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NEW ZEALAND.

# EDUCATION: TECHNICAL EDUCATION.

(A BELGIAN REPORT ON TECHNICAL EDUCATION IN ENGLAND.)

*Presented to both Houses of the General Assembly by Command of His Excellency.*

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THE following pages contain an abstract of a report presented, 31st December, 1895, by Dr. Oscar Pyfferoen, to the Belgian Minister of Industry and Labour. [*Rapport sur L'Enseignement Professionnel en Angleterre*, par Oscar Pyfferoen, Chargé de Cours à l'Université de Gand, Docteur en Droit, Docteur en Sciences Politiques et Administratives, Bruxelles, 1896, 321pp.]

WM. JAS. HABENS.

## INTRODUCTION.

SPECIAL thanks are due to many official persons in England who rendered every possible aid to the writer, by introducing him to the best schools of every district and supplying him with copious information.

## PRELIMINARY NOTE.

*Object of the Mission and of the Report.*—No single work hitherto published can give an exact idea of the present state of “professional” education \* (*l'enseignement professionnel*) in England, which during the past few years has advanced with gigantic strides. The English themselves make no effort to direct attention to the progress which is giving them an advantage in the commercial struggle with foreigners, and indeed they say that in this matter they are all behind. It would be a great mistake to believe them! Of course it is possible that they consider that not enough has been done. That there are Englishmen who do not regard with such disdain their own institutions of “professional” education is proved by a sentence in the report (1895) of the Secondary Education Commission: “Technical and manual instruction has been created and has assumed, especially in certain localities, what may in certain respects seem to be rather large proportions.” With such circumlocutions and with such timidity do the English confess to a fact of which they would willingly make their boast, were they not afraid of being too speedily imitated by other nations. The sequel will show that an almost unheard of development has taken place in a remarkably short time.

*Definition of “Professional” Education, &c.*—At present no precise definition exists. In England, even more than in Belgium, the limits which separate “professional” education from the other parts of public instruction have been left vague. The term “technical education” is used in England to denote both “professional” education and certain related branches. As a Belgian, the writer at first thought that “professional” education must mean that instruction which constitutes a special preparation for active employment in manual “professions,” trades, and business. But it is almost impossible to make a sharp distinction between “industrial” and “professional” education, and, consequently, they are in a somewhat confused way combined under one management, as is the case in Belgium, where some of the “professional” schools are really “industrial,” and others, though called “industrial,” have classes that are really “professional.” In general, and loosely, it may be said that “industrial” education is more theoretical, and “professional” education more practical. Technical education in the English sense may be divided into three stages, the elementary being such as is given in the “professional” schools of Belgium, the secondary such as belongs to its “industrial” schools, and the superior such as is provided by its schools of arts and manufactures, schools of mines, schools of civil engineering, and universities.

\* In the translation the words “professional” and “industriel” have been sometimes rendered by their apparent equivalents—“professional” and “industrial”—with the inverted commas. It is necessary to advise the reader that “professional” and “industrial” as thus used relate respectively to “trades” and “manufactures.”

The inquiry, therefore, has been extended to include those parts of technical instruction which, as it were, lie adjacent to the realm of "professional" education. Again, in some aspects the training for trades and for manufacturing industry (*aux métiers et à l'industrie*) demands artistic knowledge, and this has led the writer to go beyond his commission, and to study minutely the English schools of the fine arts on the side of their relation to "industrial" and applied art.

Finally, careful inquiry into facts as well as theory leads to the conviction that "professional" education finds its corollary, or, rather, its indispensable point of departure, in the manual instruction which belongs to the programmes of primary and secondary education, and what has been done in England in this direction is therefore noted in this report.

*Utility of this Branch of Education.*—Two facts have had a very strong influence on the economic condition of the working-classes. (1.) The old system of apprenticeship is on the wane, and destined to extinction. The master now employs so many hands that he cannot give individual instruction to any of them, or take a paternal interest in them; and it would be impossible now to prevent a youth from leaving as soon as he had begun to be really useful, and to make some return for the trouble of training him. (2.) The division of labour is carried to such a point that a workman no longer makes a garment, a boot, or a shoe; it takes ten, or perhaps twenty, to make a single part of one of these articles. A slackened demand, or a change in the fashion or make of these things, throws a crowd of operatives out of work. Excessive specialisation has rendered them incapable of touching any other part of the work of their own trade than that which they have hitherto performed almost automatically. Had they learned their trade as a whole they could find useful and remunerative occupation in some closely related branch of it.

The "professional" schools, then, have a twofold part to play; they have, first, to make up for the decline of workshop apprenticeship; and, secondly, to furnish the workman with such general and complete ideas of his trade as will enable him to do his work with more intelligence and speed, and at the same time to set him to perform all the operations of his own calling and those of the related and similar branches of industry. The workman who has had general principles and useful processes clearly explained to him in the school, and adequately demonstrated there, will pass more quickly on that account through his apprenticeship and obtain earlier the wages of a journeyman, and his wages will soon rise above the normal rate.

But the school cannot take the place of apprenticeship, or turn out fully-trained workmen. One year, three years, five years of school-teaching will not make a real workman. The "professional" school helps the young apprentice, and facilitates and completes his training. The school workshop enables him to learn the best processes, and to get a better grasp of the principles of his trade. But, according to the English view, he cannot really learn his trade and acquire manual dexterity anywhere but in the real workshop or factory.

It would be a waste of public money to keep boys at school till they became accomplished tradesmen. And how could the products of their work be disposed of? They would not fetch what they cost. To sell them at current prices, or at reduced prices, would be to compete with private industry. Besides this, families could not afford to maintain the boys so long without wages. It would never do to pay wages to the pupils. There is no "professional" school in England that does not require some contribution from the pupils. True, there are scholarships, but they are given rather as prizes than as inducements to attendance. The schools are intended rather for those who are already working at a trade than for those who merely intend to be tradesmen.

## PART I.—LEGISLATION AND LOCAL AUTHORITIES.

### 1.—LEGISLATION.

Before the year 1889 the power of provincial districts and municipalities, and of such bodies as County Councils, to establish technical schools and devote their resources to technical instruction was in doubt. The laws of 1889 and 1891 removed this doubt, and the law of 1890 provided the authorities with pecuniary resources for these purposes. Important as these laws are, they have met with remarkably little opposition; they were cordially received in Parliament, and were strongly supported by public opinion. The only criticism of any weight takes the form of the question, Ought not this Department of Public Instruction to be in the hands of the School Boards? The aim of the Government was to stimulate the institution of evening schools for the trades, and this object has been fully attained.

Before this time about three hundred schools of arts, of science, and of technology, had been established by some of the guilds, but they failed for want of means. At the time of the Queen's Jubilee, schools were instituted at Blackburn and other cities, but most of these also failed for want of means. The Government wished to render aid to these enterprises.

The principal laws are: "Technical Instruction Act, 1889;" "Local Taxation (Customs and Excise) Act, 1890;" "Technical Instruction Act, 1891." Of less importance are: "Technical and Industrial Institutions Act, 1892," "School for Science and Art Act, 1891," "Public Libraries Act, 1892." For the present purposes, legislation relating to Scotland, Ireland, and Wales is not included.

### 2.—AUTHORITIES ENTRUSTED WITH THE WORK.

These are the local authorities, such as County Councils, Borough Councils, and urban sanitary authorities. Every borough of 40,000 inhabitants constitutes a county by itself. Towns of a certain size are thus raised to the rank of provinces. Town and country have different interests in everything that relates to technical education, and both preserve their independence, not only in the organization of the instruction, but also in the providing of the money needed for this purpose.

There is no central authority for technical instruction, except that the Science and Art Department has the power: (1.) of deciding what subjects can be reckoned as coming under the head of technical instruction; (2) of settling all questions as to the amount of the subsidy, as to the right of an institution to participate therein, as to the degree and method of representation of the local authority in the administrative committee of any subsidised institution; (3) of determining the conditions on which parliamentary subsidies can be granted for manual and technical instruction.

### 3.—LEGAL DEFINITION OF TECHNICAL INSTRUCTION.

“Technical instruction” is defined as “Instruction in the scientific and artistic principles applicable to industries and in the application of special branches of science and art to definite industries and occupations. It does not include instruction in the practice of a trade or manufacture or occupation, yet it does include instruction in the subjects of science and art for which the Science and Art Department gives subsidies, and all other kinds of education, including modern languages and commercial and agricultural subjects, which may be approved by the department. . . . The term “manual instruction” means instruction in the use of tools, in the processes of agriculture, and in modelling in clay, wood, or other material.”

1. It will be seen that a distinction is made between general “professional,” instruction and special, corresponding very nearly to “industrial” and “professional” education respectively.

2. The difference between a “professional” school and an apprenticeship workshop is not very definite. Where a doubt arises the law sets up a central authority, which will judge whether a given class or subject comes under the head of education or under that of apprenticeship. As a matter of fact, the Science and Art Department has had very little difficulty on that score.

But for the provision that the practice of a trade or industry cannot be taught in subsidised schools the Act would have encountered the opposition of all the working-men. It is recognised, however, that for some trades the theoretical and the practical teaching are almost inseparable, and therefore certain classes of “manual instruction” are subsidised, without being required to obtain the approval of the Science and Art Department.

3. Technical education is related in many ways to secondary education, and the Secondary Education Commission (report, Vol. i., 1895) maintains that it is a branch of secondary education. For it must come after primary education, since the trades require the preliminary knowledge imparted in the primary schools, especially in arithmetic, drawing, and elementary geometry. Again, if secondary education prepares some pupils for the higher education, it is most often a direct preparation for the business of life, as technical education is; with this difference: that technical education is a preparation not for an undefined career but for some definite trade or other occupation. The County Councils give a very wide meaning to the term “technical education,” and the Science and Art Department makes it include even secondary-school subjects (except the literary and classical), excluding nothing that bears directly upon a student’s preparation for the work of his calling.

4. Technical education stands related also to primary education, which it requires for a foundation. Great care is taken in England to emphasize the idea that technical education is not a substitute for primary education, but ought to rest upon it as a foundation.

### 4.—POWERS OF THE LOCAL AUTHORITIES.

1. What they can do for technical education:—

(1.) They can establish schools and classes. During the last five years they have taken over forty old schools, and founded ninety-four new ones, seventy of which are finished, the cost of the seventy being £968,000.

(2.) They can subsidise schools and classes, and this is the most frequent form of their intervention.

(3.) They can give scholarships or pay student’s fees. As a matter of fact there are too many scholarships. The county of Bradford alone offers 232.

(4.) They can, if they deem it necessary, institute entrance examinations for the schools and classes which they establish or subsidise.

(5.) They can delegate their powers—except those of imposing taxation or raising loans—to committees, consisting in whole or in part of members of the local Council.

2. What they cannot do:—

(1.) They cannot pay for the technical education of children under thirteen years of age who have not finished the course of compulsory primary education. The law does not forbid the giving of this kind of instruction to such children, but the Education Department and the Science and Art Department provide the money required for that purpose, and the primary schools have not time for technical instruction in the strict sense.

(2.) They cannot assist a school of technical education that does not accept the “conscience clause.”

3. Other rules: When making grants to schools which they have not themselves established, the local authorities must consider local needs, and must take account not only of the nature and quantity of the instruction—i.e., of the real worth of the school,—but also of its usefulness, so that an inferior school may acquire vested rights to subsidy, and if the subsidy is withdrawn may appeal to the Science and Art Department, though this right of appeal is seldom exercised. The Council which grants a subsidy to a non-official school must be represented on the committee of the school by special delegates, who need not be members of the Council. The subsidies received must be duly accounted for, and the managers are personally responsible for any amount applied to any purpose other than that for which it was granted. Schools that are carried on for pecuniary profit cannot receive grants.

## 5.—FINANCE.

1. *Local Taxation*.—Under the Act of 1889 a local authority can levy a special local tax not exceeding 1d. in the pound. More than seventy localities have adopted this method of raising money for technical education, and have thus obtained an annual revenue of at least £50,000. A part of a county can be charged for expenditure for its special benefit. The local authority has power to raise loans.

2. *Special Funds*.—The greater part of the income at the disposal of the local authorities for technical education is derived from certain Customs and excise duties, which, almost by accident, are devoted to this object. In 1890 new duties were imposed, principally on spirituous liquors, to provide the means of giving compensation for the closing of publichouses. The Bill for the closing of the houses was thrown out; but the duties were imposed. At the suggestion of Mr. Acland, Government proposed that the new revenue should be for the most part applied to technical education. As the Act of 1889 had given the management of technical education into the hands of the local authorities, the Act of 1890 entrusted those authorities with the new income thus obtained. The Act does not absolutely require the local authorities to use this money in the interests of technical education; but most of it is actually so applied. In 1894 there were forty-nine County Councils; forty-two of them applied to technical education the whole of their share of the special funds, while the remaining seven applied part to this use. Of the sixty-one Borough-County Councils, fifty-one spent the whole in this way, and nine counties a part. One of these Councils used the whole for other purposes.

Many of the counties have proceeded with caution, and gradually developed their plans, reserving part of their income. Usually they have set up a committee to study the question, and to make inquiry as to the best means of promoting technical education in their own district. The Act of 1891 gives them power to create reserve funds.

For England alone the revenue on account of the special duties, in the four years from the 1st of April, 1890, to the 31st of March, 1894, was £2,797,100. Out of this amount, £1,439,321 was expended on technical education, and £632,439 reserved for the same purpose. During the same time the Councils also spent on the same object £572,685, derived from other sources. Thus the total expenditure by the County Councils and Borough-County Councils on technical education in the four years was £2,012,006, and the amount of reserved funds created was £632,439.

## PART II.—THE CENTRAL ADMINISTRATION.

Technical education is not centralised under a single administrative body. English institutions in general have a piecemeal character, and frequently overlap. They are the outcome of progressive reforms, and of a process of addition rather than of substitution. The two principal administrative bodies in directing, controlling, and subsidising technical education are the Science and Art Department and the Education Department.

## CHAPTER I.—THE SCIENCE AND ART DEPARTMENT.

At the head of this department is the Lord President of the Council, assisted by a member of the Privy Council, who is called Vice-President of the Committee of Education. This Vice-President is nominally under the direction of the Lord President, but in reality he acts alone in most cases; he may be regarded as the English Minister of Public Instruction.

The State began to make grants for education in 1837. In 1852—the year following that of the Great Exhibition—a Department of Art was instituted, and to this was added, in 1853, a Department of Science. At first the department was under the Board of Trade. In 1856 the Department of Education was created, and the old department and the new were both put under the control of the Lord President and the Vice-President of the Committee of Council. From 1873 to 1884 both departments were under the same secretary.

Assistance is granted by the Science and Art Department in several forms, as follows: (1) Payment to committees of schools and classes according to attendance, and to efficiency, as tested by examination; (2) certificates, prizes, medals, free tuition, and scholarships; (3) grants for building; (4) maintenance of institutions of higher education established by the department at South Kensington (London), and in Dublin and Edinburgh; (5) grants to local museums and schools in aid of collections; (6) grants to the State museums of manufacturing industry in London (at South Kensington and Bethnal Green), Dublin, and Edinburgh; (7) grants for technical education in Ireland.

1. *Grants to Educational Institutions.*

1. *General Conditions*.—The schools must have been recognised by the department, and must be always open to Government inspection. The qualifications of the teachers must have been recognised by the department. A school that seeks a grant must send in its time-table and a list of the teachers, must make a statement of its income, and furnish in a prescribed form a statistical report for the year just ended. The grants are supplementary to local or private contributions. A school must have local support in the shape of fees, subscriptions, or taxes; must keep registers of admission and attendance; and must not be carried on for private gain. For every subject taught there must be lessons on at least twenty-eight days in the year. The grants must be devoted exclusively to instruction, and the local committee must provide proper places for teaching and examination, and supply light, fuel, &c. Grants for buildings can be made only if the classes are officially instituted, or if they are evening classes open to the public. The fees must not be unduly reduced for the sole purpose of rivalry. Every school must be under the supervision and direction of a local committee, responsible for the appointment, work, and salary of the teachers, and for all disbursements.

The pupils whose attendance justifies a claim to subsidy are: Earners of weekly wages and their dependent children; primary school teachers and their dependent children; pupils (or ex-pupils) of primary schools; persons with less than £500 of income, and their dependent children; pupils of evening classes for "industrial" education. A pupil who has not attended twenty times in a year is not counted. Unless the inspector expressly dispenses with their attendance, the local committee must meet on the day of inspection. The grants depend on the results of the examinations.

2. *The Local Committees.*—A school must be under a committee. The local authority, or a committee to which that authority has delegated its powers, may act as a local committee, as also may a School Board, or the committee of a school (not being simply a primary school) dependent on the Charity Commission. A local committee established especially for the purpose must consist of five persons at least, and at least two-fifths must be persons occupying some public position. The composition of the committee must have been approved of by the department, and the members must be of independent standing, and must have no pecuniary interest in the school. One committee may have several schools under its direction.

3. *National Examinations.*—There are two kinds of examinations according to the nature of the subjects: (a) Individual and personal examination of the student; (b) examination of works done by the students in the course of the year. Two members of committee, or a special local secretary with assistants, must supervise the examination. Where there are more than fifty candidates there must be one more supervisor for every fifty or fraction of fifty. Outside candidates must be admitted on paying a fee of about 5s. a subject. In populous places a special local secretary is paid to make all necessary local arrangements. He is appointed by the Government and can have paid assistants. Half the cost of these arrangements is borne by the locality and half by the department. A trustworthy person, who may be a member of committee or the special secretary, but not a teacher or an interested party, is made responsible for the custody of the papers. If any suspicion as to the conduct or result of a local examination arises, a new examination is held at the place. In the year 1892–1893, the cost of the examinations was £21,635.

There are twenty-five science subjects, as follows: Practical plane and solid geometry; machine construction and drawing; building construction; naval architecture; mathematics; theoretical mechanics (solids, fluids); applied mechanics; sound, light, and heat; magnetism and electricity; inorganic chemistry (theoretical and practical); organic chemistry (theoretical and practical); geology; mineralogy; human physiology; general biology; zoology; botany; principles of mining; metallurgy (theoretical and practical); navigation; nautical astronomy; steam; physiography; principles of agriculture; hygiene.

For each subject there are three stages—elementary, advanced, and honours—and in each of the last two stages there is a first class and a second class. The grants made to the schools, according to the results of the examinations, are as follows: £2 for every pass in the elementary stage; £5 for a first-class pass in the advanced stage; £8 for each student in the first class in honours. For a second class the grant is one-half of the £5 or of the £8, and the other half is paid when the student gains the first class. A school cannot receive more than two grants for the same pupil in the same year. The regulations are very similar for the art subjects, which are even more numerous than the science subjects. There is only one county that does not render direct or indirect aid to the classes affiliated to the Science and Art Department.

### 2. *Scholarships founded by the Science and Art Department.*

1. The department helps local institutions to found scholarships, on condition that these are offered to competition, and that a fair part of the expense is met by the voluntary contributions of living persons.

2. The department itself institutes scholarships to enable children to go from the elementary schools to more advanced schools. There must be competition, and there cannot be more than one scholarship for every fifty pupils. The competitors must not be above the age of sixteen. The successful candidates must attend school regularly, and go up for the national examinations year by year. The local managers decide whether a scholarship is tenable for one year, or two years, or three years, and must contribute £5 a year towards the scholarship, the department adding £4 for the first year, £7 for the second, and £10 for the third.

3. If the directors of a local fund contribute one-half of the amount, the department grants a local exhibition of £50 a year, tenable for one, two, or three years. These exhibitions must be competed for at the national examinations by members of subsidised classes, and the exhibitioners must devote their whole time to study at some college or school where instruction of an advanced order in science or art may be obtained.

4. Seven Royal exhibitions, twenty-two national exhibitions, and six free studentships, all tenable for three years, are awarded in competition every year. A Royal exhibition is of the value of £50, with free admission to a Royal college; a national exhibition is worth £60 a year, with free admission; a free studentship entitles the holder to free admission only.

5. Sir Joseph Whitworth's four exhibitions of the value of £250 each, and thirty scholarships of £50, are tenable for one year. The candidates must have been engaged in some manual or mechanical trade for three years and a half, and must devote the whole year of the exhibition or scholarship to scientific studies.

### 3. *Rewards to Students.*

Certificates are given to all who pass examinations. A small number of prizes—books, instruments, &c.—are given to the best candidates in the advanced stage. Every successful candidate for first-class honours receives a bronze medal.

#### 4. *State Institution of Technical Education under the direction of the Science and Art Department.*

1. The Royal College of Science at South Kensington: One of the effects of the Great Exhibition of 1851 was the awakening of a desire for the development of technical education. In 1853 the new Department of Science and Art endeavoured to satisfy this desire by improving the School of Mines and Chemical Manufactures, which had been established in 1851. The improvement consisted in giving at the School of Mines more advanced instruction in chemistry as applied to arts and manufactures. The Royal College of Science had its origin in this School of Mines, to which was added in 1880 a normal school for science-teachers. The title was changed in 1890 from "Normal School of Science" to "Royal College of Science," and with this college the School of Mines was incorporated.

The college is now a complete faculty of sciences. It has laboratories and collections of botany, biology, mineralogy, chemistry, physiography, &c.; and attached to it are the magnificent collections of the South Kensington Museum, where some of the courses of instruction are given. Free students can choose the courses they will follow, but candidates for the associateship must take up the subjects of their own divisions in a prescribed order during three years or more. They attend for eight months and a half in the year, the hours being from 10 to 1.15, and from 2 to 4. Most of the time is devoted to laboratory-work. Gratuitous instruction and a sum sufficient to pay the expenses of travelling and of maintenance during their visit are given to fifty teachers and candidates for appointment as teachers. Classes for teachers are held in vacation. There are 294 students attending, of whom 136 pay fees, the rest holding scholarships.

2. National Art Training School is an Academy of Fine Arts at South Kensington, principally for the training of teachers of drawing: There is a large number of pupils. Most of the classes meet in the day-time, but some at night. The instruction is purely academic. There are more women than men in attendance. The National Museum of Art, with its unrivalled collections, is accessible to the students. It is astonishing that, notwithstanding the presence of such a display of applied art in every form, instruction in art should continue to be so abstract—so restricted to the principle of "art for art's sake"—in a country where practical ends are so commonly paramount.

These colleges are specially devoted to the training of science and art teachers. Students intending to engage in manufacturing industries often go to complete their studies to the Central Technical College of the city and guilds.

#### 5. *Central Authority of Technical Education.*

The Science and Art Department, without encroaching on the autonomy of local authorities, is a kind of Court of appeal in purely administrative matters affecting technical education. Many appeals are made on questions relating to subsidy, and to the constitution of committees. Such matters are usually arranged by an officer of the department, who holds an inquiry at the place. The department decides what subjects may be recognised for purposes of subsidy. Two lists—of subjects generally recognised, and subjects recognised in certain localities only—are kept, and these are revised annually. In 1895 considerably more than a hundred special subjects [stated in detail by the writer] were included in the two lists.

#### 6. *Public Museums of Science and Art.*

1. The department's Museum at South Kensington has no equal in the world; its extent and wealth, the variety of its collections, and their truly practical character are unique. All industries are illustrated there: their raw materials, their tools and machinery, and their products. Working models of machinery are always on view. The place is most thronged at the time of school holidays. For the convenience of working-people it is open till 10 at night. A great library is annexed, replete with works bearing on arts, manufactures, and trade. The number of visitors to the museum in 1894 was 1,057,279. From the foundation up to the end of 1894, the money spent in the purchase of the contents of the museum was £400,000, of which £9,394 was spent in 1894. The favourite opportunities of purchase at low prices occur when great international exhibitions are breaking up.

2. Less important, yet highly interesting, is the Bethnal Green Museum, a Government establishment in the poorest and most densely populated part of London. Here are exhibited animal and vegetable products, and everything that can be made out of them, and all the processes of the manufacture of any particular article—a hat, for example. Placards and tables drawn up by the best authorities give the fullest explanation of every object and every process. No better object-lesson for artisans could be devised. The first section is devoted to the clothing industries, and trades products, leather, shoemaking, feathers, shells, coral, sponges, wool, silk, cotton, pearl, bone, horn, ivory, soap-making, and oils. The second section is taken up with food products, such as sugars, tobaccos, flours, &c. A series of illustrations of the diet of Eastern nations is exhibited, which formed part of the Colonial and Indian Exhibition of 1886. In 1894 the visitors numbered 591,302.

3. There are important museums in Dublin and Edinburgh.

4. The Government regards these museums as only a beginning, and contemplates the institution of others in London, and at the provincial centres.

#### 7. *Grants and Loans to Local Museums.*

1. Grants are made for the purchase of objects of interest for museums attached to schools of science and art. These grants never exceed half the price paid, and voluntary subscriptions must be equal to the grant. In 1894 grants were made to four museums.

2. The Science and Art Department has a large number of loan collections, consisting of objects, books, drawings, photographs, &c., illustrative of some thirty subjects. These are lent to supply-

ment existing collections in schools and museums. In 1894 loans were made to fifty museums and nineteen exhibitions, and the objects lent numbered 28,884. The number of visitors was 4,635,621.

3. The department lends apparatus, pictures, drawings, &c., to the schools. In 1894 this favour was granted to thirty-seven schools and 226 separate classes.

#### 8. *Finances.*

The expenditure of the department in the year 1894-95 was about £577,782,\* as follows: Royal College of Science, London, £17,896; Normal School of Art, London, £7,487; Royal College of Science, Dublin, £6,908; science and art education in Normal schools, £7,100; administration and inspection, £41,490; museums and collections, £86,926; grants to local museums, £500; science schools (and manual instruction thereat), £136,500; art schools and classes, £57,500; scholarships and prizes, £11,225; grants for apparatus and furniture, £2,350; grants for school-buildings, £9,400; technical education in Ireland, £2,500; drawing and manual instruction in primary schools, £180,000.

#### 9. *Publications.*

The department has published more than seven hundred volumes relating to its own operations and the state of science and art education in the country. In this enumeration periodical publications are counted once only. The annual publications are: (1) the Directory; (2) the Report; (3) a Return of the aid granted by County Councils to science and art teaching, and technical and manual instruction; (4) Prospectus of Whitworth scholarship and exhibitions; (5) examination papers; (6) calendar.

### CHAPTER II.—THE EDUCATION DEPARTMENT.

This department encourages to a very small extent manual and technical instruction in the primary day-schools, and to a somewhat larger extent in evening-schools.

1. *Day-schools.*—Capitation subsidy (per annum) is granted as follows: For needle-work, 1s. to 2s.; navigation, mechanics, chemistry, physiology, book-keeping, shorthand, domestic economy, and some other subjects, 2s. to 3s.; cooking, 4s.; laundry-work, 2s.; woman's work, 4s. In 1894-95 the grant for cooking (4s.) was paid for 122,325 girls at 2,577 schools; the grant for laundry-work (2s.) for 7,238 girls at 260 schools.

2. *Evening-schools.*—These schools are designed to keep up and to supplement the instruction received in the day-schools. Any subject may be taught, but the subsidy is paid on those subjects alone which the department has recognised, such as history, languages, physics, chemistry, mechanics, electricity, ambulance, hygiene, navigation, book-keeping, shorthand, domestic economy, needle-work. The subsidy is reckoned at so much per pupil for each series of twelve hours of lessons in each subject. Each pupil must take at least two subjects, and not more than five courses at one time. There is a fixed subsidy of 1s. per pupil, and in addition a variable subsidy of 1s. or 1s. 4½d., according as the work done is good or excellent. On a subject for which the Science and Art Department gives a subsidy the Education Department gives only the fixed subsidy. In some cases subsidy is received not only from both departments, but also from the County Council. This involves useless expenditure of time and paper in the making of triple returns. In 1894-95 there were 3,518 of these continuation schools, with 3,738 teachers, and 266,683 pupils, of whom 103,323 received gratuitous instruction. Under 14 years were 12·13 per cent. of the pupils, and 13·89 per cent. were over 21. Technical or manual instruction was given in 281 of these schools; 1,213 schools taught drawing, 408 cookery, and 26 laundry-work. The subsidies amounted to £91,540.

### CHAPTER III.—OTHER AUTHORITIES.

1. For the purposes of the higher technical education, the Treasury gives £27,000 a year to the Universities of England and Wales, the Secretary of State for Ireland gives £4,800 to the three Royal Colleges; the Council of Agriculture devotes £7,450 to higher education; the Marine Department, £79,400; the Government of India, £4,492.

2. *Secondary and Primary.*—The Scotch Education Department spends £27,110 on evening schools, and the Irish Commissioners of Primary Education £9,566 on instruction in agriculture. The Charity Commission spends a considerable sum on the polytechnics of London.

### PART III.—PRIVATE INITIATIVE.

Two great private institutions have, perhaps, done more than any public authority to promote technical education: the City and Guilds of London Institute, by a large expenditure of money and invaluable advice, and the National Association, by an energetic and intelligent propaganda, which has influenced public opinion, and prompted the local authorities to action.

#### CHAPTER I.—THE CITY AND GUILDS OF LONDON INSTITUTE.

This is a federation of most of the ancient corporations of London. The charters of these guilds are of great antiquity, and by their members the members of the Corporation of the City of London are elected. The aim of the federation is to promote technical education for the trades that are more or less related to the several guilds. These companies have great wealth, derived partly from the large contributions demanded of those who wish to become members, and partly from properties acquired in times beyond memory. In olden times their revenues were expended in works of benevolence, very various, and of unequal value. These guilds had nearly lost their trade character, and their former influence had disappeared. About 1877 they began to recognise that,

[\* The sum of the items falls short of the total by £10,000.—Tr.]



with their large resources, they had it in their power to do great things for the prosperity of commerce and of the national industries, that by a reorganization of apprenticeship, by the issue of certificates granted to young workmen after examination, and by making provision for sound and practical technical instruction, they might regain their old prestige, and put British industries in a better position to cope with foreign rivalry.

In 1879 the Institute was incorporated. It seeks no aid from the State, and receives from it no money grants. It depends on annual donations from the guilds. It has a good understanding with the Science and Art Department, by which it is treated almost as if it were a public and official ally. While the Institute busies itself with technology, the department deals with the more purely scientific subjects, although it does admit a little technology into its programme.

### 1. *The Institute as a Central Administrative Body.*

It assists in many practical ways in the development of technical education, as, by the elaboration of a programme of studies for all branches of trades education, by the registration of classes, by the inspection of classes and schools, by organizing examinations, by granting certificates and prizes, by money grants, and by the direct institution of schools of trades and industry.

1. *Programme of Studies.*—For each subject the programme, which is issued every year and kept up to date in the light of experience and of fresh needs, prescribes a complete course of study graduated for the work of two or three years, and every year the questions set at the examinations of the previous year are duly published. The number of separate subjects in 1879 was seven; in 1895 the number was sixty-three. Practically the number is made much larger by a subdivision of subjects; thus, there are two courses in photography, the goldsmith can choose one course out of four, the shoemaker one out of ten, and so on. The list of subjects is as follows: Salt manufacture, alkali manufacture, soap manufacture, bread-making, brewing, spirit manufacture, coal-tar products, sugar manufacture, painters' colours (and oils and varnishes), oils and fats (including candle manufacture), gas manufacture, iron and steel manufacture, paper manufacture, photography, pottery and porcelain, glass-making, dressing of skins, tanning, boot and shoe manufacture, silk-dyeing, wool-dyeing, cotton-dyeing, cotton and linen bleaching, calico and linen printing, wool and worsted spinning, cloth-weaving, cotton-spinning, cotton-weaving, flax-spinning, linen-weaving, silk throwing and spinning, silk (including ribbon) weaving, jute-spinning, jute-weaving, lace manufacture, framework knitting and hosiery, hat manufacture, telegraphy and telephony, electric lighting and power transmission, electro-metallurgy, metal-plate work, plumbers' work, silversmiths' work and plated wares, goldsmiths' work and personal ornaments, watch and clock making, mechanical engineering, road-carriage building, rail-carriage building, typography, lithography, raising and preparation of ores, mine-surveying, slate-quarrying, carpentry and joinery, ship-carpenry, ship-joinery, brickwork and masonry, plasterers' work, cabinetmaking, milling (flour-manufacture), bookbinding, painters' and decorators' work, dressmaking, manual training (woodwork), manual training (metal-work).

2. *Registration of Classes.*—Subsidies and other advantages depend on registration. In order to be registered a class must be taught by a person holding the teacher's certificate in technology (which is granted by the Institute to those who have obtained its full certificate in the subjects which they respectively profess to teach), or a person teaching under the Science and Art Department, and able to prove that he has acquired adequate practical experience with respect to his subject; or a person whose special qualifications are recognised by the Institute on some other grounds. The Institute can inspect before registering, and can, if it sees fit for any reason, refuse to register.

3. *Inspection.*—On giving due notice, and paying the expenses, the managers of a school can have it inspected by an officer of the Institute. Eight inspectors were employed in this service in 1893-94, and 181 classes were inspected. The Rope-makers' Company maintain an inspector at its own expense to supervise the technical instruction in its own industry.

4. *Examinations.*—The annual national examinations constitute the most important part of the operations of the Institute. They are conducted on similar principles to those which are observed in the examinations of the Science and Art Department, and nearly at the same time. No candidate may take more than two subjects at a time. There are eleven subjects in which the examinations are at the same time theoretical and practical. The local committees, which assist in the formation of classes and watch over their progress, make all local arrangements for the examinations, and distribute the certificates and prizes. The examination fees are fixed by the Institute. As a rule, the fee is 1s. for each subject; but for some subjects higher fees are charged—for example, 5s. for woodwork and 10s. for ironwork. The Local Committee may require candidates from outside to pay an extra fee of 2s. 6d.

The practical examinations are of two kinds. In some cases the work is done in the presence of judges, in others it is done in definite time before the day of examination. In some subjects the work is sent to the Institute for examination. There are seventy-one examiners and forty-one assessors. It is hard to find tradesmen who have both the practical and the theoretical qualifications for the office of examiner; on that account it is the rule, in some cases, to associate a workman or employer with an experienced teacher.

The number of candidates is constantly increasing: in 1894 there were 11,631 at 344 centres, in 272 places, including some colonial cities and towns. The proportion of successful candidates was 55.4 per cent. The proportion is on the increase, though year by year the examinations become more severe.

In each subject there are three stages—preliminary, ordinary, and honours. Practically there are six stages, for at each stage there is a first-class and a second-class; and a candidate who has gained a second-class at any stage can come up afterwards for the first-class.



The certificate given in any case to a student of a registered class bears the name of his school, and is countersigned by his teacher, and on that account is considered to have a special value. What is called the full certificate in any subject is reserved for those who can show that they possess the knowledge of pure science that constitutes the proper foundation of their technological knowledge.

Besides the examinations in trade subjects there are examinations of Board-school teachers who have attended normal training classes in woodwork and metal-work. In 1894 there were 152 classes of this kind, with 3,015 students; 1,816 came up for examination, and 1,256 passed. The Institute has found that the best teachers in woodwork are primary-school teachers specially instructed in the subject, but is not certain that the same rule applies to metal-work. As teachers of normal classes of manual work capable artisans who have carefully studied the school programme of manual instruction are preferred. The Institute will not recognise normal classes held during three or four weeks of vacation.

5. *Prizes*.—In 1894 the value of money prizes distributed by the Institute—for the most part provided by individual guilds—was £395 10s. The other prizes were medals, eighty-seven in silver, and 138 in bronze, given by the Institute.

6. *Money Grants*.—Formerly the Institute granted subsidies to technical classes, the principles of distribution being nearly the same as those observed by the Science and Art Department; but on account of the growing expenditure on examinations it ceased in the year 1891 to give pecuniary aid to schools outside of London. But the County Councils in most places came to the rescue, and they distribute their grants according to the results of the examinations conducted by the Institute. Further, the Science and Art Department recognises all the subjects in the programme of the Institute as subjects with respect to which classes may be subsidised under the Technical Instruction Acts. The Institute now grants to registered schools in London for every pupil who, being actually engaged in a trade, passes an examination in a subject bearing on his trade, a subsidy of £2 for a first-class pass, or of £1 for a second-class pass, and £1 for a subsequent first-class. The number of pupils examined under this rule (in 1894) was 2,580, of whom 859 passed.

7. *Cost of Examinations, Prizes, and Grants*.—Expenditure and receipts on account of examinations, omitting fractions of pounds, are as follows: Paid to examiners, £1,249; inspection, £262; printing and advertising, £943; materials and sundries, £506; Inspector-General and subordinates, £1,684; grants to seventeen London schools, £665; medals and prizes, £86: total, £5,399. Examination fees, £1,275; inspection fees, £204; special reports, £8; sale of prospectus and advertisements, £110: total receipts, £1,599.

In 1894 the grant from the Institute to the Joint Committee of Manual Instruction [see New Zealand Parliamentary Paper of this year, E.—1c.] was £250. In 1895 the section of metallurgy at King's College received £200; the Society for Promoting the employment of Women, £70; a school of chromo-lithography, £25.

## 2. Colleges and Schools of the Institute.

1. The Central Technical College: The aim of the College is to give practical instruction in the application of the different branches of science to the various manufacturing industries. It is attended by students who desire to become teachers in technology, or to become engineers, architects, or manufacturers, or to acquire a scientific knowledge of the principles of the industry in which they are engaged. It was opened in 1885. Built for about two hundred students, it is already too small. In 1891 the Institute voted £5,000 for the improvement of the appliances, but what is most needed is more room. There are laboratories for chemistry, physics, and electricity, and the students have workshops at their service, and can attend to the boilers and manage the engines. There are separate rooms for photography, optics, and experiments in heat and magnetism, &c. Courses in theory are merely accessory; practice is paramount. The vast museum of South Kensington is close at hand, so that the Institute has no occasion to set up scientific collections of its own.

In 1880 the most applicants for admission were thirty; in 1893 there were 122. An entrance examination must be passed. A full course covers three years, but students may enter for single classes. The first-year students have a common course, though at the outset they must say which of the four sections they enter for: (1) Mathematics and mechanics; (2) civil engineering and mechanics; (3) physics and electricity; or (4) chemistry. Specialisation begins with the second year, and constantly becomes more marked up to the end of the full course. The fee for a full course is £25 a year; for a partial course, £4 to £10 a year. In 1893-94 there were 186 students following the full course, and thirty-six attending selected classes. They attend five days a week, from 10 till 5, with an hour's recess at noon.

The College does not profess to render unnecessary the customary sojourn in the factory or yard—for which a young man has to pay an employer perhaps £40, perhaps £80 a year. It has recognised the necessity of this stage in a young man's career, and has made some provision for it by giving to some of its old pupils bursaries of £40 or £50. On Saturdays there is a special class, to prepare primary-school teachers for the work of manual instruction. A school of wood-carving is installed on the second floor of the college. It has day classes and evening classes. The day classes constitute a true "apprenticeship workshop." The course extends over three years and a half; there are eighty or ninety pupils, from thirteen years old and upwards. The County of Kent gives scholarships to be held in this school. In this age of luxury and of revived artistic sentiment, the art of wood-carving has a great future before it. The evening classes are attended by workmen and apprentices. The expenses of the school amount to £11,379, and the fees to £4,670.

The site, buildings, and fittings of the Central Technical College cost more than £90,000.

2. The Finsbury Technical College: This college, founded by the Institute, is in its character and aims intermediate between the Central College on the one hand and the "Polytechnics" and trades schools on the other. It comprises five sections: (1) Civil engineering and applied mathematics; (2) electricity and applied physics; (3) manufacturing and technical chemistry; (4) applied art; (5) building trades. The workshop teachers are skilled workmen; the teachers of trades classes are old foremen. There is a day-school with about two hundred pupils, from about fifteen years of age to nineteen, for the most part the sons of working-men. For the full course, which extends over one, two, or three years, the annual fee is £15; a few of the pupils, taking only a partial course, pay less. The accommodation is limited, and preference is given to boys who have already been a year or two at work, but others are admitted to prepare for the College or for work. The hours are from 9.30 to 5, with an hour and a quarter for dinner. Promotion to a higher class depends on an annual examination. Scholarships to this school have been founded: eight of £30, for two years; one of £10, for one year; six conferring the right to free admission only.

In the evening school there are one thousand students, most of them apprentices, workmen, or foremen. The age of the majority is between twenty and twenty-five, the extreme ages being fourteen and forty. The teaching in the day-time is more theoretical and "industrial," and that of the night-school is more practical and "professional," but in general the teachers are the same, and the same appliances are available for both. The fees vary from 6s. to 15s., except that they are a little higher for the art classes. Apprentices under twenty pay half-fees. In 1893-94 the night-school had 1,091 pupils, and of these 283 were apprentices paying the reduced fee.

The annual cost of maintaining Finsbury College is £9,346; the fees amount to £3,304; the balance, £6,402, is provided by the Institute.

3. The South London School of Decorative Art was founded by private persons in 1879, and handed over by them to the Institute. There are classes in moulding, drawing and painting from nature, design, decorative house-painting, and machine drawing. The teachers are men who have been practical workers in the several branches, and they have a free hand in adapting the instruction to the individual needs and wishes of the students. At an exhibition of the work done at this school, and at other schools belonging to the Institute in 1894, there were designs for glass-windows, wood engravings for the illustration of books, designs for Christmas-cards and chromo-lithographs, models of decorations of rooms and furniture, &c. The school has been very successful, but owing to the increasing facilities offered at cheaper rates by newer institutions, such as the Polytechnics, and to the crisis through which some trades are passing, the attendance is not now growing larger. It stands now at 135. The expenses are £1,165; the fees (5s. a quarter for each class) amount to £109; the balance, £1,056, is the cost to the Institute.

4. The Cordwainers Trade School has been established by an agreement between the Institute, two of the city guilds, and the masters in the boot-and-shoe trade, to give instruction to apprentices, workmen, and intending superintendents of work in the leather industries. Programme: (a.) General and theoretic classes: Anatomy and physiology of the foot; the feet and their characteristics; expenses; measures; raw materials; commercial geography; drawing; arithmetic; book-keeping, &c. (b.) Practical classes: A series of eleven different courses embraces all the many different operations required in shoemaking. The classes meet in the evening between eight and ten. The fees are very low. There are about two hundred pupils, and eight instructors. It is hard to find men who have sufficient experience in their trade, and at the same time, the method and precision essential to good teaching. There is a library of books bearing on the trade; a reading-room, supplied for the most part by the editors, with sixteen trade periodicals; and a parlour and refreshment-room. The expenses amount to £1,082; the receipts are £550 from the Institute; £396 from three corporations; £70 from fees and sale of work. The Master's Society formerly gave considerable aid, but has ceased to do so, having become apathetic in the matter. Many manufacturers lend machines for use in the workrooms, and supply materials.

### 3. *Finances.*

The income of the Institute in 1895 was £33,975; subscriptions and donations, £23,768; examination-fees and sundries, £10,207; the expenditure, £30,430. On the whole, about one-third of the cost of the schools and colleges is covered by fees, and the corporations provide two-thirds. The managers declare that the money expended by the Institute is not to be regarded as alms; their aim is the development of the national industries. Since its foundation the Institute has received donations from corporations and individual benefactors amounting to £453,436. The Goldsmith's Company also has given £78,964. The smallest donation from any one company is £10, and the largest from a single person is £300.

## CHAPTER II.—THE NATIONAL ASSOCIATION.

The Royal Commission in 1884 revealed to the nation the want of technical education and the gaps that had to be filled. The National Association was then formed, and by its timely publication of pamphlets and the zeal of its members aroused the people to a sense of the urgency of that need. It proceeded to elaborate in draft Bills a scheme of legislative encouragement. Members of the Institute, such as the Duke of Devonshire (president), Sir A. Roscoe (secretary), and Mr. Acland, made the first proposals before Parliament, defended them with much energy, and succeeded in getting them carried by an overwhelming majority. Then the association began to disseminate the knowledge of the new legislation, and to urge the local authorities to make use of their new powers. Next, it supplied these inexperienced bodies with invaluable advice, which has enabled them to avoid many costly and useless experiments. Further, the influence of the association has been most successfully employed in promoting the foundation of a very large number of polytechnic institutions and trade schools, and in stimulating the interest necessary to the generous flows of subscriptions and donations. One might be inclined to suppose that, since the association

néver takes any part in the management of the schools it has been the means of calling into existence, its task is now accomplished. That, however, is not its own view of the case. It now does everything possible to improve technical education; it keeps the public well informed with respect to the progress of the cause; it publishes a quarterly review—the “Record”—containing the latest information of the educational work of the County Councils; it holds frequent meetings in different parts of the country; it has established affiliated associations in Scotland, Ireland, and Wales; in 1895 it called a first meeting of delegates for counties and boroughs, a veritable national congress for the examination and discussion of all questions relating to this important public service; and, finally, it is extending its sphere of action to include the development of secondary education, which, in England, stands much in need of improvement. [Here follows a list of the publications of the association.]

#### PART IV.—TECHNICAL EDUCATION IN LONDON.

The metropolis is, for administrative purposes, a county. The London County Council, availing itself of the provisions of the laws of 1889–91, has surpassed all other similar bodies in the organizing of a complete system of technical education. In 1892 was published the report of Mr. H. Llewellyn Smith, who had been appointed by this County Council to inquire into the wants of the population of London in this respect, and to suggest the best means of meeting them. The report is a very remarkable production. It states the number of persons engaged in the several occupations, classed according to age and locality. Coloured maps show at a glance in what districts are to be found the largest number of men engaged in the several most important industries respectively—building trades, metal-work, woodwork, printing, bookbinding, chemical manufactures, &c. There is a special map of the distribution of women's work in the clothing trades. Based on the result of such statistical information is a discussion on the best method of distributing technical instruction over the whole area of the metropolis. The institutions existing at the time are taken into account.

Having thus made due inquiry, the County Council set up a Committee of Technical Education, which is renewed annually, and consists of thirty-three members: there are twenty appointed by the County Council, and there are delegates from the School Board, the Charity Commissioners, the City and Guilds Institute, the Trade Council, and the Head Masters' Association, and two members appointed by co-optation. There are several sub-committees, a secretary, three or four inspectors, and a dozen mistresses of house-work schools. The Committee avoids injurious competition with existing institutions, and endeavours to improve them and to bring them into co-ordination. It assists them with money-grants on conditions designed to improve the teaching, and it has established a large number of scholarships. It has also set up certain classes of its own which appeared to be wanted.

##### 1. *Subsidies.*

1. The grants are made in such a way as to leave nothing to be arbitrarily decided by the Commission, or by Dr. Garnett, the secretary. Everything is settled by fixed rules, and nothing is done by favour. [The writer sets forth the rules, which occupy three or four pages. The most important relate to the subjects to be taught, and the principles on which the grants are distributed.] The subjects of subsidised courses: Bookbinding, lithography, printing, shoemaking and the leather industry, silk-weaving, flour-milling, baking, brewing, watchmaking, plumbing, plastering (of ceilings), stonemasons' work, house-painting and decoration, chemistry, carpenter-and-joiner's work, photography, electricity, electro-metallurgy, machinery, metal-leaf work, telephony and telegraphy; carbon-products industries, manufacture of gas, glass, pottery, porcelain, soap, sugar, colours, oils and varnish, coach-building, carriage-building. Grants\*: 6d. an hour for each pupil, up to fifteen in number; 1½d. an hour for each pupil beyond the first fifteen. If the workshops are satisfactorily equipped, there is a further grant of 50 per cent. of the cost of materials after deducting the proceeds of the sale of old materials. The grants are independent of those that are made by the City and Guilds Institute. No grant is made for any class if the fee is higher than 10s. The committee grants supplementary subsidies in aid of new laboratories and workshops, and subsidies or loans in aid of the purchase of new tools and apparatus, but never contributes more than half the cost, and in these matters takes into consideration the needs of the district, the resources of the institution, and the aid rendered by other authorities. There are special rules for grants to polytechnic institutions, and others affecting art classes. The grants to polytechnics are: (1) Three-quarters of the salary of the director, provided that this subsidy shall not exceed £500; (2) a fixed contribution of £1,000; (3) 10 per cent. of the fixed salaries of the teachers; (4) 1d. an hour for each pupil. The whole contribution under these four heads must not exceed £2,500 a year for one institution. (5) The committee gives an amount equal to 15 per cent. of voluntary subscriptions, and a grant in aid of new class-rooms, laboratories, and shops. It also makes grants in aid of the establishment of house-work schools.

##### 2. *Housewifery Classes.*

Mr. H. Llewellyn Smith's report showed that in London a larger number of persons were engaged in domestic service than in any other kind of occupation. The number of women and girls so employed is 250,000. Further, most of the girls from the public schools some come to have homes of their own to manage. It appeared, therefore, that women's special classes of domestic economy and household management would furnish the best technical education for a very large part of the community. Such classes have been established for cooking, dressmaking and needlework, and laundry-work. Under each of these heads there are subdivisions. For

\* To evening classes of trade instruction, excluding polytechnic classes and classes aided by the Science and Art Department.

example, there is what may be called the trade of a cook, of the “professed” cook employed in the kitchens of the upper classes; and the cookery that is to be done by the “general” servant in the houses of the tradespeople; and, again, the cooking in the houses of the working-people. The committee employs women as teachers of classes of domestic economy, and places their services at the disposal of existing institutions. It regards this part of its work, however, as temporary, expecting that cookery will soon be taught regularly in Board schools as needlework is now. There are now classes of household work at the polytechnics, at the Board schools (evening schools as well as day schools), and in different social institutions, such as the Young Men’s Christian Association. There is also a special school of cooking for sailors; the County Committee provides 75 per cent. of the expenses (apart from rent, fuel, and superintendence) on condition that the teachers are paid at least £1 15s. a week each, and that the grant shall not exceed £150. The committee also encourages the teaching of cookery and dressmaking in secondary schools.

1. *Scholarships*.—A full course of instruction in domestic work occupies nearly a year. The best time for it is when the child leaves school. But the working-people cannot afford to keep a child at school for another year, and lose the advantage of her wages. Scholarships to the number of 340 every year are therefore given to girls between thirteen and fifteen recommended by the head-teachers of their school. A scholarship is tenable for six months. It gives the right to free instruction, to two meals a day, and to the materials for clothing, which becomes the property of the pupils who make it. Three or four polytechnics receive such pupils, and to each of these institutions the County Committee gives £200 a year for this service, besides paying for meals and materials. To other schools the County Committee sends its own special instructions, and pays for meals and materials: £4 10s. a year for a full-time pupil, and £3 10s. for a half-timer, in addition to £200 for salaries if not less than thirty holders of scholarships attend full time, or £150 if thirty attend half time.

2. *Ordinary Pupils*.—For pupils other than scholars, eight institutions below the rate of polytechnics receive sixpence a lesson for each pupil in classes for the following subjects: Cookery, laundry-work, needlework, dressmaking, household management, hygiene, aid to the wounded, care of the sick. The fees must not exceed twopence a lesson. Institutions can if they please have the services of teachers appointed and paid by the County Committee. At the polytechnics the subsidy is the same for these subjects as for others. The number of pupils who attend for a second year is growing.

3. *Normal Classes*.—The teacher of a household management school requires special training. She must, besides knowing her subject, know how to teach it to children and to adults. The teacher of cooking must know the manner of life and the means of the families to which the pupils belong, the appliances at their disposal in their homes, and their habits and preferences in the purchase and in the preparation of their food. She must also have a practical acquaintance with the markets frequented by the poorer classes. In certain polytechnics normal classes have therefore been instituted, and there are twenty-four scholarships tenable for two years, for women between twenty and thirty years of age. The County Council, which has induced a voluntary committee to establish an examination for those who have followed the normal examination for two years, bears half the expenses of the examinations, and pays the amount necessary for secretarial management.

### 3. *Scholarships for the Children of the Working-Classes.*

#### 1. *County Scholarships* :—

(a.) *Junior County Scholarships*.—Every year 300 scholarships of £8 and free tuition at a secondary school are offered by the County Committee to children under thirteen years old, being pupils of Board schools, and not below the fifth standard. In 1895 the number actually granted was 334, and 109 of these were obtained by girls. If the scholar’s conduct and progress are satisfactory, a second-year scholarship, £12 and free schooling is conferred. The first-year scholarships depend on competitive examinations. The same examinations are used by the London School Board, and twenty other authorities, in the selection of candidates for 170 other scholarships.

(b.) *Intermediate County Scholarships*.—There are seventy scholarships given every year after competitive examination to boys and girls under sixteen years. A certain number are reserved for candidates under fifteen. The scholarships may be renewed year by year, but not to any one who has attained the age of eighteen. The scholarship includes free tuition, and the money-value varies according to age, from £20 to £35. The scholars must study at secondary schools where sufficient attention is paid to technical education.

(c.) There are five *Senior County Scholarships* of £60 a year for three years, with free tuition at a scientific school of superior instruction or of university rank. These do not depend on competitive examinations. The candidates in June, 1895, were 110.

2. Besides the other grades of county scholarships there are the scholarships in domestic economy already described, and others as follows: (a.) One hundred and forty art scholarships granted for one year, but renewable for a second year, and even, in the case of a workman, for a third year. In the award some preference is given to the younger students. Also some of the scholarships are conferred, not after strict competition, but according to the merit of works submitted by the candidates. This arrangement is meant to favour independent study, and to encourage artistic originality, skill, experience, and taste. Some special scholarships and grants are given on the ground of extraordinary merit. The level of the work of art schools has been considerably raised by the emulation thus evoked. The candidates send in bindings, works in metal, carvings, engravings, lithography, embroidery, &c. (b.) One hundred scholarships of £5, renewable for a second year, and (exceptionally) for a third, granted to defray the travelling-expenses of students who are at work during the day, and attend evening classes of science or technology. The recipients must be between fourteen and twenty-eight years. Three-quarters of the scholarships go to the candidates under twenty, and one-half to young workmen and apprentices. Some preference is

accorded to certain candidates, especially to such as have held the junior scholarships, and certificates of former examinations are taken into account. The examination is in arithmetic, geometry, and drawing.

#### 4. *Finances.*

In 1894-95 grants were made to polytechnics and colleges amounting to £18,455 (£9,635 in ordinary grants, and £8,820 in extraordinary). The School of Applied Art and other institutions received £4,805 in ordinary grants, and £2,590 in extraordinary. In that year the Board expended on technical education £41,998, and reserved for the same purpose £58,714—a great part of which has since been disbursed in accordance with promises made during the year and fulfilled when the necessary conditions were complied with.

The *London Technical Education Gazette*, published monthly (4,500 copies), is the official journal of the County Committee.

### CHAPTER IV.—THE POLYTECHNICS.

#### *Section I.—Charity Commission.*

All endowments for education or charity are entrusted to the administration of local committees, subject to regulations made by a central controlling body for all England—the Charity Commissioners. So far as these regulations affect education they require the approval of the Education Department. There were in London in 1883 many foundations which had come to be out of use or needed definite organization. “The City of London Parochial Charities Act, 1883,” brought these under the control of a special Charity Commission. Under this Act nine great new institutions for technical education have been founded in London since February, 1891. The preliminary negotiations occupied seven years, because the Commission resolved not to act alone in founding institutions, but only to aid in founding them, and as a condition of aid, required that voluntary contributions equal to the amounts it was prepared to give should be forthcoming, and also that local bodies, such as the County Council, should show their interest in such institutes by granting subsidies. As a rule, the Commission contributes to the first cost of establishment, and also makes annual grants. These nine institutions are: Bishopsgate Institute, St. Bride Foundation Institute, Cripplegate Institute, Northampton Institute, Borough Road Polytechnic Institute, Battersea Polytechnic Institute, South-western Polytechnic Institute, North-western Polytechnic Institute (for which the Commission promises £5,000 a year, besides £30,000 for first establishment), Northern Polytechnic Institute (£5,000 a year, and £25,000 towards first cost). Further, a number of established institutions, such as the People’s Palace, the City Polytechnic, and the Regent Street Polytechnic, have had their existence secured by grants. Twenty-six institutions in London have derived such advantages from the operation of the Act of 1883. In 1895 the gifts of the Commission to parochial charities in London amounted to about £160,000. The latest project relates to Sir John Cass’s Technical Institute. It includes a section of primary studies and a section of trade instruction, and the grant will be £6,000 a year.

#### *Section II.—The Polytechnics in General, and the Central Committee.*

The polytechnics in London are not to be confounded with such schools of engineering or of arts and manufactures as in France and in some other countries which go by the name of Polytechnic Schools. The London Polytechnic Institutes, by means of evening classes, furnish to persons employed during the day in business or industries the opportunity of elementary instruction in the sciences, arts, and trades, with special reference to local industries. In 1893 the central committee of the City Parochial Charities took counsel with the City and Guilds Institute and the County Council’s committee of technical education, with a view to the co-ordination and supervision of the polytechnics and of institutions receiving grants from the parochial charities, and to the attainment of a common system in the distribution of grants, the procuring of returns, and the conduct of examinations. A joint committee was set up to attend to these matters. The Science and Art Department co-operates with this committee by furnishing it with extracts from the reports of the Government Inspectors. The City and Guilds Institute expects that this new organization of elementary technical education for young people already at work will be the means of securing a better preparation of students for the Finsbury College, which is a school of secondary technical instruction, and for the superior curriculum of the Central Technical College. In 1894-95 the expenditure under this scheme was, for eight polytechnics, with 27,000 students in 1,250 classes, £90,000. These institutions provide about nine-tenths of the evening instruction in trades classes in London, and three-fourths of the scientific instruction given in evening classes. Their art schools are in the front rank. Immense progress has been made in the past five years, and especially in the two or three years during which the County Council Committee has been at work. In 1895 the polytechnics in London were Regent Street Polytechnic, Borough Road Polytechnic, Battersea Polytechnic, Chelsea Polytechnic, Woolwich Polytechnic, Birkbeck Institute (a section of the City Polytechnic), City of London College (another section), People’s Palace, and Goldsmiths’ Institute. The last two receive no grants from the County Council. The Northern Polytechnic, Northampton Institute, Wandsworth Technical Institute, and Norwood Institute were in process of construction. Institutes of the same rank, and subject more or less to the same rules, are the Shoreditch Municipal Technical School, St. Bride Foundation School, and Whitechapel Craft School.

Mr. Llewellyn Smith, in his report, reckoned that the annual loss in carrying on a polytechnic institute is on an average £5,000. All these institutions admit to their trade classes no one who is not already working at the trade to which the class he attends is related. They would not dare to break this rule. To do so would be to arouse the violent opposition of the artisan class. The trades-unions are very watchful, and would strongly object to any artificial increase of the number of artisans with the consequent reduction of wages.

*Section III.—Visit to the principal Polytechnics.*

1. The Regent Street Polytechnic is the pioneer institute for technical education, and has served as a model for the others. Its founder, Mr. Quintin Hogg, at first intended it to be a refuge for neglected children. In 1865 he opened for them a night shelter with a school. His work grew, and was transferred to a new locality, where it became a house of industry, with classes in the evenings and on Sundays. In 1873 the establishment was opened in Hanover Street, with forty-eight pupils and half a dozen classes, to meet the intellectual and physical needs of the boys. Next, the school was moved to a building in Long Acre, with room for 450 pupils, and means were adopted for the intellectual and moral improvement of the unfortunate children for their social advancement and for rational and wholesome amusement. A library of 1,300 volumes was collected. Seven years later this place in its turn proved to be not large enough, and Mr. Hogg bought the old Polytechnic for £50,000, and spent £100,000 on improvements and enlargements. Soon it became necessary to acquire adjoining properties, and to occupy other buildings in the neighbourhood. In its new quarters it rapidly developed in a new direction, and became really a great technical school combined with a great society for recreation and pleasure. It is now the typical example of the great institutions in London that are known by the name of polytechnics, each of which is a technical school and a kind of popular university, and at the same time the home of a large democratic association of a philanthropic character—sometimes even of a religious character, and including a number of clubs—of amusement or recreation, or of science or literature. Such institutions have upon their rolls both members and pupils; the members pay their subscriptions and enjoy all the moral and material advantages of the association, and the pupils pay fees for attending the classes. The members are admitted to classes at fees lower by 25 per cent. than those paid by mere pupils. The Regent Street Polytechnic, in addition to its central premises, occupies other buildings nearly as large in the immediate neighbourhood; and, apart from these, it owns extensive recreation-grounds, and places for boating and other amusements, and even sea-side villas in three different localities.

(a.) For scientific and trade instruction there are 500 classes a week, with an attendance of 11,000 pupils, meeting generally in the evening. Some of the classes are devoted to trades and manufactures, in about twenty different branches. There are also commercial and general classes in arithmetic, book-keeping, French, German, Latin, Greek, commercial history and geography, mathematics, English, penmanship, Italian, shorthand, finger-speech (deaf-mute alphabet, &c.), and gymnastics. There are classes for preparation for university examinations, classes to prepare for public offices, excise, army cadetships, places in the British Museum, for the navy, police, Justice, Customs, telegraphs, &c. There is a school of photography, a school of art and design, a school of music and elocution. There are scientific classes, attended principally by apprentices and artisans. There are special classes for women: in care of the sick and wounded, dressmaking and cutting-out, cooking, laundry-work, &c. The women all pay fees, from 5s. to 8s. per class per session, and they have a gymnasium and nine lawn-tennis courts, and, at a certain hour every day the swimming-bath is reserved for them. There is also a day-school of 850 pupils, paying about £6 a year each, and including in its course commercial and technical instruction, and in addition there are day-classes for pupils between eleven and seventeen, of a more definitely technical character.

(b.) The social operations are no less important, not only on account of their extensive range, but also because they constitute an attraction without which it would have been much more difficult to interest the working-people in the technical instruction offered to them. When this institution took up its abode in the old Polytechnic, there were at most 8,000 pupils attending evening classes in London; now there are 3,000 every night at this school alone. The society was formerly called "The Young Men's Christian Association," and this is still its official designation, which shows that it has not laid aside its religious character. In order that it may continue to be a young people's club, it limits the age of admission (for members as distinguished from pupils), the minimum being sixteen years and the maximum twenty-five. The subscription is 10s. 6d. for young men, and 5s. for young women.

All members have the use of the gymnasium (the finest in London), the swimming bath (which in winter is converted into a reading-room), the library, and the recreation-grounds. The library contains 6,000 volumes, and there are small technical libraries for the several classes. There is a refreshment-room and a buffet for tea and supper, and accommodation for chess and draughts. The society has a recreation-ground of twenty-seven acres at Wimbledon, and another of twelve acres at Pinner, and others again at Kensal Rise and at Paddington. Many special societies are formed among the members, e.g.: a discussion class; a mock parliament; a reading circle; an athletic club (of 500 members paying a 5s. subscription) divided into sections for cricket, football, swimming, boating, and lawn tennis; a chess club; a military society; a gymnastic society; a boxing club; a roller-skating club; two circles of tourists and excursionists; a bicycle club; a society for physical development; and three volunteer corps. There are French and German clubs for foreigners who speak French and German and for members who wish to learn either language. Some of the operations of the association are partly social and partly religious, and include open-air preaching and tract distributing, lantern lectures and concerts, a temperance society, and a Sunday choral society. The "Old Quintinian Society" consists of old pupils of the day-school of the Institute. A monthly journal, the *Polytechnic Magazine*, is published.

On Sundays, and also on other days, there are religious services and bible-classes. On Saturday nights there are public promenade concerts in the Queen's Hall, members being admitted at reduced prices. The railway companies grant tickets at reduced prices to members, and many excursion trips are organized. In December, 1895, tours were arranged as follows: (1) Paris, Genoa, Pisa, and Rome; (2) Paris, Pisa, Rome, Florence, Venice; (3) Paris, Lucerne, and Italian Lakes; (4) Christmas at Paris; (5) Holland and Belgium; (6) Naples, Malta, Athens, Constantinople, Jerusalem, Alexandria, &c. A month's tour costs only £26. Excursions to Norway, to Switzerland, to



France, to Italy, to the Canary Isles, to Madeira, to Germany, to the Mediterranean, to North Cape, were organized in 1895 at wonderfully low rates.

There is a mutual benefit society, for life insurance, and assurance against sickness and accidents. There is also a savings-bank, and a registry office which publishes "The London Labour List."

This polytechnic receives from the County Council £3,000 a year (about a penny per pupil per hour); from the Science and Art Department, £2,000; from the City and Guilds Institute, £300; from the Charity Commissioners, £2,000. The annual deficit is £9,000, which Mr. Quintin Hogg, the founder, pays out of his own pocket.

2. People's Palace: In 1882 the Beaumont Trustees acquired a site in the Mile End Road and invited subscriptions for the erection of a great assembly hall and a public library, and the Drapers' Company gave £20,000 for the establishment of a technical school in connection with the new institute. In 1887 the hall was opened by the Queen, and the foundation-stones of the other buildings were laid. Lord Rosebery provided a swimming-bath, and Lord Iveagh a winter-garden. The Drapers' Company built a gymnasium, transformed some old buildings, provided for the installation of electric lighting, and gave £5,000 towards a laboratory and a shop for work in iron. Up to 1890 the Beaumont Trustees had the direction, both of the instruction and of the social and recreative departments of the institution; but in that year the Drapers' Company assumed the sole responsibility for the educational part of the scheme. In 1892 the Drapers, who had already spent £60,000 on the institute, undertook to grant £7,000 a year, and the Charity Commissioners added £3,500 a year. The Drapers' Company gives also £1,000 a year in scholarships. The People's Palace, being thus endowed, has no need of aid from the County Council, and is in no way subject to its control.

The technical day-school at the People's Palace is more fully developed than the day-schools at the other Polytechnics. The pupils must be twelve years old, and must have passed the Fifth Standard. The fee is 1s. a week. The course is spread over three years, and is designed to prepare the pupil to learn a trade, or to devote himself to a calling that requires special knowledge or a certain manual dexterity. Systematic instruction is given in sciences, arts, languages, and the handling of tools. For the first year all follow the same course, and their special aptitudes are carefully noted. In the next year, while certain classes are common, the school is divided into two sections—a trade section, and a scientific section. In the third year there are three sections, the first relating to trades and mechanical industries, the second to chemistry, and the third to art and designs. In the evening classes the age of the students is generally from sixteen to twenty. The classes fall into three groups: (1) Science and art classes preparing for South Kensington examinations; (2) general government classes (for French, German, Spanish, Latin, Greek, shorthand, arithmetic, book-keeping, &c.)—some of these classes are reserved for pupils between the ages of thirteen and sixteen; (3) technical classes, not intended to supersede practical work in shop or factory, but to supplement it. There is an engineering department with a three years' course, and a section of electricity and physics.

The social and recreative operations of the institution are many and various. In 1896 a general exhibition of the works of the polytechnics and other technical schools is to be held in the Queen's Hall.

3. The Borough Polytechnic was opened in 1892; it is one of the largest institutions of the kind, and the first to be established through the intervention of the Charity Commissioners. Its name, "Polytechnic," was adopted, as in many other cases, to indicate its likeness to the pioneer technical school in Regent Street, which occupies premises formerly occupied by an older institution bearing the name of "Polytechnic" (and entertaining the public with scientific lectures and semi-scientific shows). The Borough Polytechnic had in its second year 1,750 students; it has forty paid teachers; it receives £7,000 a year from the County Council. The same body bore the expenses of erecting the workshops (£3,200), and of furnishing them (£1,200). The institute is devoted principally to the wants of the building trades. It seems to have an unusual proportional number of working-men in its classes. The first year of the course is taken up with such subjects as drawing and geometry, and students must show proficiency in the subjects of this course before they can join the more technical classes of the second and third years. The usual provisions for social enjoyment, mental improvement, excursions, &c., are made for the members. There are two affiliated institutions: a small technical school called the Norwood Technical Institute, where there is no trade instruction in the stricter sense, and a more important institution at Bermondsey, the Harold Institute, for instruction in all branches of the building trades, and in tannery. The tannery school is of great importance: the Company of Leather Merchants gave £300 for the installation of a laboratory, and has promised £300 a year towards the cost of its maintenance.

4. Battersea Polytechnic Institute was opened in 1894. The Department of Public Works gave the site (2½ acres) to a private committee, which had been formed for the purpose of establishing the Institute; but the committee had to pay nearly £5,000 to extinguish certain private interests in the land. The committee collected subscriptions to defray the cost of buildings, &c. (£55,000). The City Parochial Foundation contributes £2,500 a year, the County Council a like sum, and the City and Guilds Institute a much smaller amount. The technical and scientific instruction is adapted to the requirements of the industries of the neighbourhood. The evening classes in technology, pure and applied sciences, art, commerce, domestic economy, and music constitute the chief part of the work of the Institute. All who desire to attend classes related to the trades in which they are engaged, are recommended to take a preliminary course (extending over one year) in mathematics, and geometrical and freehand drawing. There is a technical and scientific day-school for boys and girls, a normal school of domestic economy, and a school of household work for girls—the normal school and the housework school being probably the best of their kind in London.

In the year 1894-95 there were 2,930 students in the evening classes, and 160 in the day classes. As is the case elsewhere, many of the students fall off after the first few weeks of study. The indolent soon retire, and a great many drop out when the examinations are coming on. There are



on an average five hundred students present every evening. Not quite one-fifth of them attend the classes especially devoted to trade subjects. There are about sixteen instructors, most of whom follow other occupations, and receive very moderate remuneration.

Some of the manufacturers do not see the use of technical education; some are afraid of having the secrets of their processes unduly exposed; but others require attendance at classes on the part of their apprentices, and pay better wages to those who have had technical training. Large donations have been given by individual benefactors: in 1882 Mr. Henry Bute gave £3,500, and Mr. Edwin Bute £500. Several gentlemen give small scholarships.

5. South-West Polytechnic (Chelsea): The Chelsea Polytechnic closely resembles that of Battersea. In 1888 the Chelsea Parish Council applied to the Charity Commissioners for assistance in founding the Institute, and received a promise of £1,500 a year. Lord Cadogan offered a site worth £10,000, and added a donation of £1,000. Lord Manners gave £3,000 for a swimming-bath, and altogether £40,000 was collected. The work languished until the Young Chelsea Union took the matter up and canvassed for subscriptions. The Parish of Chelsea gave £3,000, and other subscriptions were obtained; and to-day the deficiency, so far as the expenses of first-establishment are concerned, is only about £8,000. In October, 1895, the finishing touches were still being put to some parts of the building. The left wing on the ground-floor is occupied by the School of Housework and Women's Industries, which has at once proved very successful. In the right wing are the recreation-room, a dining-room, and a kitchen. The section of fine arts, with an adjoining room for photography, is on the first floor. The central part of the building is a large gymnasium, which can be used as a theatre or lecture-room. The Chelsea Public Library is close at hand, so that the institute has no need of a library of its own. The shops for carpenters, mechanics, engineers, modellers, plumbers, &c., are on the basement. A forge is to be added. The place is lighted by electricity. The Institute is managed by a committee of representatives of the City Parochial Charities, the County Council, the School Board, and the Parish of Chelsea. In two successive years the County Council has granted for furnishing and apparatus £750 and £1,000.

6. Woolwich Polytechnic: Founded in 1889 by five persons, who maintained it at their own expense. This institution was in danger of collapse in 1894, but the public authorities came to the rescue: The Charity Commissioners undertook to grant £1,000 a year, and the County Council promised £1,700 a year and £2,500 towards first-cost, on condition that a sum of £2,500 was collected in two years. The former proprietors presented the buildings as a free gift, and the parish levied a rate providing £500 a year. The War Department gives £200 a year.

7. City Polytechnic: The Birkbeck Literary and Scientific Institute is one of the three (*sic*) colleges that belong to the City Polytechnic. It is less practical and technical than theoretical and scientific, and the students for the most part are not working-men. It was founded in 1823, and has been slow to introduce any large measure of technical education; but, at the instance of the County Council, and in order to be able to claim larger grants, it has lately enlarged its laboratories and paid more attention to technology.

8. Goldsmiths' Institute: This is not called a polytechnic, but is really analogous to the institutions that bear that name, and like them, it has both members and pupils. It belongs to the Goldsmiths' Company; it is supported by that company, and seeks no aid from the City Council; but in its last report it complains of the heavy burden of rates—£870 a year. The buildings cost £300,000, and the company expends £5,000 a year in maintenance. It excels all similar institutions in the completeness of its equipment, and is the only one that has a recreation-ground actually adjacent. Its concert hall, which has a large organ, seats 2,500 persons. A year or two ago it established a small technical museum. Generally speaking the operatives do not constitute the majority of the pupils, but in the workshops and practical classes most of the students are apprentices and journeymen. There are about 6,000 pupils. The institution gives scholarships, tenable for three years, to boys and girls coming from the Board schools in Greenwich—eight of £10, twenty-five of £5, and seven entitling the holders to free tuition.

9. St. Bride Foundation Institute: This is a printing school opened in 1894, in Fleet Street, the centre of the printing industry and of the publishing trade. It is designed to supply compositors and others with technical instruction supplementary to the practical education of the workshop. The classes are held in the evening as a matter of necessity, the pupils being all engaged in various branches of the trade during the day. Besides the school of typography, the institution has a library, rooms for reading and for meetings, a gymnasium, and baths (including a swimming-bath). The school is well ventilated, lighted by electricity, and furnished with all the machines, instruments, materials, and accessories necessary for practical instruction in every branch of the trade. The workshop is provided with excellent printing-machines of different sizes, and a very good collection of type. The whole cost £500, the contribution of the County Council being £450. The writer was present at a lesson attended by sixty-five pupils of from sixteen to thirty years. Classes for lithography and other processes will be set up as soon as arrangements can be made. Last year there were one hundred and twenty pupils. Students under eighteen pay 5s. a year, and the others 12s. 6d. The City and Guilds Institute makes the ordinary grants according to the results of the examinations. The common distinction between students and members is made. The members' subscription is 7s. 6d. Honorary members subscribe £1 1s. and upwards. The County Council renders financial aid.

#### CHAPTER III.—SOME OTHER SCHOOLS.

1. The Trade Training-school: The Carpenters' Company has had the principal share in the establishment of this school, to which it contributes £1,000 a year. The company also gives £500 a year to the City and Guilds Institute, and subsidises King's College, University College, &c. Other companies assist in maintaining the Trade School—the tilers and brickmakers, dyers, coach-builders, plasterers, masons—and some of the members of these guilds contribute personally. The

school receives no Government aid, desiring to maintain a certain independence, and having aims somewhat different from those of the polytechnics. The school is devoted to the building industries. It admits none but workmen and apprentices. The director, Mr. Banister Fletcher, explains this exclusiveness—which gives great satisfaction to the working-class—by saying, any one can nowadays attend technical evening schools; that is an evil, for it only augments the number of inferior workmen, whereas our aim should be to improve those who belong to the trade, so that they may become more competent workmen. In its present form the school is in its third year. It is always growing. On an average there are 150 students in attendance.

The teacher of the painting class says, "We do not seek to fill the mind of the student with superficial knowledge to enable him to gain marks at examination. He must do one practical exercise well before he goes on to the next. A house painter will have to get his living with his hands, not by answering difficult technical questions. It is only by practice that he will acquire manual skill, so as to be a good workman and a capable foreman."

In the mason's class the pupils learn not only to cut a stone and work it properly, but also how to treat a piece of architectural work and to follow the drawings in such a way as to satisfy both the designer and the artisan. The more advanced receive lessons in matters more complicated than any that belong strictly to the mason's trade.

The teacher of joinery says the students may be classed under three heads—(1) Boys between fourteen and eighteen with little or no knowledge of the use of tools; (2) those between eighteen and twenty-two who know how to use their tools, but who have not knowledge and experience enough for the workshop, and carpenters who want to learn joinery; (3) young men from twenty-one to thirty who are competent joiners, but who wish to learn the more difficult parts of the trade, or to prepare for examination.

In the moulding class the pupils learn to make their own moulds. The classes in coach-building and plumbing do very thorough work.

The school differs from most of the London technical schools in having no social side. The best pupils can use the library of the Carpenters' Company.

2. Westminster Technical Institute: Here, again, there are pupils only, and there is no separate social organization of members. Most of the technical schools, though intended for the instruction of working-men, have more or less deviated from their original purpose to meet the needs of other classes. Here, however, there has been no such change. The programme is less expensive than in other technical schools, but the results are in no way inferior. The coach-building class is probably the best in London. There are classes for the various building trades, classes in needlework and cooking, science and art classes, and in French, shorthand, and book-keeping. There is a very large attendance of police officers for the study of writing, composition, arithmetic, and other subjects. The workshops have become too small for the growing number of students. It has been found necessary to divide the cutting-out class. A two years' course is necessary in certain trades, and to such classes none but workmen are admitted; one year is enough in the sewing-classes.

The school is conducted on a modern scale, and this renders its statement of accounts the more interesting: Expenditure—Salaries, £783 18s.; appliances, £99 9s.; materials, £25 2s.; general expenses, £160 6s.; repairs and maintenance, £463 6s.; management, £303 1s.; sundries, £4 3s.: total, £1,839 5s. Receipts—Fees for trades classes, £74 10s.; for other classes, £110 2s.; sales from kitchen, £3 1s.; sale of old materials, £13 4s.; sale of journal, £3; Forest and Grinsell Charities for scholarships, £20; Townsend Trust for scholarships, £228; contribution from St. Stephen's Primary School, £60. Grants: County Council, for materials, £16 16s.; for tools and apparatus, £48; for finishing, £50; in proportion to number of pupils, £238 4s. City and Guilds, £30; Science and Art Department, £36 14s.; Education Department, £203 9s. Total receipts, £1,135. The Baroness Burdett-Coutts makes up the deficiency (about £700 a year); last year she gave £1,500, and this year £500. The teachers are working-men, who are paid from 7s. to 10s. each per night. In the strictly technical (trades) classes the salaries come to about £470 a year, the pupils paying only about £70. A pupil who takes a course of plumbing, and a course of geometry, pays only about 15s. The Townsend is an old trust for the benefit of the working-people. At the time of its foundation there were no technical schools. The trustees set up a free primary school for workmen, one of the earliest schools of that class. The income is now devoted to scholarships held in the Westminster Technical School.

[The rest of this part is occupied with,—(1.) A reference to the Camden School of Art, which is taken as a type of a large number of art schools of a purely academic type, though intended principally for working-men; (2.) the technical work done at King's College and University College; (3.) members of the Royal College of Science, the Normal School of Art, and the great schools founded by the City and Guilds of London Institute, described in Part III.]

## PART V.—PRINCIPAL ESTABLISHMENTS OF TECHNICAL EDUCATION IN THE NORTH OF ENGLAND.

### 1.—MANCHESTER TECHNICAL SCHOOL.

The Manchester Technical School is, perhaps, the very largest of the popular polytechnic institutions. In London the work of technical education is scattered, and divided among many institutions; in Manchester, the second city in England, it is concentrated in one neighbourhood. The school has outgrown its old habitation, and now occupies more than half a dozen different buildings not far apart; but new premises are in course of construction, where the whole institution will find accommodation, and where its great extent will be more impressively manifest. The school may be said to comprise four distinct institutions—a school of manufactures, a trades school, a school of secondary education with a technological bias, and an art school.

The classes intended to educate apprentices and workmen in matters bearing on their own trades meet, as a rule, in the evening, and their class-rooms are occupied in the daytime by the pupils of the manufacturing school, who are young people belonging to the fairly well-to-do classes, and who are being prepared for responsible positions in the control or supervision of some of the industries of the district. Also in the daytime a school is carried on which may be regarded as preparatory to the manufacturing school, and which is attended by boys who have left the primary school and have not yet entered upon a determinate occupation. In each of its parts the institution seeks to supply instruction in the scientific principles which underlie the processes of the trades and industries of the neighbourhood, and to show by experiment the application of these principles. Its aim differs from that of the universities and university colleges in that, in its teaching of science, it has always in view the application of science to practical uses in commerce and industry, and not the mere culture of the mind. At the same time it offers to the students of university colleges the opportunity of acquiring practical knowledge of the industrial application of the sciences.

In the evening-classes there are courses of work in the laboratory and in the shop, and lessons for apprentices, workmen, and foremen in the scientific principles most applicable to their own trades or manufactures, and especially in any newly-discovered processes or improved methods.

To the day-classes no one is admitted who has not been sufficiently educated at a secondary school. Manchester took a more active part than any other city in the movement for the spread of technical education, and in promoting the legislation of recent years which has rendered it possible to found this great municipal school of technology.

#### A.—*Commercial and Manual Instruction School for Boys.*

This school receives boys of thirteen years and upwards, who must pass an examination in the subjects taught in the upper classes of the primary schools, and must engage to remain at least a year. The school course extends over three years. The fee is £6 a year. The course is arranged with the design of developing the intellectual faculties, and at the same time training the hand to dexterous service. Habits of careful observation, and of precision in measurements, and in the execution of manual work are cultivated. No attempt is made to prepare the pupils for any particular trade. At the same time the studies are so arranged as to bring into view individual aptitudes. Instruction is given in literature, mathematics, science, and drawing, and at the same time in practical affairs, in the use of tools, and in the value and nature of materials. No better preparation for the manufacturing school could be devised; and at the end of the three years' course, scholarships, giving the right to free tuition in the manufacturing school, are offered, with the addition in some cases of a money-grant.

The programme of studies is as follows: Languages and literature, geography and history, five hours a week; arithmetic and mathematics, four hours; writing, shorthand, and drawing, nine hours; sciences, six hours; carpentry, six hours.

#### B.—*School of Manufactures, or Day-classes.*

Pupils on leaving the day-school (commercial and manual) of the institution may enter the day-classes of the manufacturing school. Other pupils are admitted, the minimum age being fifteen. There are seven sections. The fee for any section is £15 15s. a year. A pupil entering for a single class pays £1 1s. a year for every hour per week that the class meets.

There are 3,731 students in the institution, and about one-sixth of them are in these day-classes. In some sections the course extends over two years; in others, the course extends over three years. This is a secondary school, but its studies are less theoretical and literary than those of other colleges of this kind; it is principally a secondary school of manufactures. The Leeds Central Board School is an organised science school, where the physical and chemical sciences are studied from the point of view of the manufacturing industries; but this technical day-school at Manchester has a more direct bearing on handicrafts, and prepares for the arts and trades by cultivating taste and ability, and by developing the inventive faculty. The teaching occupies thirty-eight hours a week.

##### *Section 1. Pure and applied Mathematics.*

*Section 2. Machines.*—In this section are laboratories for physics, chemistry, and metallurgy; a large hall for drawing; shops for woodwork, ironwork, and modelling; and a forge.

*Section 3. Physics and Electricity.*—This section is for electricians and mechanicians, for chemists, and for architects and engineers (civil, mining, or sanitary) who recognise the importance of recent developments in the use of electricity, and the necessity of studying their bearing on building construction. In the basement are the dynamos, which furnish electricity, especially for lighting; and on the ground-floor and above are the class-rooms, laboratories (for physics, electricity, mechanics, photography, and telegraphy), a museum of electrical science, and workshops for the making of instruments of precision.

*Section 4. Plumbing and Sanitary Engineering.*—This section is intended for young people who wish to be architects, municipal (sanitary and civil) engineers, constructors and superintendents of works, sanitary inspectors, or plumbers. There is a complete workshop for plumbing.

*Section 5. Chemistry and Mineralogy.*—This section is for sons of manufacturers, for directors and firemen, and others who intend to devote themselves to chemical manufactures, dyeing, glass-staining, printing (of textile fabrics), bleaching, or metallurgy. The laboratories are furnished with appliances for all experiments in organic and inorganic chemistry, qualitative and quantitative, and in the dyeing department every provision is made for practical work.

*Section 6. Spinning and Weaving.*—This section is for designers, supervisors, managers, manufacturers, and merchants. The collection of machines is, perhaps, unique. There is a collection of models and products, materials and tools, and an excellent library of English and foreign books and

reviews bearing on the two industries. There are classes for theoretical instruction, and classes for practice, covering together about forty hours a week.

*Section 7. Architecture and Building Construction.*—The classes prepare for the examinations of the Royal Institute of British Architects, and assemble twice a week for three hours (two to five) each time.

There are day-classes for teachers in wood-carving, manual instruction, and sloyd; and day-classes for women in French, German, Italian, dressmaking and cutting-out, needlework, and embroidery.

#### C.—*Trades School, or Evening-classes.*

The evening-classes are for persons who are engaged in trades or business, and who wish to complete or extend the knowledge they obtained at school, or the experience they have acquired in the workshop or store. The teaching bears especially on local industries, and the programme includes technical drawing, principles of science, laboratory work, and the use of tools and machinery. There are four sections.

*Section 1. Commercial.*—The subjects are commercial correspondence, commercial arithmetic, commercial geography, hand-writing, shorthand, book-keeping, French, German, Italian, Spanish, and Portuguese.

*Section 2. Sciences and Technology.*—A student cannot derive the full benefit of the classes in this section unless he has a good primary education, and attends regularly. There is a three years' course of study which students in chemistry, in construction, in the iron industry, or in electricity are recommended to pursue before they proceed to the advanced study of a single occupation. The technological classes are for the most part adapted to the examination programme of the City and Guilds Institute, and in these classes there is no free tuition. There is barely room for the 2,500 paying students.

For the iron industry there are classes as follows: 1. A class of instruction as to tools and machinery. The pupils learn the use of all the tools used in the construction of machinery; polishing-machines and hammering-machines—their history, development, and construction, and the limits of their application are explained in detail. (2.) Machine construction. The class is attended by those who intend to engage in this industry, by those who work in the offices of machine-builders, by those who are at work in one branch of the industry and wish to acquire a knowledge of some related branch, and by persons who for any reason wish to learn the use of tools. (3.) The forge class. (4.) Modelling. This class is for artisans and designers in the machine industry, who learn here the use of carpenters' and joiners' tools so that they may be able to make models of machinery.

For the building industry there are classes as follows: (1) Plumbing; (2) sheet-metal work; (3) masonry and bricklaying; (4) house-painting and decorating, letter-painting, gilding, plastering, and moulding; (5) woodwork, including joinery, sloyd, turning, cabinet-making, carving, carriage-building, railway carriage- and truck-building; (6) sanitation—construction, inspection, disinfection, sanitary law; (7) building quantities; (8) trigonometry.

In physics and electricity there are two classes for telegraphists—a class in electricity, to give a clear and exact idea of the instruments and methods, and a class in the theory and practice of telegraphy and telephony, illustrated with the aid of the latest and best instruments. There is a three years' course in electric light, and a practical course in fitting-up. For electro-metallurgy there is a two years' course. There is also a class for work in the electro-chemical laboratory.

Under the head of chemical industries there are courses as follows: (1) Metallurgical laboratory, three years; (2) manufacture of iron and steel; (3) chemistry of brewing, two years; (4) photography, two years; (5) dyeing, bleaching, and printing cotton, linen, and silk; (6) carbon product; (7) paper-making and staining, &c.; (8) analysis of gas.

For the textile industries there is a separate building, the cost of which was defrayed from a legacy of Sir Joseph Whitworth. The machines have been presented by different manufacturers, with the exception of one which was bought and presented by students. The machinery and apparatus alone are valued at £6,000. The subjects of instruction are the same here as in the day-classes, but the treatment is more elementary. The fee is £2 for a course extending over thirty weeks with three lessons a week, while the fee for the day-classes is £15 15s. a year. There are classes for printers, lithographers, farriers, and tailors, and in sewing and embroidery.

The School of Art has a two years' course. There are about fifty pupils, of whom only a few are artisans. In 1893–1894 the number of pupils in all the departments of the Manchester Technical School was 3,223. The expenditure of the Technical School was £13,387 (of which sum £5,922 was for salaries of teachers), and its income £6,890 (of which £4,416 was derived from fees, and £1,427 from Government and municipal subsidy earned by the school). The expenditure of the School of Art was £3,882, and its income £1,978. The deficiency was made up by endowment revenue of about £417, and a contribution of about £8,000 from the special fund of the municipality for technical education.

[The remaining articles of Part V. relate to the Manchester Museum of Manufactures; Birmingham Technical School and Art School; University College, Nottingham; Liverpool Trade School, University College, and Navigation School; Bradford Technical School; Leeds Mechanics' Institute; Yorkshire College, Leeds; Sheffield Technical School; and operations in towns of the second rank—Halifax, Bolton, Oldham, Preston, Blackburn, Warrington, Coventry, Huddersfield, Oxford.]

#### PART VI.—SPECIAL SUBJECTS.

[The special subjects are: Commercial instruction, manual instruction in primary schools, evening-classes organised by the School Boards, technical education in the country districts, and

technical education in private industry. The chapter relating to manual instruction in primary schools is important, but it is probably unnecessary to reproduce it here, seeing that the report of the Joint Committee on this subject has just been reprinted in another parliamentary paper (E.—1c.) from last year's annual report of the London School Board.]

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## PART VII.

[Part VII. is devoted to a discussion of the bearing of the information the writer has collected upon the problems of technical education in Belgium.]

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