

13TH AUGUST, 1908.

THE TECHNICAL COLLEGE IN
RELATION TO THE APPRENTICE.

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Technical education has, in modern times, become a matter of paramount importance in every civilised country, and has earnestly engaged, not only the best thought of all advanced educationists, but also the paternal attention of the world's various Governments. With the tremendous development of machinery in every branch of manufacture, and the universal exploitation of Applied Science in every department of industry, the old apprentice system utterly broke down, and it was found as necessary as desirable to supplement the practical teaching of the workshops by the theoretical teaching of the Technical College. In our own State of New South Wales the apprentice system became a matter of legislation of an exceptional and very intimate character; but before dealing with this aspect of the case he would pass in brief review the various systems for the imparting of technical knowledge adopted by the leading civilized nations of the world—systems which it was his privilege personally to examine in all their administrative and executive details.

He would begin his survey of technical education systems with that of Russia—politically the most reactionary country in Europe, but by no means the least progressive in expert pedagogy. Indeed, most misleading and erroneous impressions were entertained by the outside world of the condition of education in the Empire governed by the Tsar. However backward the interior provinces might

be in this respect, his colleague and he found that the city of St. Petersburg stood abreast with the foremost centres of the Continent in the matter of secondary and technical schools, one of the finest of those they inspected being the Tsessarevitch Nicolas—a technical school which supplied the educational needs of the apprentice to the handicrafts operating with wood and iron. This school is conjointly endowed by the Tsar, by the Municipality, and by the Society for the Development of the People. The attendance is over 300, and the great majority of the pupils are bursars. In the Tsessarevitch Nicolas the entire details of a handicraft are thoroughly taught, and on the completion of the course the better operatives in wood-work remain yet another year in the institution, and in receipt of a good scale of wages. The work done by this class of mechanics touches a high standard of excellence, and is a tribute to the value and thoroughness of the system of instruction, besides being ample evidence of its scope and efficiency. It appears, by the way, somewhat incongruous to the inquiring traveller that a city like St. Petersburg, which possesses so many fine schools, is so difficult to enter and explore. Before the foreign visitor can gain access to the Russian capital, he must obtain official permission, and he is obliged to arm himself with a properly accredited passport for production on every and any trivial demand—an obligation which does not obtain in any other part of Europe.

Educationally the Empire of the Kaiser stands in the very front rank, especially so in the matter of technical instruction. The facilities afforded in Germany for obtaining extended education are astonishing, those methods and means which have been merely highly recommended in England being regularly employed and exploited in the States of the great Germanic Confederation. On the completion of their compulsory period of

attendance at the "Folk School" (the primary academy of the masses), provision is made for the children to continue their education in the "Trade Continuation Schools," to which young workers and apprentices are bound, in some parts of the Empire, to attend until they reach the age of sixteen years, in others until they are eighteen. During this period of technical tuition the employers of the young workers and apprentices are obliged by law to contribute the cost of the fees, and also to permit absence from the workshops and factories in order to afford the pupils ample time for attendance at school; while parents and guardians are under the obligation of sending the boys under their control regularly. Drawing is the basis of all instruction in these "Trade Continuation Schools," and it is taught on a carefully devised system in the most methodical and thorough manner. The system evolves a radical principle of the highest educative value, as, not only are the hand and the eye of the pupil simultaneously trained, but the exercises themselves, which operate instrumentally in this training, bear specifically upon the art or craft in which the apprentice is engaged, and great ingenuity is shown in the adaptation of the lessons to the end in view. The objective of the "Trade Continuation Schools" is twofold: namely, (a) the carrying on of the mental development of the pupil, and (b) the perfecting of the apprentice's efficiency in the pursuit he has taken up. The majority of the youths who attend schools of this type either learn or exercise a calling, whether it be of the nature of a handicraft, or of some form of activity in workshops or factories.

He would like to interject here a remark on a purely etymological question. The word "trade" or "tradesman" is one somewhat confusing. Its primary meaning is "transit," "traction," then, by a process of transference, "barter," "exchange," "buying and selling," and,

secondarily, any other occupation by which a person earns a livelihood. In dealing with the educated use of tools and machinery, he preferred the use of such English words as "art," "craft," "artizan," "handicraftsman," "mechanic," etc.; such German words as "handarbeit," "handwerk," "handwerker," "handwerksmann"; and such French words as "travail manuel," "artisan," "industriel," and "mecanicien." He made this interpolation for the sake of clearness, for it is almost impossible to avoid the use altogether of such words as "trade" and "tradesman." Wherever used in this paper these designations had nothing whatsoever to do with the business of barter or exchange, unless otherwise mentioned with specific emphasis. With this explanation, necessary from his point of view in consideration of the technical character of his subject, he resumed:

The apprentice-pupils of Germany learn the practical side of their "trades" in the workshops and factories in which they are carried on; and they obtain their knowledge of expert technical drawing and their skill in its artistic accomplishment, besides all the theoretical side of their instruction, in the Trade Continuation Schools. The by-law which established such schools in Dusseldorf in 1902 provides that all apprentices and youthful workers engaged in every kind of calling (not even excepting "trades" of the commercial or business type) be compelled to attend the Continuation Class on the appointed hours of certain specified days until the completion of the school half-year which marks the conclusion of their sixteenth year of age. Not alone Dusseldorf, however, but every city of any importance in Germany, has its Trade Continuation School, and the educational activity and mental enthusiasm which are so characteristic of the students of the Fatherland from fifteen years upward are an everlasting credit to this self-reliant and earnest people, and an enduring moral asset of greater value than all the victories of a hundred battlefields.

The educational system of Switzerland is deserving of the highest commendation, and it would, on its technical side, be difficult to surpass. The colleges devoted to this very important branch of tuition are attended by apprentices and other students for the gaining of knowledge for the scientific section of the arts and handicrafts in which they are engaged, while the workshops and the laboratory supply the necessary actual practice and illustrate the application of the principles of theoretical science. In Geneva, a city noted for the manufacture of watches, arithmometers, and other fine mathematical, calculating, and mechanical instruments in which delicacy of construction and accuracy in the relation of parts are the highest desiderata, schools for the imparting of this description of knowledge are second to none in any other country; while in the large institution of La Prairie, in the same city, ample evidence can be obtained of similar high-class instructional activities with regard to the building and general industrial crafts. Two fine types of the lower technical institutions are to be found in the Swiss capital of Berne, in the apprentice school of that city, and in the "Technikum" at Winterthur, in the canton of Zurich. The latter, an industrial teaching college, aims at facilitating the acquisition of knowledge, representing an intermediate grade of technical education, by means both of theoretical and practical instruction. Its curriculum includes special instruction in the following industrial branches, each of which is denominated a school, namely: Builders, Mechanical Engineers, Operatives in Mechanical Crafts requiring precision, Electrotechnicians, Chemists, Workers in Art Industries, Surveyors, Followers of Commercial Pursuits, and Employees in the Railway Service. Applicants for admission to the "Technikum" must be above the age of fifteen years, and the possessors of a secondary education. The courses extend over four

half-yearly terms for the Railway Service; and for the other divisions over five and six terms. There are some 700 students in this institution, and the material equipment and general organization are of the very first order.

While investigating the educational system of this progressive and interesting land, he found so much to admire that he was impelled to make a most exhaustive examination of the technical side of Swiss tuition, and for this purpose visited many of its towns; and subsequently, through the marked courtesy of Mr. Alfred Wunderlich (of the Wunderlich Ceiling Company), who but recently returned to Sydney from a visit to his native land, he (the speaker) was placed in a position which enabled him to present the salient points of the law with relation to apprenticeship as it obtains in Switzerland. Mr. Alfred Wunderlich has, by the way, already forwarded, by request, a report on this subject to the Master Builders' Association. In Switzerland the apprenticeship system extends to all arts and crafts, to all callings of an industrial nature, and to all "trades." Nothing is exempt excepting unskilled labour; besides which, no boy or girl who has not reached the age of fifteen years may be employed in shops or factories. The control of the nation's apprentices is vested in bodies appointed by the Department for Agriculture and Commerce, and these bodies, styled Prud'-hommes (meaning, literally, "Prudent Men"), are composed of respectable citizens, who are called upon to perform their allotted duties just as our jurymen are called upon to act in their especial capacity in the law courts. Attendance at the technical schools is compulsory, and no apprentice can obtain a certificate of competency if he has not passed the prescribed examination. Moreover, the students' employers or superintendents have absolutely nothing whatsoever to do with this test examination, which is entirely out-

side their scope and function, and takes place in the capital of each of the federated States of the Helvetic Republic. The examination of the apprentice is conducted by professional experts with whom he may never have before come in contact. The Swiss law makes no provision for the transfer of an apprentice from one master or establishment to another, the contract being absolutely binding on both parties. He might mention in passing, as illustrative of the remarkable simplicity of public life in Switzerland, and of the almost Roman austerity of its highest officials (and he was thinking of the Roman Republic, not the Roman Empire), that the President of the Swiss Confederation receives a stipend of £400 a year, while a judge corresponding to one of our Supreme Court Judges receives £250, and the first men in the land holding public offices lecture voluntarily in the colleges.

Of all English-speaking countries none, in his opinion, had developed such a continuous and such a connected system of instruction as the United States of America. The work of primary education may have nothing about it especially meritorious, if we excepted, perhaps, the well-co-ordinated tuition in the various branches of manual training; but when the American boy left the primary school at the age of fourteen years his opportunities advanced to meet him. There were at his disposal, either under State or municipal control, four kinds of schools, which in every case were free; while in some States the University course was free also. The schools were as follows: (a) the Latin High School, with its goal in Yale or Harvard; (b) Technical High Schools; (c) Trades Schools; and (d) Continuation Schools.

In the educational institutions of America class distinctions are absolutely unknown, and the boy makes his choice according to his inclination and the standard of his ability. Any one of each of the four classes of

schools he had above enumerated was willing to receive him, for he was the citizen of a land which did not recognise one kind of educational institution for a rich man's son and another kind for the son of a poor man. •

The American system of education made every provision for a course of instruction in all the various industrial and manufacturing processes and activities, and this side of pedagogy found its adequate medium in the Technical High School, which follows the probationary period passed in the ordinary primary school (with its capially systematized course of manual training), and secured in every considerable centre of population, a theoretical training of the very first importance to the industrial life of the nation. The State of Massachusetts, always in the van in matters educational, was the first to recognize the great value of manual training in the high school curriculum, and in the light of an illuminative prescience passed a law which required every centre containing a minimum of 20,000 people to maintain this highly educative branch of instruction as part and parcel of its high school system. The American people are always ready and willing to support whatsoever they are convinced is for the benefit and advancement of their children, and these fine parental qualities were never better exemplified than in a report of the Massachusetts State Board, which showed that not only had the law been complied with in its absolute terms, but that, also, a number of towns, possessing less than the minimum population of 20,000 amenable to the enactment, had voluntarily established Manual Training High Schools.

Writing of this class of school, a Canadian specialist in education states: "It was maintained that the Manual Training High Schools are more important educationally than are the Academic High Schools, for they educate the whole nature, the creative as well as the acquisitive

powers." But he points out that it is not denied that, in the later years of the work of such institutions, the courses undertaken are a direct preparation for the industrial callings; nevertheless, the courses followed in the other schools are no less a direct preparation for the taking up of the professions, and the industrial arts have surely an equal right to educational consideration. He says further that some of the Manual Training Schools may fairly be described as Lower Grade Technical Schools, as they emphasize the industrial activities more than other institutions of the same kind. The schools thus specially alluded to supply a demand which the decline of the system of apprenticeship, together with the marvellous progress and development of industry, have of late years created and stimulated in the United States for a grade of technical training of a standard somewhat lower than that insisted upon by the Schools of Technology.

An admirable type of the schools specialized by the Canadian writer in the preceding paragraph, he saw in 1903. It was the Central Manual Training High School of Philadelphia. In a report of this establishment, dated 1902, a Chairman remarked that the institution had achieved the reputation of being one of the best exponents of the modern educational movement, and that it was the logical outcome of a demand for the kind of training by which the young could be put in closer touch with the needs of the present day. The opening up of new fields of employment by the development of the latest inventions, the immense strides made in means and methods of travel, the rapidity of the transmission of the world's concurrent news, the revolutionizing of modes of manufacture by improved machinery, the varied and various uses to which electricity alone could be put, all these things called for a class of young men, educated not only along the time-honoured academic lines,

but young men who were trained also in the application of ideas to concrete results of practicability. It was felt that if useful men were needed, means which would develop their usefulness should be employed in their training. To bring Thought and Labour, Theory and Practice, together; to make the Thinker a Worker also, and the Worker a Thinker—this was the problem to be solved by the founders of the movement.

In the Philadelphia Technical High School the period of instruction covers three years, and the courses include: (a) English Literature, History, Practical Economy, and a Foreign Language; (b) Mathematics—Bookkeeping, and Surveying; (c) Science, Chemistry, Geology, Botany, Electricity, and Steam Engineering; (d) Drawing—Freehand, Constructive, Architectural: Designing and Modelling; and (e) Practical Instruction in Wood and Iron and Applied Electricity.

In England, the country which in some respects most nearly resembles our own in educational matters, three methods are employed in the imparting of technical knowledge to apprentices, namely:—

- (a) After finishing his ordinary school course the lad goes direct into the workshops to undergo an apprenticeship of four or five years, the attendance at evening classes being optional with him;
- (b) He is sent to a Technical College for two or three years, and thence into the workshops for a shortened period of three years; or
- (c) He combines both methods of instruction, the theoretical and the practical, and alternates between the workshop and the College.

In 1897 the London County Council conducted an inquiry into the conditions affecting the Building Trades, and discovered that only eighty apprentices and 143 learners were employed out of a normal proportion of

1,600; and it was concluded that the only alternative was the training of youths in the schools until they were sufficiently skilled to make it worth the while of employers to take them on at a reasonable weekly wage and without a premium. In the subsequent Report the chief recommendation was the lengthening of the school life (with Parliamentary sanction) from its present abbreviated term—a step which would, of course, include a raising of the legal age for leaving school; and it was further suggested that opportunity should be afforded for special instruction in manual training and drawing to youths between thirteen and fifteen years of age.

It is painfully notorious that the average British manufacturer has in the past exhibited extraordinary apathy towards almost every description of scientific progress, and that he has consistently refused to employ the trained man whom the technical schools have produced, or to offer any encouragement to such a desirable product, thus contrasting very unenviably with the American of the same class, with whom it is quite an ordinary thing, in the workshops under his control, to appoint a special superintendent of apprentices, who watches their attendance and progress, and reports periodically thereon to the head or heads of the firms—another example, if such were wanting, of the methods of thoroughness which Americans find to pay well, both directly and indirectly. Nevertheless, many individual employers in Great Britain have encouraged their workmen by every means in their power, some even holding instructional classes of their own, some filling vacancies from the ranks of their apprentices, some giving concessions of morning time-leave to those who attend evening classes, and some paying the fees and providing the books and instruments of their youthful workers.

As a specimen of an English method of technical instruction he would summarise the scheme adopted by the

North-East Coast Institution of Engineers and Ship-builders:—

At the end of September in each year each apprentice is awarded a certain proportion of marks, namely:

For each approved examination passed during the year, 20.

For time-keeping (maximum), 40.

For good conduct, perseverance, and progress in the workshops (maximum), 40.

(N.B.—The marks for time-keeping are deducted at the rate of one mark for every three hours lost; but no deduction is made for special leave, or for sickness, provided the latter be certified by a doctor.)

Conduct marks are awarded quarterly by the chief foremen of departments on the following scale:—Very good, 40 marks; good, 30 marks; fair, 20 marks; moderate, 10 marks.

An apprentice obtaining 60 marks is entitled to the sum of sixpence being added to his weekly rate of pay for the ensuing year, and for a number of marks in excess of 60 this amount will be proportionately increased. Thus, an apprentice passing in two science subjects at an evening science school during the course of any one year would be entitled to 40 marks; for very good time-keeping, 40 marks; and for general good conduct, perseverance, and progress in the workshops, a maximum of 40 marks—total for the year, 120 marks. Such a record would entitle the successful student to an increase of one shilling per week on his rate of pay from, say, the 1st October, for one year; but payments under this scheme would cease on the termination of his apprenticeship or on his dismissal.

Again, should an apprentice obtain 30 marks for time-keeping, and 40 marks for good conduct, perseverance, and progress, or a total of 70 marks, his rate of pay would be increased by 7d. per week, and so on.

(N.B.—No payment would, however, be made to apprentices obtaining less than 60 marks, while those who failed to obtain any marks at all for time-keeping, good conduct, perseverance, and progress, would be subject to dismissal.)

Going further afield, we find that the London and South-Western Railway Company has introduced an original method of dealing with the apprentices at its Nine Elms Works, the special feature of which method may be, in part, attributed to the objection which the head of the Locomotive Department entertained against evening classes. In September, 1903, a notice was issued to the effect that all the Company's apprentices would be permitted to attend classes during the regular working hours; an entrance examination was subsequently held in Mensuration, Mathematics, and Mechanics, at which 136 apprentices presented themselves; of these 74 were considered to have passed, and the remainder were informed that they would be required to reach the required standard by the ensuing season. The 74 students who were considered to have passed this entrance examination were divided into two groups, each of which was under the obligation of attending classes at the Battersea Polytechnic Institution on two mornings a week—on the one morning from eight to nine o'clock, and on the other from eight to half-past nine. The subjects of instruction comprise Practical Mathematics and Mechanics, and the students are permitted to attend a class in Machine Drawing on one evening a week.

The subjects prescribed for the second year are Practical Mathematics, with lectures and laboratory work on Steam and Heat Engines. The apprentices who pass the annual examinations with adequate credit proceed to the course prescribed for the year following. Those who fail to pass are obliged to take up the curriculum

for another year; and then, if again unsuccessful, are debarred from the advantages of student facilities during the regular working hours.

The most promising students are allowed at the end of the third year to spend six months in each of the last two years of their apprenticeship in attendance at day classes in an approved Technical College; and throughout the course all the class fees are disbursed by the Company, and wages are paid as though full-time was being kept in the workshops.

At Middlesborough, in Yorkshire, and in the Cleveland District, also in the same county, some of the big ironmasters permit their apprentices to attend day classes, on one day in each working week, without deduction from wages for the time so spent, the subjects of instruction being Machine Construction and Drawing, Applied Mechanics, Theoretical Chemistry, and Electricity. The fee for the course is six guineas per annum, half of which is paid by the employer, and the other moiety by the County Borough of Middlesborough in the one case, and in the other by the County Council of the North Riding of Yorkshire. The firms which have made this educational concession to their apprentices are, so far, the Tees Side Bridge and Engineering Company, Middlesborough; Richardson, Westgarth, and Company, Middlesborough; Bolekow, Vaughan, and Company, Middlesborough; and Head, Wright, and Company, Stockton. At Bolton, in Lancashire, three or four hundred apprentices attend evening classes at the expense of their employers; some firms giving ten scholarships, others twenty, and so on, of a value averaging about twenty-five shillings each, an amount which covers the fees and the cost of books, instruments, and the general outfit of the student.

Having passed in a rapid survey the methods of theoretical and technical instruction of apprentices in Russia,