are from 8 to 1 and 2.30 to 6.30 in winter; 7 to 12 and 2 to 6 in summer, or 9 hours per day.

The cost per pupil averages $71.40; the annual aggregate expenditure amounts to $20,606, of which amount $8,330 is used to pay maturing bonds. The cost of materials averages about $1,428 per annum.

PERMANENT EXHIBITION.

Connected with the school is a permanent exhibition of machinery, tools, raw materials, articles in various stages of manufacture, etc. To this exhibition any manufacturer of machinery may donate specimens of his product. At the present time three stories of a large building are well filled with the best types of machines for use in small industries, such as small machine shops, factories, etc., including a very fine exhibit of the latest electrical motors and appliances for all kinds of machinery. The machinery in this exhibition is all operated by belts or individual motors and is used by the students of the school for demonstration purposes.

VI. SCHOOLS FOR FRUIT GROWING.

By Consul General H. W. HARRIS, *Frankfort on the Main.*

(a) THE GRAND DUCAL SCHOOL FOR FRUIT GROWING, OPPENHEIM-AM-RHEIN.

The Grand Ducal School for Fruit Growing at Oppenheim-am-Rhein is maintained by the Hessian Government and is placed under the supervision of the grand ducal ministry of the interior at Darmstadt, section for agriculture, commerce, and industry.

The school is independent of any other educational institutions. Through its varied activities, described further on in the present report, model vineyards, extermination of vineyard pests, itinerant instruction, etc., the school is naturally in very close touch with the fruit-growing interests of the Grand Duchy of Hesse.

The school is located in a town of about 4,000 inhabitants, in the Hessian Province of Rheinhessen. It is managed by a director, who also takes a considerable part in teaching. Supervision by governmental officers is exercised through frequent visits of inspection.

BUILDINGS, APPARATUS, SHOPS.

The school possesses four buildings, as follows: The main building, containing schoolrooms, collections, library, etc.; a building containing chemical and botanical laboratory and a fruit cellar; an office building, containing also school and study rooms, etc.; a building where vines are cultivated.

The school has no dormitory. The hours are so arranged as to permit students from neighboring districts to live at home. According to the prospectus of the school, students desiring to live at Oppenheim can find suitable board and lodging for $12 or $13 per month.

The school has at its disposal about 4 acres in productive vineyards and about 5 acres used for experiments, acclimatizing American vines or seedlings, and for similar purposes. The orchards, in which various kinds of fruit are grown, cover nearly 12 acres.

INSTRUCTION.

The Grand Ducal School for Fruit Growing at Oppenheim has a regular course consisting of two semesters, a winter semester from

the beginning of October to the last of March and a summer semester from the middle of April to the last of June, with holidays from Christmas until after New Year and two weeks at Easter. This arrangement permits the students to take part in the spring sowing as well as the harvest work either at home or on some well-conducted farm. In case the students do not spend their holidays at home the school undertakes to find suitable employment for them.

The instruction offered in the regular course is as follows:

1. German, 2 hours per week during the first semester.
2. Arithmetic, 2 hours per week during the first semester.
3. Geometry, surveying, leveling, and drawing, 2 hours per week, first and second semesters.
4. Physics, 2 hours per week, first semester.
5. Chemistry, mineralogy, geology, 6 hours per week, first semester.
6. Botany and zoology, 7 hours per week, second semester.
7. Grape growing, 7 hours per week; or, general fruit growing, disposal of fruit, and vegetable raising, 5 hours per week, first and second semesters.
8. Farming (including knowledge of soil, manuring, working soil, stock raising), 3 hours per week, first and second semesters.
9. Agricultural economy (with special attention to fruit growing), 2 hours per week, first and second semesters.
10. Bookkeeping and business methods, 2 hours per week, first semester.
11. Elements of constitutional, administrative, and common law, 1 hour per week, first and second semesters.

PRACTICAL WORK.

1. Surveying and leveling, 2 hours per week, second semester.
2. Chemistry, 2 hours per week, first semester.
3. Botany and zoology, 2 hours per week, second semester.
4. Fruit and vegetable growing, 8 hours per week, first semester; 24 hours per week, second semester.

The first semester consists of 24 weeks with 34 hours of theoretical and 10 hours of practical work per week; the second semester of 11 weeks with 25 hours of theoretical and 28 hours of practical work per week.

The following table shows total number of hours in each course:

Theoretical work:	Hours.
German	48
Arithmetic	48
Geometry, surveying, etc.	70
Physics	48
Chemistry, mineralogy, etc.	144
Botany and zoology	77
Vine culture, etc.	228
Fruit growing, etc.	175
Farming	105
Agricultural economy	70
Bookkeeping and business	48
Constitutional law, etc.	35
Total theoretical	1,091
Practical work:	
Surveying and leveling	22
Chemistry	48
Botany and zoology	22
Fruit and vegetable growing	456
Total	548

The students take part in all kinds of work in the school's orchards and vineyards. In addition, excursions are made to points in the neighborhood of Oppenheim and to other fruit and vineyard districts.

There is also a so-called "Praktikanten-Abteilung," a section in which preparatory practical experience may be acquired by students too young to take the regular course.

SPECIAL COURSES.

In addition to the regular course just described, the school gives several kinds of special courses which are held from time to time, according to the necessities of the district.

One of these is a course for vineyard owners, which includes instruction in the newest methods of planting and caring for vineyards, manuring, and combating vineyard pests, etc.

Another is a course for orchard gardeners. This consists of theoretical and practical instruction concerning fruit trees, planting, pruning, improving, etc. These are short courses held at irregular intervals.

ITINERANT INSTRUCTION.

Besides theoretical and practical instruction offered in regular and special courses at Oppenheim, the School for Fruit Growing sends its teachers as "itinerant instructors" all over the fruit-growing districts of the Grand Duchy of Hesse, has charge of an organized attempt to exterminate vineyard pests, supervises "model vineyards," and carries on extensive experiments in fruit growing in the vineyards and orchards connected with the school.

The "Wanderlehre," or itinerant instruction, consists of both theoretical and practical work; that is, lectures and field demonstrations. Originally most attention was paid to lectures held in fruit-growing centers. It has been found, however, that fruit growers derive more benefit from lectures which follow practical demonstrations. At present, instructors go through the district, follow work in the field, give practical demonstrations, and then close their visit by a lecture reviewing what has already been shown in practice. The teachers of the school are frequently invited to address meetings and associations of persons interested in fruit growing. The following figures will give an idea of the extent to which itinerant instruction is given by the school:

Itinerant instruction.

	Lectures.	Practical demonstrations.	Other work outside of school.[1]
1903	12	5	6
1904	20	6	7
1905	21	7	5
1906	35	7	15
1907	30	15	20
1908	44	23	200
1909	65	20	210

[1] This includes outside work in connection with model vineyards, experiment stations, etc.

EXTERMINATION OF VINEYARD PESTS.

In 1906 the Grand Ducal Government at Darmstadt decided to begin a campaign against vineyard pests; this work was placed under the supervision of the school at Oppenheim. The principal measures adopted by the school are, briefly, as follows: Instruction in vineyard culture; carefully organized observation and warning service; supervision of vineyards; training experts. The school gives from time to time as necessity may require two-day courses (called "Wiederholungskurse," or repetition courses), the object of which is to instruct growers how to cooperate with the school in the latest methods of combatting vineyard pests.

MODEL VINEYARDS.

The school attaches great importance to the educational value of its so-called model vineyards. These vineyards are quite independent of those already mentioned, which are the property of the school. The model vineyards are worked by the proprietors under the supervision of the school. In 1910, when the last report was published, 13 such vineyards were being supervised by the school. A contract is made for five years, by which the proprietor agrees to follow the very precise directions given by the school for planting and administrating the vineyard. As a rule the property administered as a model vineyard is about six-tenths of an acre in extent. The proprietor furnishes the labor and the school makes no charge for its assistance. The materials required are supplied principally by the school vineyards and orchards, and also by model vineyards. The products of the school are sold in the open market to private individuals and the proceeds turned over to the school funds.

STUDENTS.

Students admitted to the regular course must be at least 16 years old; they must have a common-school education or its equivalent, and be familiar with the most important features of fruit growing. Students admitted to special courses must be at least 20 years old.

The regular course was attended by 38 students in 1910–11, 28 in 1911–12, and 42 in 1912–13. The average age of students attending the regular course is 18 to 20 years. They are recruited for the most part among sons of fruit growers of the district.

TEACHERS.

The faculty of the school is composed as follows:

A director, who conducts the school and gives instruction in grape growing. The director has charge of experiments, model vineyards, combatting vineyard pests, and improvement of vines.

A teacher of natural sciences, who gives theoretical instruction in chemistry and botany, conducts experiments in the chemical and botanical laboratory, and tests the products.

A teacher for fuit and vegetable raising, whose further duty it is to direct practical work and experiments in these branches and superintend the school's orchards.

A teacher for agriculture, who gives instruction in farming and economy and in surveying and leveling. He assists in itinerant courses and experiments, superintends practical work, and edits a periodical published by the school on fruit growing and gardening.

A vineyard expert ("Weinbautechniker"), who manages the model vineyards under the supervision of the director and assists in itinerant instruction and practical work of students.

A gardener, who assists in practical work in fruit and vegetable raising.

A man who handles shipments and assists in the practical work of the students.

A secretary, who assists the director in accounting, correspondence, registration, etc.

Four assistant teachers (not exclusively attached to the school) for arithmetic, German, physics, and bookkeeping.

An attendant who is also employed in the chemical and botanical laboratory.

The principal members of the faculty have a theoretical training obtained at "Gymnasien" and higher institutions of learning. Their practical preparation is obtained partly at the school itself and partly in other technical schools of a similar character. The assistant teachers for arithmetic, German, physics, and bookkeeping, who are not attached exclusively to the school at Oppenheim, possess the usual preparation and educational qualifications of German teachers.

The salaries of the principal members of the faculty are as follows: Director, $952 up to $1,428 per year; teacher of natural sciences, $666 up to $1,428; teacher of agriculture, $666 up to $1,428; teacher for fruit raising, $666 up to $952. As usual in German schools salaries increase gradually, according to length of service. The assistants, chosen as a rule among the former students of the school, receive about $300 a year on an average. The hours of work for teachers are from 8 to 12 and 2 to 5. They have on an average 4 to 6 hours class work a week, the rest of the time being taken up by field work, experimenting, itinerant instruction, etc.

COST, AGGREGATE AND PER CAPITA.

Tuition for the entire regular course amounts to 50 marks ($11.90) for Hessians and 75 marks ($17.85) for others. This does not, of course, include board and lodging.

The aggregate cost of the school at Oppenheim is approximately $10,000 per year, of which $7,600 is contributed by the Government of the Grand Duchy of Hesse, and the remainder is made up from tuition, sale of products of the school, and miscellaneous receipts. The expense to the Government is about $240 per year per student. The principal items of expense are $5,250 for teachers, $700 for materials, and $1,650 for general expenses. Scholarships ranging from $24 to $71, contributed from public sources (state savings banks, etc.), may be granted needy students.

RESULTS.

The Grand Ducal School for Fruit Growing exercises a considerable influence on fruit growing in the Grand Duchy of Hesse and adjacent districts. While attendance varies considerably, it has never been so large as during the past school year. The rapid development of the school's supplementary activities tends to emphasize more and more the practical side of the school work and to give it almost the character of an experiment station. The steady increase in itinerant work shows the success of this branch of instruction. The model vineyards scattered over a considerable district bring the school into still closer touch with fruit growers and are of mutual benefit.

The fact that the Grand Ducal Ministry gave to the school supervision over the work of exterminating vineyard pests is an evidence of achievements on the practical side.

On the whole, through careful training of future growers and close relations maintained with those already engaged in active work, the school is undoubtedly contributing materially to the furtherance of fruit growing in the Grand Duchy of Hesse and surrounding districts.

(b) THE PROVINCIAL SCHOOL FOR FRUIT GROWING, KREUZNACH.

The Provincial School for Fruit Growing at Kreuznach has been in existence since 1900. In 1911 a so-called "winter farm school" (Landwirtschaftliche Winterschule) was opened in connection with the school. The winter farm school has some 80 students, is under the same director, and uses to a certain extent the buildings and equipment of the school for fruit growing. The latter is otherwise independent from other educational institutions, and was conducted from 1900 until 1911 solely for instruction in fruit growing. Only that part of the school devoted to fruit growing is considered in the present report, as coming properly within its scope.

Relations to industrial establishments, particularly, of course, vineyards and orchard plantations, are very close.

The school is under the supervision of the Provinzial-Verwaltung der Rheinprovinz, and is inspected at regular intervals.

Kreuznach, where the school is located, is a city of 23,000 inhabitants, the seat of an active commerce, and within a short distance of the vineyard districts of the Palatinate and the Grand Duchy of Hesse.

BUILDINGS, APPARATUS, SHOPS.

The School for Fruit Growing at Kreuznach possesses a main building, a smaller building used for practical work of various kinds, and a dormitory.

The main building includes, in addition to office rooms, the principal classroom, a laboratory, a microscope room, and a library. The principal classroom seats comfortably 40 students, and contains, further, a collection of plants, minerals, and objects connected with fruit growing. The laboratory affords facilities for 20 students to do independent work, each one having separate water and gas connections and a locker. The microscope room and library are also well equipped. The library contains a considerable number of scientific works, in addition to books dealing with technical problems of fruit growing. The director of the school is also lodged in the main building.

The second building is used for handling the product, and includes a cooperage shop and a fruit kitchen. The fruit kitchen is used for putting up fruit, making fruit juices, marmalade, etc., and drying fruit and vegetables. It is equipped with a gas oven, apparatus of various kinds for drying fruit, fruit crushers and presses, and miscellaneous utensils. Two adjoining rooms are used for storing fruit and the products of the kitchen, respectively.

The school dormitory can accommodate over 40 students, and has, further, rooms for teachers and the matron. Out-of-town students sleeping in the dormitory can also board there.

The school has an orchard covering about 5 acres, in which different kinds of trees and planting methods, distribution of trees and bushes, etc., can be studied. A second orchard, nearly 20 acres in extent, is situated a short distance from the school and is used for ordinary and intensive fruit growing.

The school possesses also a number of vineyards scattered through the several districts of Kreuznach. These vineyard are planted with different varieties of grapes and cover an area of about 10 acres in all.

In addition to its own property, a number of Government experiment vineyards are placed under the supervision of the school and afford additional opportunity to study the different kinds of soil, vines, etc.

INSTRUCTION.

The school year at Kreuznach is from the beginning of October to the middle of August. Instruction consists of a two years' course, including theoretical instruction in the following subjects: Vineyard growing; orchard trees and their care; trees trained on trellis work; different varieties of fruit; utilization of fruit; farming; stock raising and care of stock; vegetable gardening; flower gardening; bookkeeping; management of agricultural enterprises; agricultural mathematics; chemistry (including laboratory work); mineralogy; physics; surveying; arithmetic; German; religion. It will be observed that the students are not only taught fruit growing, but also such subjects as arithmetic, bookkeeping, etc., with special reference to the needs of their future work. Afternoons, from 2 to 5 in winter and 2 to 6 in summer, are devoted to practical work in which the students learn to lay out and care for vineyards; improve vines; exterminate vineyard pests; harvest the grapes; plant, train, and care for fruit trees and trees trained to trellis work; pick, store, and utilize fruit; raise principal varieties of vegetables, etc.

Furthermore, the school trains young men for positions as managers of agricultural enterprises. These men receive in addition to the work above outlined, special instruction in chemistry, stock feeding, veterinary science, management of farms, and surveying. This is a two years' course.

Besides the regular yearly courses, the school offers a number of special courses held generally during the winter months and lasting one to three weeks, thus enabling farmers and fruit growers to attend.

A course of three weeks is given in fruit growing, a six weeks' course for nurserymen, and courses in utilization of fruit ("Obstverwertung"), including preserving and drying fruit, etc., for girls and women. The object of these special courses is to afford older farmers and growers an opportunity to familiarize themselves with the latest technical improvements and scientific investigation. They include both practical and theoretical instruction. They lead to a beneficial exchange of views and make valuable experience common property. They further make the school known to older farmers and growers and encourage them to send their sons. The principal object of the courses in utilization of fruit is to show how inedible fruit can be advantageously disposed of and thus encourage fruit raising.

Furthermore, the director of the school and teachers give itinerant instruction by means of lectures and practical demonstrations throughout the school district.

The raw materials required—grapes, fruit, etc.—are supplied by the vineyards and orchards of the school and by purchase. They are supplied free of charge to the students.

STUDENTS.

In general, students under 16 years of age are not admitted to the regular courses. Students are expected to have had considerable practical experience in agricultural work and presumably to be able to derive benefit from both theoretical and practical instruction.

For Germans, tuition alone costs 36 marks ($8.57) a year; board and tuition together, 300 marks ($71.40). Half and full scholarships can be granted students unable to pay tuition and board. For foreigners, tuition alone costs 100 marks ($23.80) per year; board and tuition together, 450 marks ($107).

In general, students admitted to special courses must be at least 20 years old. There is no tuition or other charge for these courses. The average age of the students is 16 to 20 years. They are for the most part sons of farmers and growers and have had considerable practical experience as well as elementary schooling. The regular courses have an average attendance of about 30.

TEACHERS.

Teachers of the School for Fruit Growing at Kreuznach include a director; three teachers for vineyard culture, orchard growing, and general farming, respectively; teachers for Catholic and Protestant religions; two common-school teachers for elementary subjects. The school also has a vineyard inspector, a garden inspector, a matron, and various servants and laborers.

The four principal members of the faculty must be graduates of a technical school for fruit growing and possess practical experience extending over several years. The other teachers are not attached exclusively to the school at Kreuznach and possess the usual training and qualifications of German teachers.

The principal members of the faculty commence with a salary of $476 per year and receive an increase every two years, the first four increases amounting to $59.50 each, followed by six increases of $47.60 each up to a maximum of $999.60 a year. They may further receive special additional remuneration amounting to $160 a year.

The principal members of the faculty have the following hours of work: In winter, 8 to 12 and 2 to 6; in summer, 7 to 12 and 2 to 6. They have one afternoon in the week free.

COST, AGGREGATE AND PER CAPITA.

The school at Kreuznach is supported by the provincial authorities of the Rhine Province.

The total expenses are about $14,250 per year, of which about $4,000 is for teachers, $3,800 for material, and $6,400 for general

expenses. These figures cover the "winter farm school" maintained in connection with the school for fruit growing, with its 30 students. The director estimates the per capita cost at about $240 per student.

The Prussian Government contributes $1,095 to the support of the school, the district and city of Kreuznach $71 each.

RESULTS.

The Provincial School for Fruit Growing at Kreuznach was opened in 1900. From the beginning the attendance has been good, and shows that fruit growers appreciate the advantages of the training given their sons. Through the special courses, intended chiefly for older growers, and the itinerant instruction given by the director and his assistants, the school keeps in close touch with the district, covering about 200 localities.

The advantages of such an organization are obvious. On the one hand, the teachers gain a better knowledge of the problems and necessities of the district, besides being able to judge the practical results of the school's work. On the other hand, not only the regular students, but also those already engaged in fruit growing, have an opportunity to become acquainted with and apply under the supervision of experts the latest improvements in technical methods and materials. The special courses and intinerant work of teachers also tend to keep former students in contact with the school.