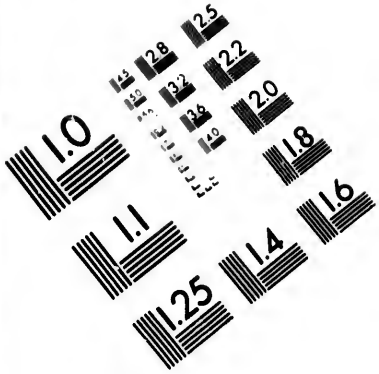

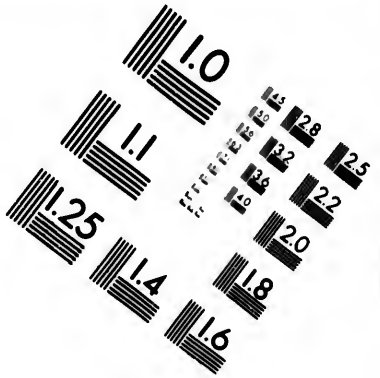

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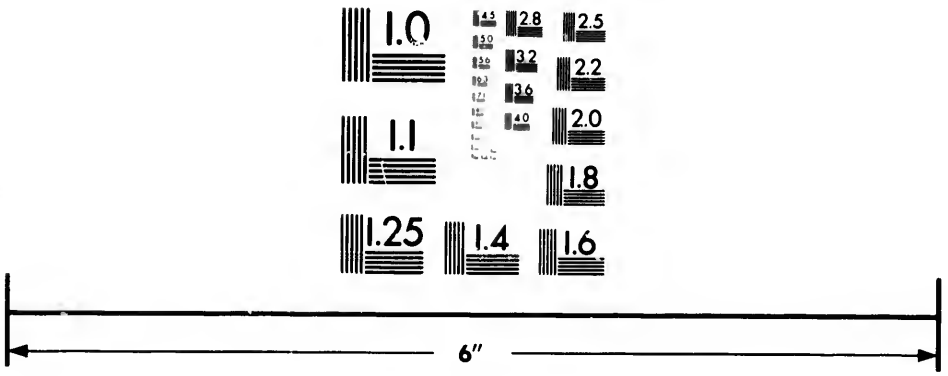

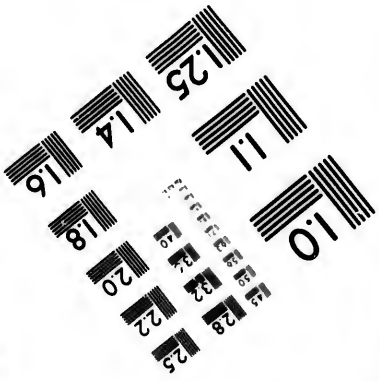

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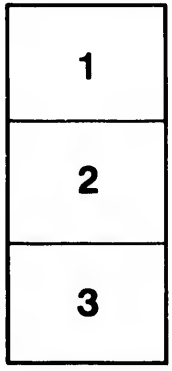
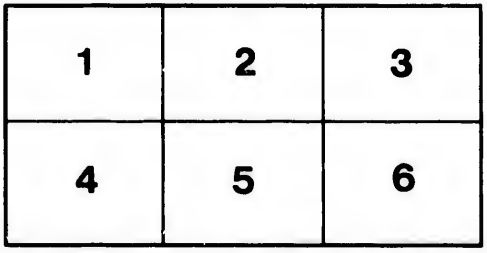




Promoting

Technical Education

ABROAD AND AT HOME.

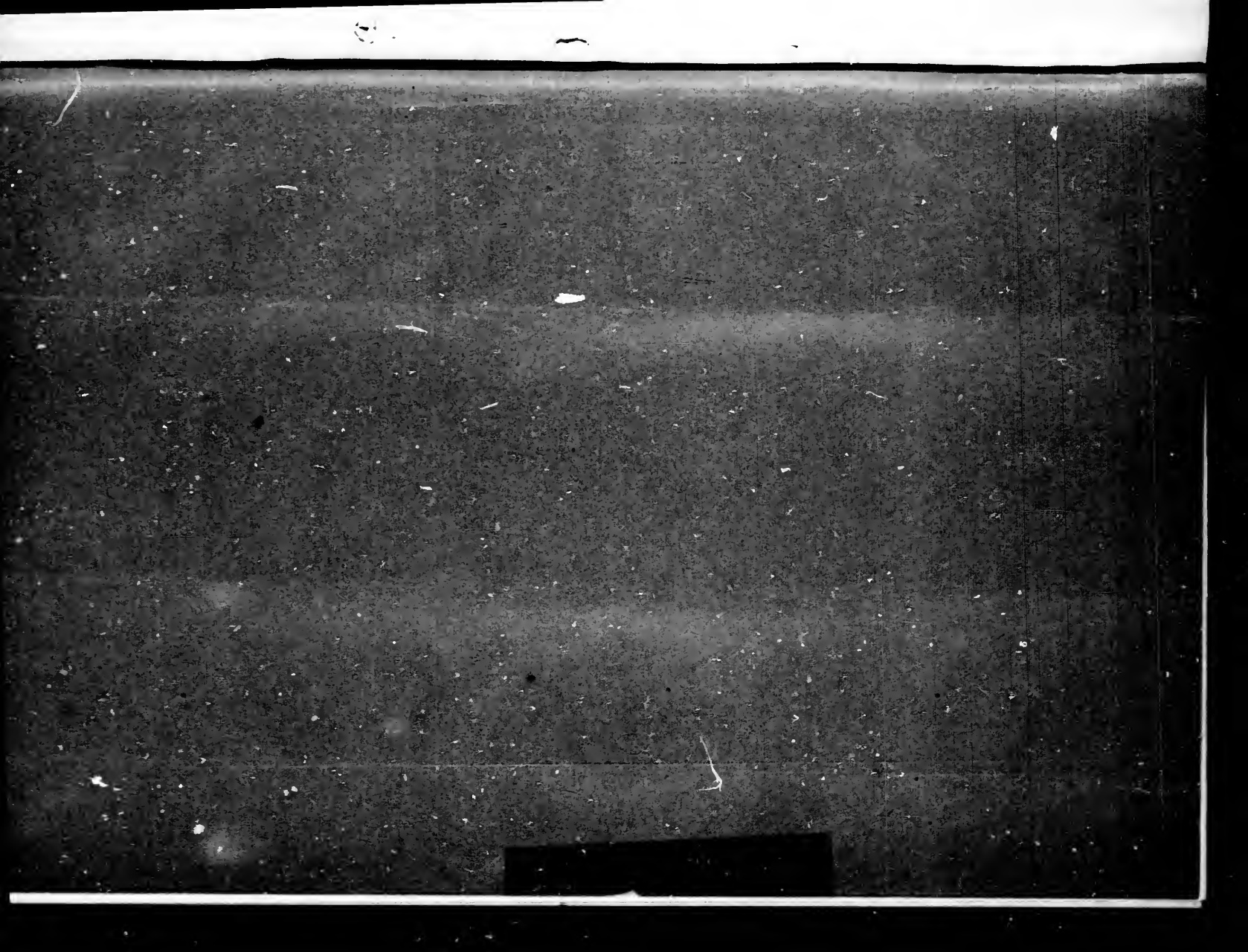
BY

PROFESSOR J. G. MACGREGOR,

Dalhousie College.

"What is put into the schools of a country comes out afterwards in the manhood of the nation."—STEIN.

COMPANY.



Published by the Association for Promoting University Consolidation.

TECHNICAL EDUCATION

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HALIFAX, N. S.:

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PREFACE.

This pamphlet is a reprint of a short series of letters contributed during the past winter to the *Morning Herald*. I have given them this more permanent form at the request of friends of University Consolidation, and of men who feel our need of Technical Education. My facts I have drawn from a great variety of sources. I may mention: *Rapport sur l'organisation de l'enseignement industriel en Allemagne et en Suisse*, published in 1864, by the French Government; Russell's Systematic Technical Education, 1869; Matthew Arnold's Report to the British Government on the Schools of France, Italy, Germany, Switzerland, 1868; *Preussens landwirthschaftliche Verwaltung*, 1875-7; *L'enseignement agricole en France*, by H. Johanet, 1882; Technical Education in a Saxon Town, by Felkin, 1881; Agricultural Education, by Prof. W. Johnston, 1881; Liversidge's Report to the Government of New South Wales, on Museums and Scientific and Technical Instruction in Great Britain, and on the Continent of Europe, 1880; the Report of the Quebec Commissioner of Public Works and Agriculture, 1880; Report of the United States Commissioner of Education, for 1879; Discussions on Technical Education, published by the American Institute of Mining Engineers, 1876; Apprenticeship Schools in France, and other pamphlets, by Prof. S. P. Thompson, Bristol; The Future of Mechanics' Institutions, by Prof. W. E. Ayrton, London; Report to the Japanese Government on the Engineering College, Tokio, 1878; papers in the Transactions of the Highland and Agricultural Society of Scotland, 1875-81; various Circulars of Information issued by the U. S. Bureau of Education; the Education Reports of the Provinces of Canada; and circulars, prospectuses, and calendars of Universities, Colleges, and Technical Schools.

J. G. M.

HALIFAX, May 10th, 1882.

TECHNICAL EDUCATION

ABROAD AND AT HOME.

In the following pages I wish to consider how Nova Scotia compares with other civilized countries in the matter of technical education. By technical education, I mean those forms of education which assist the people of a country in the development of its natural resources. I shall, therefore, have nothing to say of legal, medical, or theological education, or of that form of school and university training whose object is culture. Not that in these departments we have attained or are already perfect. We are in them also far behind the rest of mankind. But their effect on the development of the resources of the country, though of the greatest importance, is indirect. The effect of technical education would be direct; and yet the most of us are quite unconscious of the great gulf which in this matter separates us from the rest of civilization.

To make this gulf apparent, I shall first give a short sketch of the facilities for technical education which are supplied by other countries to their people, and compare with them those which Nova Scotia affords her sons. I shall then bring facts to show the value of this kind of education, and point out what forms of it Nova Scotia ought to have if she wishes to compete with other countries or even only with the other Provinces of Canada. Finally I shall consider the best means of establishing the necessary schools, and endeavour to make some estimate of their cost.

The best systems of technical education are to be found in Europe. In the short space at my disposal, however, it would be impossible to describe the systems of all the European nations. Let me therefore select one for somewhat detailed description. In the case of the others it will be sufficient to point out only those of their features which are of special interest to us. I select for detailed description the Swiss canton of Zurich, not because in respect of technical education it is foremost among the European nations, but because it has a population of only about 300,000, and can therefore readily be compared with Nova Scotia.

In the Swiss republic, as in the various States of Germany, primary education is compulsory. The period of compulsion extends over nine years. The first six are spent in the primary school, where the

pupils are taught among other subjects, natural history and drawing. The last three may be spent in various ways. If the pupil is the son of poor parents, and must work for his living, he attends the *Fortbildungs Schule*, or school for the continuation of education. It meets twice a week, and the training which it supplies has to do chiefly with the application of the knowledge gained in the first period to the wants of practical life. In most of the German States these continuation schools are evening schools. In all cases the subjects taught depend upon the class of industry in which the pupils are employed. They generally include drawing, geometry, and arithmetic. In agricultural districts, the pupils are taught the elementary principles of agriculture ; in manufacturing districts, the elements of the sciences bearing upon their daily work.

If, however, a pupil is able to continue daily study, he may, if not sufficiently far advanced for a higher school, enter what is called the secondary school, where he is taught not only ordinary subjects, but also the governmental organisation of Switzerland, geometry, the elements of physical science, with indications of its application to agriculture and other industries, and drawing. The course of the secondary school extends over three years, but the work of each year is a complete whole.

From any stage of the secondary school, or, if a boy is sufficiently far advanced at the end of the the first six years, from the primary school, he passes either to the Gymnasium (High Classical School) or to the Industrial School. If he is to enter one of the learned professions, he chooses the former; if he is to be engaged in engineering, architecture, manufacturing, etc., he chooses the latter. With the Gymnasia, I have nothing at present to do. They have no connection with technical education. Their course consists of literature, philosophy, and pure science, and extends over a period of six and a half years. From them the student who wishes to prosecute professional studies, passes to the University of Zurich, whose efficiency may be estimated by the fact that it has a staff of seventy-nine professors.

The Industrial School prepares its pupils either for immediate practical work in the lower departments of industry and commerce, or for the technical schools in which they study the higher departments. It is divided into the upper and lower schools. In the lower school whose course extends over three years, the following are the subjects taught: German and French, history, geography, natural history, physics, mathematics, arithmetic, geometrical and free-hand drawing, writing, singing, gymnastics and military drill. The studies of the upper school extend over two and a half years, and embrace the subjects of the lower school with English, Italian, mechanics, mechanical technology, commercial arithmetic, commerce, banking, exchange, book-keeping, office work, the knowledge of merchandise, commercial geography and statistics, political economy,

biology, mineralogy, chemistry, technical chemistry, industrial and perspective drawing. These subjects are arranged in three departments, those, viz., of chemistry, mechanics, and commerce. The department which a pupil takes is determined of course by his prospective employment.

Besides the Industrial Schools, the canton of Zurich possesses three special technical schools—the Veterinary School, the Agricultural School, and the Polytechnic School. The Veterinary School provides a course of instruction extending over three years, and embracing all the branches of pure and applied science necessary for the successful breeding and training of domestic animals, and for the cure of their diseases. The school possesses a hospital, a dissecting room, a smithy, and a museum. The Agricultural School is intended to turn out farmers, well equipped with scientific knowledge, and well trained in practical work. It has a farm which is worked by the students. The school has the use of the Cantonal Library, a museum, a collection of agricultural implements, and a botanic garden. I am not sure that there are any special trade schools in the canton of Zurich. Berne, however, had, according to a circular issued by Lord Stanley, in 1868, a Watch-making School, and a Wood-carving School; Appenzell, a Weaving School.

All the schools to which I have referred are cantonal. The Polytechnicum, however, is federal. It belongs to Switzerland rather than to Zurich. I quote from J. Scott Russell, F. R. S., an eminent English engineer, a sketch of its foundation. The quotation is long, but it has a good moral. "Switzerland," he says, "is, like ourselves, a free country, a religious country, and consequently embarrassed in action and organisation by the desire to abstain from interference with personal liberty of action, and liberty of enterprise. It is encumbered also in its initiative by the same sectarian hatred which sets Catholic Christians against Protestant Christians, High-churchmen against Low-churchmen, and orthodox folk against heretics of all sorts. These prejudices or principles, equally in Switzerland as in England, made men jealous—especially churchmen—of all other education than that bestowed by the Universities of the Church, and offered a dogged resistance to the establishment of universities which were designed to fit men rather for their destinies in this world than in the next. These prejudices in which we share, caused Switzerland to remain in arrear of educated Germany in this matter of technical education of the highest sort. . . It happened, however, about fifteen years ago (1854) that the government of Zurich was in the hands of wise, educated, and patriotic statesmen. These men clearly foresaw the enormous material benefit which would accrue to Switzerland, and especially to Zurich, from the training of the more highly educated youth to the practical business of life, by means of a university, in which everything that

was most valuable in the sciences, arts, and manufactures of all other countries, should be taught by the most distinguished men imported from all nations for that purpose, in the best manner which their wisdom could organise, and with all the practical means of learning placed at their disposal which could be invented or bought. Switzerland accordingly, and Zurich especially, set about this task with a zeal and self-sacrifice well worthy of our imitation, even if quite beyond all hope of our rivalry. The city and the state competed with each other to tax themselves, in order to endow worthily this new university of the nation. The Swiss are true patriots; and having once ascertained that their national system of education was defective in the great element of modern practical science, they determined to do, in the most thorough, systematic, and comprehensive way, that which they felt they had been wrong in so long neglecting. . . . . The founders of the Swiss Polytechnicum did not ask themselves the question: What is the smallest and least costly scale on which we can begin to make good a few technical deficiencies?— but they asked themselves this other question: What is there in the science, the philosophy, the learning, the art, and the practical skill of modern times, which can be learned and taught, or which has been taught or learned in any other school of knowledge, but for which there is no adequate provision already made for teaching to our own students in the university of the land?—and those things we will see to having thoroughly taught. They soon found that the German universities had long been in the habit of teaching far deeper science, far larger philosophy, and far profounder art, than the Swiss in the isolation of their mountains had ever dreamt of. They found in the manufactories of Prussia, Belgium, France and England, structures, machinery, and manufacturing processes utterly unknown to the skilled men of Switzerland. . . The founders and governors of the Polytechnicum, searched the annals of pure philosophy and applied science, for the names of those men who were best known for science, skill, and the love of teaching; and these men from every country they selected, and entreated to come and teach their children, considering only how they could best make it agreeable and convenient to them to become the teachers and patterns of Swiss youth. . . . . The Polytechnicum at Zurich is larger than Buckingham Palace; the apartments of students and professors, the lecture halls and museums, are large, lofty, well-aired, well lighted. The building itself is the *chef d'œuvre* of a German architect; and certainly, if we judge it by its fitness for its purpose, rather than by profuse decoration, or lavish embellishment, it is an admirable structure. Even physically therefore, or materially, it is a model institution, while morally, it teaches us this lesson, that there is one nation in the world sufficiently disinterested and patriotic to save money by extreme self-denial, in order to lavish

it with profusion upon the intellectual training of the rising generation for the practical duties of citizenship."

Students enter the Polytechnic from the upper industrial schools. They require to pass a special entrance examination which is different for the different departments of study. These departments are six: (1) the school of architecture; (2) the school of civil engineering; (3) the school of mechanical engineering; (4) the school of industrial chemistry and pharmacy; (5) the school of agriculture and forestry; (6) the higher scientific school of the natural and mathematical sciences, of the literary sciences, and of the moral and political sciences, intended to train men who are to devote themselves to scientific research, or to teaching in the higher schools, especially the industrial schools. (There is a Normal School for training teachers of the lower grades.) In all the first five departments which are altogether technical, the actual practice of professional work is combined with the thorough study of its scientific basis. It is impossible for me to give here a list of the different subjects in which instruction is given in these six departments. There are about 190 different classes. The teaching staff numbers 90 Professors and 14 Assistants. The school has fine collections of drawings for educational purposes, of models of machines, of Zoological, Botanical, Mineralogical, and Palæontological specimens. It has a rich library, and laboratories which the French Commission of 1864 described to the French Government as being models for their imitation.

Zurich then provides for her youth, from her own resources, primary schools in which subjects are taught which are valuable both from the point of view of culture and of practical utility, evening schools for those who at an early age must enter upon the battle of life, industrial schools in which the pupils are prepared for commercial life and taught the applications of science to the lower departments of industry, and special technical schools for educating men for certain trades who cannot afford a prolonged course of study; while, by combining her resources with those of other cantons, she provides for them also a Polytechnic School for giving the highest possible preparatory training for all the more important industries of the State.

The organisation of industrial education in most of the European States is very much the same as in Zurich. The chief differences are to be found in the higher departments, the development of the various branches of which depends in each state upon its natural resources and its prevalent industries. Thus, in one town in Saxony, Chemnitz, whose schools are described by H. M. Felkin, in a most interesting little book, "Technical Education in a Saxon Town," we find, besides splendidly equipped schools corresponding to the gymnasia and industrial schools of Zurich, four Royal State Technical Institutions, viz: The Higher Technical School, (with mechanical,

chemical, and architectural departments), The Royal Builders' School, The Royal Foremen's School, and the Royal Technical Drawing School, having in all a teaching staff of 39 ; also a Weaving School, a Hosiery School, and evening schools for Hand Weavers and Tailors. When we remember that in Dresden, the capital of Saxony, there is a Polytechnic School, with a department for mechanical engineers, a second for civil engineers, a third for chemical industries, a fourth for drawing and modelling, and a fifth for training teachers of technology ; and that in Leipzig, another Saxon town, there is a University with a staff of about 150 teachers, our Nova Scotian souls are simply lost in wonder and amazement.

But Switzerland and Saxony are not in this respect unique among European States. Prussia, Austria, France, Italy, Spain, Russia, have all technical educational systems, more or less complete and efficient. To describe them is needless. For we cannot compare our Province with these populous states. In the smaller states, however, we find the same eager endeavor to educate. At Hanover, at Brunswick, at Carlsruhe, at Stuttgart, at Munich, at Nuremberg, at Aix-la-Chapelle, at Liege, we hear of large and well-equipped Polytechnic Schools, and I should exhaust the reader's patience were I even only to name the special trade schools and schools of less importance. I must restrict myself to a short statement of the more interesting peculiarities of those of the European States, whose prevalent industries more or less resemble ours.

In the Polytechnic of Berlin we find a department of naval construction. There was no such department in that of Zurich, for Switzerland is an inland country. But Prussia is a maritime state, has shipbuilders among her people, and, therefore, provides facilities for training men in naval architecture. In Berlin, in this department, students are trained in mathematical and physical science, the designing and the construction of ships, the theory of sailing-ships and of steamships, the construction of wooden and of iron ships, and the making of plans and estimates of ships.—Sweden has a school of naval architecture, a ship-building institution, and a department of naval construction in the industrial school at Gothenburg ; and the principles of the construction of ships are taught also in the higher departments of her nine special schools of navigation.—England and France have also their schools of naval architecture. The English school at South Kensington is intended to instruct not only officers of the navy, but also naval architects, and shipbuilders in wood and iron, marine engineers, foremen of works, shipwrights, etc. Besides the purely scientific subjects, instruction is given in ship drawing, designing of ships, practical shipbuilding and laying off, engine drawing, designing of engines, marine engineering, steam and the steam engine, strength of materials, etc. The course lasts three years. The summers are spent in practical work in dockyards or marine engineering establishments, public or private. This

school encourages the study of the same subjects in mechanics' and other institutes, by holding examinations and granting certificates without demanding attendance on the London classes.

In some states more largely agricultural than the canton of Zurich, the schools in this department are developed on a larger scale. Wurtemburg has at Hohenheim, one of the most complete agricultural colleges in Europe. It has three regular divisions,—the higher and lower schools of agriculture, and the school of horticulture,—and several special divisions. In the higher school of agriculture alone there are fifteen professors, with many teachers of special subjects. The lists of subjects taught even in this one division is far too long to give here, and including the special courses for shepherds, fruit growers, vine growers, bee keepers, etc., it reaches an almost incredible length. The farm consists of 780 acres; the forest of 4,800 acres. There are gardens, nurseries, orchards, green-houses, and hot-houses in abundance. Besides the ordinary farm buildings, there are a beet sugar factory, a vinegar factory, distilleries, a brewery, a malt house, a starch factory, a fruit drying and canning establishment, flax and silk-worm industry buildings, and wagon-makers' and other shops;—in fact, enough model factories to fit out a manufacturing town. The college has a library of 10,000 volumes, and fine laboratories, museums, and collections of models. Elementary agricultural education in this state is carried on by five agricultural academies, five winter schools for farmers, and 851 evening schools with 17,844 pupils. Baden, Bavaria. all the German states are, if not equally well, at any rate, well provided with agricultural schools and colleges. Of Holland and Belgium the same may be said. Denmark has at Copenhagen, the Royal Agricultural and Veterinary College, which, in some of its departments, is among the most celebrated in Europe. Denmark has also about 100 more elementary schools of agriculture with a short course.

The more populous countries do not despise the methods which the weaker states adopt. In Sweden, for example, we find two agricultural colleges and twenty-seven agricultural schools. The course of study in these schools is eminently practical. It embraces the principles of agriculture and horticulture; agricultural chemistry, botany, zoology, and geology; veterinary science, the care of domestic animals, and the improvement of breeds; drawing, surveying, and drainage; smith work and the construction of farm buildings, fences, and walls; meteorology; forestry. There are dairy departments connected with them, where young women learn to make butter and cheese. Instruction in these schools is free; but the students give their labour.—Austria has her Royal Agricultural College at Vienna, 69 schools of agriculture, all having farms attached, and 174 evening schools of agriculture. This subject is taught also in 2,128 of the public schools; arboriculture in 4,034; bee culture in 1,496;

and silk culture in 862.—In 1876 Prussia had 6 agricultural colleges, with 44 professors; 46 agricultural schools with 277 teachers; 29 schools of arboriculture and viniculture, with 71 teachers; and 6 schools of forestry, with 27 teachers. Altogether Germany and the German parts of Austria have 158 academies and schools of agriculture, with farms, gardens, etc. attached, for practical work.—France has primary schools with teachers trained in agriculture in the Normal schools. She has 24 farm schools, 6 practical schools of agriculture, 3 national agricultural schools, a national school of horticulture, an institute for higher agricultural education, 3 veterinary schools, a school of forestry, 3 secondary schools of forestry, 2 schools for shepherds, a practical school of irrigation and drainage, and a school of horse breeding. Spain, Italy, all the larger European States have their agricultural schools. But I dare not enumerate them. Those of your readers who would like more information on this subject should procure a copy of Prof. W. Johnston's pamphlet on Agricultural Education, published by C. Blackett Robinson, Toronto. They will find that wherever in Europe farming is done, there men are taught to farm in colleges and schools.

Zurich has no school of mines. In those states, however, in which mining is an important industry, education in this department is by no means neglected. Prussia has an Academy of Mines at Berlin, giving instruction in the working of mines and of salt works, metallurgy, the metallurgy of iron, mechanics, machines, the surveying of mines, drawing, mineralogy, geology, mathematics, chemical analysis, and assaying. The course extends over four years at least, of which one must be spent in practical mining. The academy is splendidly furnished with museums, laboratories, and libraries. Prussia has also the famous mining school of Clausthal.—Saxony has a thoroughly equipped school of mines at Frieberg, which aims at giving a complete education in mining and metallurgical science. Its staff consists of a director, 14 professors, a teacher of drawing, and two laboratory assistants. During the year classes are formed in about sixty different subjects. I need not give the list.—France has a School of Mines, a School for Miners, and two Schools for Foremen Miners. The School of Mines at Paris, trains mining engineers for the service of the State. It gives its students the highest training, and fits them to become Directors of Mines and of Metallurgical factories. It has a three years curriculum, the subjects of which I need not enumerate. The School for Miners at St. Etienne is of a lower grade. It trains directors of works, however, as well as mining overseers. The course is one of two years. The Schools for Foremen Miners at Alais and Douai, are intended for working miners. The pupils spend six months in the schools, and six in the mines. The course is one of two years, at the end of which time deserving students graduate as Foremen Miners.—Austria has three academies

of mines at Schemnitz, Leoben and Pibram. In 1864, the teaching staff in all three, numbered twenty-three professors, and there were 235 students.—Brunswick has a mining department in her Polytechnic school. Sweden has mining schools at Falun and Filipstad. Belgium has one at Hainault. Norway has one at Kongsberg. In short, in those countries in which minerals are a source of wealth, there we find facilities provided for educating young men in mining and metallurgy.

The United Kingdom is far behind the rest of Europe in respect to technical education. But for some years a conviction of its necessity has been forcing itself upon her, and in some departments progress has been made. Since 1851, the Department of Science and Art has been fostering the study of artistic and scientific subjects among the artisans. The number of art schools of all kinds has largely increased. There are now about 20,000 artisan pupils receiving instruction in Geometrical Drawing, nearly as many in Mathematics and Physics, and encouragingly large numbers in other subjects. For the training of normal school and high school teachers, the National Art Training School in London was founded, and to-day there is scarcely a National School Teacher in the United Kingdom who cannot draw and teach drawing.

Engineering Schools exist generally as departments of Universities or Colleges. There are about fifteen of them. Mining Schools are also generally departments of colleges. The Royal School of Mines, which is a department of the Normal School of Science, is the best equipped. It has Professorships of Chemistry, Physics, Biology, Geology and Physiography, Mechanics and Mathematics, Mining and Metallurgy, and possesses fine laboratories, museums and libraries.

The higher departments of chemical manufactures, and of a few others, are taught in several of the colleges; but there are few facilities for the education of the foremen and workmen of factories. England is being driven in this direction now, however. Colleges are starting up in various towns, which are offering instruction in pure science and technical applications in both day and evening classes; and the city and guilds of London have lately founded a college in the metropolis, which is intended to furnish training in applied science to managers of manufacturing establishments and technical instructors, while they are also establishing District Technical Colleges for the training of artisans.

Agricultural education is represented in Great Britain by two colleges, and by departments in the University of Edinburgh and in the Normal School of Science. The Science and Art Department, and the Agricultural Societies encourage the study of this subject in schools and private classes, by holding examinations and offering prizes, both to teachers and to meritorious students; and consequently agriculture is taught in about 25 of the public schools. Ireland,

however, has a complete system of agricultural schools. The National Schools use an agricultural text book, and 115 of them have special teachers of this subject, and small farms. There are moreover 16 Model Agricultural Schools with farms, and lastly, there is the Albert Institute as Glasnevin, designed to supply instruction in the science and practice of agriculture to the sons of farmers and to agricultural teachers.

How it is that England is so far behind, and why it is that she is waking up, we shall see farther on.

Europe is far away, and the state of technical education among European States may seem to be of little consequence to us. Whether of direct consequence or not, we may learn a great deal from a study of the means which these nations take to maintain prosperity in the face of the competition of their neighbours. What lessons we may draw from their uniform policy, we shall see farther on. Meantime, I shall come nearer home, and sketch the technical education of the United States, a country with which, in many departments of industry, we come into very direct competition.

Technical Education in the United States is of comparatively recent growth. In 1870 there were about 17 Colleges of Applied Science, with 144 instructors and 1,413 students. In 1879 there were 81 Colleges, with 884 instructors and 10,919 students. This rapid development has been due to a great extent to the action of Congress in 1862, in passing an Act called *The Land Scrip Act*, "donating land to the several States and Territories which may provide colleges for the benefit of Agriculture and the Mechanic Arts." The Act has resulted in the endowment of 47 Schools of Science, either having an independent existence or being departments of Universities, and affording instruction not only in purely scientific subjects, but also in one or more of the departments of Agriculture, Civil and Mechanical Engineering, Mining, Metallurgy, and Technical Chemistry. Besides these 47 schools, there are 34 other Colleges of Science, or scientific departments of Universities, deriving their revenues from various sources, and offering instruction in technical subjects. It is not necessary for me to describe all these various schools. Some are too poorly equipped to be worthy of description. For education in the United States is hampered as it is in Nova Scotia by the existence of many small colleges, which waste educational funds in vain repetitions. Many of these Schools of Science, however, are well equipped and thoroughly efficient. With few exceptions they have chemical and physical laboratories; many have museums of technology and natural history; about half have experimental farms and gardens, and ten have practical workshops.

The Massachusetts Institute of Technology has a faculty consisting of a President and 15 Professors, with 18 additional Professors, Lecturers, and Assistants. Its grounds, buildings, and apparatus. are valued at $300,000, and it has an income of about $53,000,

Instruction is given by lectures and by practical exercise in the fields the laboratories, and the drawing rooms. The Institute offers ten regular courses of which five are of a distinctly technical character. It has a School of Mechanical Arts, in which special prominence is given to manual instruction, and which is intended for those who are to enter upon industrial pursuits, rather than to become scientific engineers. The shop work is conducted upon the plan adopted at the Imperial Technical School of Moscow, Russia, and includes carpentry and joinery, wood turning, pattern making, foundry work, iron forging, vice work and machine tool work.

The Sheffield Scientific School of Yale College provides instruction in chemistry, civil engineering, dynamic engineering, natural history, biology, metallurgy, and mining. It has a teaching staff of 28. Its buildings are valued at $100,950.

The Illinois Industrial University provides for the youth of that State, courses of instruction in agriculture, horticulture, civil and mechanical engineering, mining, architecture, chemistry, natural history, and "domestic science." Ample material is provided for the illustration of the various branches. There is a stock farm of 410 acres, and one of 180 acres for agricultural experiments. Both are well furnished with apparatus. It has 27 instructors and 343 students, a library of over 12,000 volumes, and grounds, buildings, and apparatus valued at $470,000.

The Iowa State Agricultural College has three departments,—agriculture, engineering, and "general science for women." These subjects are taught by 24 instructors to 297 students. Its grounds, buildings, and apparatus are valued at $498,000, and its income is $41,000.

The University of Missouri has an Agricultural College and a School of Mines and Metallurgy, with a combined staff of 15. The former provides a four years' course in agriculture and allied subjects, and a course of two years in horticulture, to which women are admitted. The latter has three departments, civil and mining engineering, and metallurgy. In both schools there are about 200 students. The real property of these schools has the value of about $150,000.

One of the best Agricultural Colleges of the United States is that of Michigan at Lansing. It provides instruction in surveying, levelling, laying out of grounds, mechanics as applied to implements, building, stock breeding, agricultural chemistry, horticulture and such practical applications of science as are useful to the farmer. Each student is required to work three hours a day on the farm or in the garden. The labour is in part educational, and is varied for the illustration of the principles of science. The farm comprises 676 acres, of which 190 are in a systematic rotation of crops. Besides the barns, stock, and other material for illustrating agriculture, the college is supplied with chemical laboratories, a museum of mechanical

inventions, a general museum, a laboratory and a reading room. There is a staff of 12 instructors and the college has about 190 students.

Cornell University, Ithaca, New York, has in its technical departments 17 instructors. These departments are agriculture, architecture, civil and mechanical engineering, and chemistry and physics. It is thoroughly equipped with farms, workshops, laboratories, library and museums, and practical work in those departments in which it is possible, forms always a part of the regular course.

The School of Mines of Columbia College, New York, offers to students the means of acquiring a thorough knowledge of branches of science which have a direct bearing upon the resources of the country. It provides five separate courses: (1) civil engineering, (2) mining engineering, (3) metallurgy, (4) geology and palæontology, (5) analytical and applied chemistry. It has a staff of 27 instructors and its students number about 290.

The above are details of a few of the technical schools of the United States. I have chosen them, not because I know them to be the best, but because I have at hand the details which I have given. Many of the American Colleges are not so well equipped as those I have described. But according to the return of the Commissioner of Education, which gives for 1879, 884 instructors in 81 different institutions, we have an average teaching staff of about 11. This number includes of course teachers of pure science as well as technical applications; but even a staff of 11 scientific and technical instructors can do a large amount of excellent educational work.

It may be instructive, in the case of one State at least of the neighbouring Republic, to give a sketch of the whole educational system so far as it bears upon technical training. I select the State of Massachusetts. Its educational institutions embrace common schools, evening schools, high schools, technical Colleges, and Universities. The chief peculiarity of the schools from our point of view, is the great importance attached to drawing among the subjects taught. In 1870, an act was passed by the Legislature, providing for the teaching of drawing in the public schools. The chief difficulty in the execution of this law was found to be a lack of teachers; and in 1873 a Normal Art School was founded to train them. The consequence is, according to Prof. W. Smith, State Director of Art Education, that for some years, "all teachers, male and female, have been able to give the first instruction in Drawing in daily classes to all their scholars, and that Drawing is taught thoroughly through all the schools of this state." Of Technical Schools there is no lack. They are the Agricultural College, Amherst, the Institute of Technology at Boston, the Lawrence Scientific School and Bussey Institution of Harvard College, the Worcester County Free Institute of Industrial Science, and the Engineering

department of Tufts' College. The Agricultural College trains young men for the practical pursuits of life in Agriculture and Horticulture, in Civil Engineering, and in Chemistry. It has a staff of eight instructors. The Institute of Technology I have referred to above. The Worcester Institute teaches, besides modern languages, Drawing, Mechanical, and Civil Engineering, Physics, and Chemistry. It has a staff of eleven instructors. The Lawrence Scientific School has a staff of twenty-six instructors in the departments of Civil Engineering, Chemistry, Natural History and Mathematics, the first three of which are all more or less technical in character. The Bussey Institution, with a teaching staff of seven, trains students in Theory of Farming, Agricultural Chemistry, Applied Zoology, Horticulture, Botany, Entomology, and Chemical Analysis. Tufts' College offers a three years' course in Engineering, but what it amounts to I do not know.

While, therefore, Massachusetts is behind the European States in the educational preparation of the people for their daily work, it is certainly working on the same lines, and has made great progress in the same direction. Other States are perhaps on the whole not quite so far advanced, though several offer, in some department or other, better facilities than Massachusetts does. But all the States are perceiving more and more the immense utility of technical education, and are making both individual and concerted efforts to provide it. Between 1870 and 1879 the number of technical colleges, we have seen, increased nearly five-fold, the number of instructors, six-fold, and the number of pupils, about seven-fold. So satisfied are our neighbours of the immense value of the work which is being done by the schools of technology, founded by the Land Scrip Act, that they are going even farther. For the Education Bill, lately before the Senate, provides that moneys arising from the sales of all public lands within the borders of the United States, shall henceforth form an educational fund which is to be used in the first instance to endow all the Agricultural Colleges of the United States to the extent of $30,000 a year, and, when that has been accomplished, to support the Public Schools. The people of the United States are determined that they shall have skill sufficient to utilise their boundless stores of raw material.

I am forced to omit all reference to Brazil, which supplies means of education in agriculture; to Japan, which has lately founded a University, an Agricultural School, and a well equipped College for civil and mechanical engineering, chemistry, telegraphy, architecture, mining and metallurgy; to India, which has several Agricultural Colleges; and to the Australian Colonies, which have already some technological schools, and one of which, New South Wales, has taken the first step towards the establishment of more by publishing a large blue-book giving full information about the best English and foreign schools.

The facts which I have noted, however, must suffice, and I must pass on to give a short description of the educational means which the Provinces of Canada offer their people to assist them in the development of her natural resources. The common and high schools of Ontario are admittedly the best in the Dominion of Canada; and from our point of view it is important to note that subjects of great technical value, viz: industrial drawing, book-keeping, and other commercial subjects, mathematical, physical and natural science and agriculture are taught in the High Schools; and drawing and the elements of science in the Common Schools. Whether or not this instruction is efficient depends of course upon the training of the teachers. Ontario takes care that its teachers have means of thorough education in the subjects they are to teach. They are provided by the Normal School and by the University.

In Toronto, there is a School of Applied Science in connection with University College, providing teaching in day and evening classes in various pure Sciences, and in Civil, Mechanical, and Mining Engineering, Technical Chemistry, Assaying, and Metallurgy. University College has departments of Agriculture and Civil Engineering. The Military College, Kingston, trains Civil Engineers.

We find also scattered over the Province about 100 Mechanics' Institutes, many of them provided with Libraries, and having evening classes in such subjects as Mathematics, Book-keeping, Mechanics, Geometrical and Freehand Drawing, Phonography, and Modern Languages. The Government assists and encourages these Institutes by grants of money, given on the fulfilment of certain conditions. Grants are given to over 70 of them.

Ontario has also an Agricultural College. It is situated near Guelph, on a farm of 550 acres. The College building is large and commodious. It has a staff of eight—the President, Professors of Agriculture, Natural Science and Veterinary Science, a Mathematical Master, and Foremen in the Farming, Horticultural and Mechanical departments. It offers a course of two years in the following subjects: 1st year—Practical Agriculture, Veterinary Anatomy and Materia Medica, Physical Geography, Chemistry, Botany, Zoology, English and Mathematics; 2nd year—Agriculture and Horticulture; Veterinary Pathology, Surgery, and Practice; Agricultural Chemistry; Economic Botany; Entomology; Meteorology; Book-keeping; Levelling and Surveying; English Literature and Political Economy. Connected with the course of study is the course of apprenticeship, embracing practical work in the fields, barns, yards, stables, and shops. A great deal of attention is paid to actual farming and stock-breeding. There are herds of cattle and swine and flocks of sheep, of various breeds. The students devote about five hours a day to manual labour. The cost of main-

tenance is about $22,000 per annum, and the Legislature has expended for farm, buildings, and permanent improvements about $200,000. This College is deficient in many of the appliances for teaching, far behind many of the institutions we have described in equipment, and inferior to the most of them in the number of its teachers, but its progress is gratifying, and the excellence of its work is recognised not only by the farmers of Ontario, but also by the Agricultural educators of Europe.

Ontario, therefore, is training her boys in the schools in subjects which will make them good artisans. She is encouraging and helping her artisans to continue their education in their leisure time, and she is providing higher education in pure and applied science for men who can afford to prepare themselves for engineering, for manufacturing, for mining, and for farming.

The schools of the Province of Quebec are not in so satisfactory a state as those of Ontario. Hence the Council of Arts and Manufactures, wisely holding that a complete system of industrial education "would give a stimulating impetus to our manufactures by producing skilled workmen," has taken the first step towards the establishment of such a system by founding schools of Art and Design. Under its control are 12 of these schools, in which instruction is given in evening classes to artisans. They are situated in Montreal, Quebec, and other important towns. The number in attendance in 1879-80 was 1183. The subjects taught are Free-hand, Mechanical and Architectural Drawing and Modelling. In some cases lectures bearing on Industrial Education have also been given. The council, moreover, is urging the government to qualify teachers for imparting instruction in industrial drawing and to introduce that subject into the primary and higher schools.

In higher departments of technology, Quebec has the Faculty of Applied Science of McGill College, Montreal, with the four departments of Civil, Mechanical and Mining Engineering and Practical Chemistry. The work of these departments is conducted by Instructors, of whom three have technical subjects, viz: Assaying and Mining, Civil and Mechanical Engineering, and Geometrical Drawing.

In the department of Agriculture, Quebec has three Schools; at L'Assomption, St. Francis, and Ste. Anne La Pocatiere. They are small schools with four Instructors each, and 15, 16 and 19 pupils respectively. All three have farms attached, worked by the students. There is, moreover, in Montreal a Veterinary College, offering to French and English students instruction in veterinary science. It has five English and five French Lecturers on special subjects, and in purely scientific subjects the students attend the English classes of McGill College and the French classes of the Victoria College.

Quebec, therefore, behind Ontario in some respects, before her in others, is alive to the value of education, and offers her youth very considerable facilities for gaining thoroughly practical training.

Passing next to the Maritime Provinces we seem to have got beyond the bounds of civilization. For these Provinces are almost entirely "unspotted from the world" so far as technical education is concerned. They have known nothing of the great educational movements of the world; or knowing, they have despised them, having no confidence in schools as a means of giving practical training for the work of everyday life.

In New Brunswick, drawing is being introduced into the schools and teachers are trained in it in the Normal School. Scientific subjects are prescribed as subjects to be taught in the schools, but no efficient instruction is provided whereby teachers of the higher grades may be prepared to teach them. This Province has lately leased a stock farm, but whether or not it is to be used for educational purposes I do not know.

Prince Edward Island is, in one respect, ahead of New Brunswick. It does not profess to teach agriculture, but does provide a model farm. The farm is worked by young men, who give their time and labour in exchange for their board and the privilege of working under the experienced men whom the government have appointed managers. So far there are no lectures; but in time the model farm may develop into an agricultural school.

When we turn to Nova Scotia we find in the department of technology practically no facilities of education offered to our youth. In some of the country schools industrial drawing is taught. In the Normal School a teacher of this subject has lately been provided. But as the work of the Normal School is and ought to be chiefly devoted to the training of teachers of the lower classes, and as the universities are unable to provide such teaching, our higher class teachers, who are usually and ought to be university men, have had no chance of getting a proper training in this important department. Evening schools for the teaching of drawing and other subjects useful to artisans are unknown. Mechanics' Institutes do not exist. We have five so-called universities, of which perhaps four do more or less of real university work. But in all of these the work done is almost altogether in the departments of literature, philosophy and pure science, and only one offers anything like adequate training in pure science. King's College advertises a school of civil and mining engineering; but all the technical work of this school and the mathematical and scientific work of the arts faculty are done by two men, one of whom professes mathematics, natural philosophy and engineering; the other, chemistry, geology and mining. I assume that the governors have been able to secure the services of men fitted to

give thorough training in these various departments; but those who are acquainted with the amount of work which must be done in a thorough school of Engineering and Mining will know that the execution of this work must be impossible for two men, however varied their intellectual gifts. In the technical curriculum of King's College twenty-two different classes are advertised. Many of these would require at least three or four hours a week, some of them more, and it is evident that the time and energy of two men must be utterly inadequate to the task imposed upon them. The School of Civil and Mining Engineering of King's may be taken consequently as evidence of the belief on the part of the Governors that technical education is desirable; but it cannot be regarded as a means of supplying it in anything like an adequate manner. In agriculture Nova Scotia has neither School nor model farm. A text book on this subject is recommended for use in the Schools, but no provision is made for the training of teachers.

The public spirit of certain professional men in Halifax started, a few years ago, the Technological Institute. As it had no funds, however, to pay Lecturers, the staff had no permanent organisation, and no course could be offered in any department sufficient to attract students from a distance Such lectures as were provided (in Chemistry, Mathematics, Engineering, Drawing, &c.) were well attended by citizens of Halifax. Lack of funds has prevented the Institute from doing any work during the last two years.

Our Province, therefore, differs from all the nations of the civilized world, and from the Upper Provinces of the Dominion, in refusing to provide for our youth any adequate facilities for technical education. If material progress is advanced by knowledge, and if the requisite knowledge can be imparted in Schools and Colleges better than in the rough school of practical life, then we occupy an extremely hazardous position. We are trusting to our natural advantages, while our competitors are arming themselves with knowledge and school-acquired skill. It is well, therefore, to ask whether or not in the history of the world it has been found that the possession of Technical Schools is of avail in the struggle for material prosperity.

In a few pages, it is quite impossible to discuss with any fulness the question whether Technical Schools have been found by the world to be of avail as a determining factor of material prosperity. I say technical schools, for I suppose we all admit the necessity of a knowledge of the scientific foundations of industry and the industrial applications of science. The only question is whether this requisite knowledge can best be obtained in the technical school, or in the school of daily work. To settle this question an enormous number of facts might be cited. I must satisfy myself with very few; and the difficulty is to choose the most convincing.

I have quoted Russell's account of the founding of the Zurich Polytechnicum. Here is what he says of its effects: "This self-denial, generosity, and large wisdom have been fully rewarded by the issue. The youth of the country have flocked with avidity to Zurich, and the young men thus trained are, with equal avidity, taken out into the public works and manufacturing institutions of Switzerland, and whether it arises from this cause or some other, it is an astounding fact that the Swiss, remote from the sea—that highway of merchandise; remote from coal and iron—those staples of our manufacturing industry; the Swiss, in their far valleys, are rapidly growing a dexterous and successful manufacturing people. From us they have taken away our Coventry ribbon manufacture; from Lyons they have appropriated a large portion of their famous silk weaving; in watches and clocks they have long kept the rest of the world going; and their intelligent, educated, skilled men are prized all over Europe." So Russell wrote in 1869. To-day we hear of the Alps being tunnelled at Mt. Cenis, that the manufactures of Switzerland, and especially of Zurich, may find at Genoa a sufficient outlet to the sea.

I have referred above to Felkin's book on the Schools of Chemnitz. It is addressed to the people of Nottingham, and he tells them that the development of the hosiery trade in Chemnitz "has been most remarkable, and has taken place almost entirely within the last thirty years, and to such an extent that Chemnitz has proved itself a formidable and successful competitor to Nottingham." "The glove trade," he says, "may be said to have been transferred from Nottingham to Chemnitz, and is now in a more flourishing condition than it was ever known to be before. . . . The loss of the glove trade to Nottingham is a striking example of the way in which England is being robbed in detail of her industrial supremacy." Again: "The first lace machine has left Nottingham for Plauen, in Saxony. More are to follow. . . . Twenty years or more ago this very same experiment was tried with lace frames, and failed, as technical knowledge was insufficient amongst the workmen. Now it is sufficient, and the success is assured."

So direct are the effects of Technical Schools found to be that they have been employed to feed a hungry populace. In 1852 Baden, through changes in the course of trade, had been reduced almost to beggary. The Government employed two different means of amelioration—emigration and education. They lessened the population one-twentieth, and established in each village a School of Design and a small special trade school. Embroidery and lace making were taught to the girls; the cultivation of rye in the poor districts was utilised to create anew the manufacture of plaited straw for hats; painting on porcelain was introduced, and the watch making industry, which had existed many years before but had declined, was developed by the aid of a special school. By these

means prosperity was re-established. The change which they produced in the country may be judged from the following statistics:—

	In 1852.	In 1861.
Criminals punished	1,400	691
Police expenses	305,175 fl.	141,866 fl.
No. of arrests	190,000	67,000
No. of bankruptcies	1,347	240
Poor rate	1,108,751 fl.	552,868 fl.

The Prussian Government had a similar experience in the poor districts of Silesia. By means of schools they introduced the manufacture of Turkey carpets and lace; and these industries have become widespread and given rise to an extensive trade. In Belgium also education has been employed to grapple with poverty. In the poor districts of Western Flanders the organisation of sixty communal schools of weaving drove out beggary.

I may quote here also from among the many facts which Mr. Scott Russell cites to show the value of technical education, the following:—"It happened to me to be professionally occupied in a foreign country where the iron for a large engineering undertaking was about to be contracted for. Competitive tenders were obtained from some of the best works in England, and from Creusot." (Creusot is a town in France, which had had for some years a systematic organisation of Technical Schools.) "The prices were so near as to have little influence on the result, but they were slightly in favour of the English manufacturer. The contract was given to Creusot, and when I enquired, officially, the reason which had sent the contract to France, I was informed that they could more perfectly rely on the uniform excellence of the quality of the iron from Creusot than from England—a result to an English engineer sufficiently humiliating. I asked the value of this character in the opinion of the buyers, and was answered that they considered it equivalent to more than five per cent. in favour of France."

Such facts as these are not conclusive singly. But they may be quoted by the score, and their convincing power increases with their multitude. The short space at my disposal prevents my quoting more. I cannot refrain, however, from giving a short sketch of the history of the great International Exhibitions. From our point of view it is very instructive. The Exhibitions formed, as Russell says, "a series of competitive trials of intelligence and skill between the citizens of the different civilized nations of the world." The first was held in London in 1851, when England found herself behind other nations in the beauty and grace of design, especially in pottery and glass, and the French and German nations were struck by the continued supremacy of England in all the great objects of manufacturing and constructive skill. Both parties had recourse to education. England, under the Prince Consort, started schools of design, and began to train teachers for art workmen. The French

and Germans saw the hopelessness of their competing with England in mere raw material and mechanical power, and they concluded that their only hope was in the attainment of greater skill in the use of what they had. They therefore established schools in every metropolis, large town, or centre of industry, for educating professional men and masters, foremen, skilled workmen, and even apprentices. The Exhibition of Paris, in 1855, showed the fruit of this education. The art schools of England had even in four years produced an evident effect. She was no longer outstripped in pottery and glass. As for the French and Germans, they had already advanced far into the English provinces of iron, steel, and metal manufacture. But they were still behind, and England made the mistake of despising her rivals and not extending to iron the lesson she had learned in pottery. The third trial was the London Exhibition of 1862, in which England found proofs that every nation had begun to rival her in some one at least of her specialties. However, no conviction dawned upon her of the necessity of any great national exertion to advance the manufacturing skill of the people.

"It was the Exhibition of 1867 in Paris," says one of the Jurors, "which gave the nations, and especially England, a final lesson. England then learnt not that she was equalled, but that she was beaten—not on some points, but by some nation or other on nearly all those points on which she had prided herself." This Exhibition "startled the thinking Englishman and ended by convincing him that England had been asleep, and that a whole generation of wakeful skilled workmen had been trained in other countries between 1851 and 1867." "The announcement of the verdict" of this exhibition, says President White, of Purdue University, Indiana, "produced consternation among the representatives of British industry. They met at the Hotel du Louvre and the one absorbing inquiry was: 'Why this defeat?' * * * The disaster arrested public attention and a searching and thorough investigation for its cause was made by a Parliamentary commission The report made to Parliament in 1868 contains the testimony and the conclusion. *Education had won the palm of exeellence for her competitors.* The discovered cause indicated the remedy and the report to Parliament was soon followed by the great Education Bill, which established a general system of elementary education throughout Great Britain. Technical schools have been multiplied since and science has claimed a large place in the higher schools and universities. Great Britain has appealed to the schoolmaster to win back her pre-eminence in industry.' To shew the position which the United States has taken in these Exhibitions, I may quote from a report made to the Japanese Government by Principal Dyer of the Imperial College of Engineering, Tokio. "I will only notice for a moment the latest of the international exhibitions—that of Philadelphia. I do not intend to

compare the quality or quantity of manufactured articles exhibited by America with those of England, but merely to observe that taking the former by themselves the progress made within the last few years is wonderful. I have not the slightest hesitation in saying that a great part of the progress is due to the excellent elementary education to be obtained everywhere in America, to the technical schools which have been recently started, to the system of patent laws which encourages ingenuity by securing to the inventor the fruits of his labor, and last, though not by any means least, to the number of American students who frequent European technical schools."

These facts refer more especially to the effect of technical schools on manufactures and mechanical arts. The beneficial results of education are evident also in other departments. In Engineering, for example, Russell, himself an engineer of the first rank, says: "It is notorious that those foreign railways which have been made by themselves in the educated countries of Germany and Switzerland have been made far cheaper than those constructed by us in England; it is known that they have been made by pupils of the industrial schools and technical colleges of these countries, and I know many of their distinguished men who take pride in saying that they owe their positions entirely to their technical schools. I find everywhere throughout their work marks of that method, order, symmetry, and absence of waste which arise from plans well thought out, the judicious application of principles, conscientious parsimony, and a high feeling of professional responsibility. In the accurate cutting of their slopes and embankments, in the careful design and thoughtful execution of their beautiful but economical stonemasonry, in the self-denying economy of their large span bridges, the experienced traveller can read as he travels the work of a superiorly educated class of men. * * * The one thing in which our railways excel theirs is in high speed. Theirs, on the other hand, are economical in capital and high in revenue."

The evidence of the utility of agricultural schools is contained in blue-books and other reports, shewing the increase in the wealth yielded by the soil, which has been consequent, at any rate in time, upon the provision of education for farmers. I have not the necessary statistics at hand for quotation. I may refer, however, to the case of Prince Edward Island. It is well known, not only that this Province has lately carried off the first prizes at our Exhibitions for horses, cattle and sheep, but also, what is of far more importance, that its exports of sheep and cattle have enormously increased since the starting of the Provincial model farm. Of course such increase may not be altogether the effect of the education which the Province has begun to supply. But there can be little doubt that the Island has been ready to meet the increased foreign demand for cattle largely because of the fact that

her modest model farm has already scattered over the country knowledge of the best breeds of cattle and of the best modes of breeding them.

Such facts as those which I have either given or referred to above have convinced the world that Technical Schools are an effectual means of building up industries, and of fitting the nation which possesses them for advantageous competition with others. And experience has always shown this conviction to be well founded. For the nations which have established Technical Schools and tried them are extending them and making them more and more efficient. They find that high position in the scale of national strength is determined nowadays not only by military and naval power, but by educational equipment as well; and consequently nations vie with one another in the efficiency not only of fleets and army corps, but also of schools and colleges. Hence the nations of the Continent of Europe, though, as we have seen, already well supplied, have watchful commissions which enquire into the projects of foreigners, and are continually suggesting improvements and extensions. Great Britain, convinced that she must arm herself with modern means of gaining technical knowledge and skill, is calling to her aid the Schoolmaster and the College Professor. The United States, notwithstanding their vast stores of raw materials of all kinds, recognise the necessity of training, and are making great progress in supplying it. The Upper Provinces of Canada have caught the spirit of the time, and have made considerable advance. Even the neighbouring Maritime Provinces have begun to move. And the verdict of all nations is that without Technical Schools no nation can maintain an advantageous position in the face of modern competition.

Nova Scotia alone, among all the countries on the surface of the globe, slumbers and sleeps. Yet it can hardly be maintained that our people need education less than others. If any one entertains that notion he should travel. Let him visit the ordinary Nova Scotia farm, and he will find it badly and wastefully worked, yielding only a fraction of the profit which the experience of educated farmers shows to be possible. Let him visit Nova Scotian mines, and he will find everywhere traces of needlessly wasted labour, wasted material, and defective work. Let him visit our factories, and he will find them run by imported skill. Managers, foremen, even skilled workmen, are usually either foreigners or have been educated abroad. The hewers of wood and drawers of water are home-educated Nova Scotians. These statements I do not make of my own experience alone. I have heard them made by so many knowing people that I cannot doubt their substantial accuracy. If they are, even only in a general way, correct, then something is wanting; and that something, in the judgment of the world, is technical education in schools.

There are those I know among us, so far behind are we even in our elementary generalisations, who hold that we have already too much schooling in Nova Scotia, and that the consequence of it is the prevalence of discontent and of a desire on the part of our young men to abandon the honourable employment of their fathers on the farm or in the workshop. There is some foundation for this opinion. Our boys who have gone through the High School, and our young men who have gone through College, are usually unwilling to do manual work and eager to live by their brains alone even in the most humble and unambitious manner. Young men who might make good farmers or artisans crowd into the professions, become teachers, start in business, become clerks in mercantile houses, or worry members of Parliament for appointments in public offices. Some of us wonder at this, and conclude that education does not improve Nova Scotian character! To me it seems that, with our present education, nothing else is to be expected. So long as we restrict our ambitious young men who seek an education to a kind of education which fits only for a narrow range of work, it must result that those forms of work are overcrowded, and that others are left to the unambitious or stupid, who seek no higher level of intellectual development than the Common School affords. And consequently this rush into clerkships, public offices, and professions cannot be taken as an indication that we are educating too much, but is rather to be interpreted as an indication that we are educating in too uniform a mould.

We may assume, then, that there is nothing in the intellectual or moral character of the Nova Scotian to prevent his being made a more successful worker by education, if only he is furnished with education of the proper kind. We may also assume that the kind of education he requires is that which all the rest of the world finds requisite, and that his chance of prosperity would be very greatly increased by technical training. It only remains to ask what forms of technical training we require, and how we can get them.

What amount and what forms of Technical Education Nova Scotia ought to provide for her sons in order to put them on a level with their competitors, depends upon what education can do for her more important industries. These are farming, lumbering, fishing, mining, commerce, civil and mechanical engineering, manufactures, and various mechanical arts, including house and shipbuilding.

The education of all who are to be engaged in these pursuits begins in the common schools. They cannot therefore be made means of special training. The interests of general education and of practical utility, however, may both be served by the teaching of such subjects as geometry, industrial drawing, physical and natural science. That these subjects may be taught in our common schools, it is necessary to teach the teachers; and the one thing which Nova Scotia has done for technical education is the provision

of Normal School training for common school teachers in these subjects. In special districts, however, our common schools might perhaps advantageously teach special subjects. In farming districts, for example, the elements of agriculture. I say, perhaps. For while in some countries this is done, in one at least, viz., Prussia, the experiment has been tried and has failed. We might try the experiment for ourselves. For the amount that could be taught would be small, and the Normal School lecturer on Science could readily give the teachers a sufficient training in the application of science to agriculture.

For the benefit of boys unable to continue their education beyond the common school, it would in many cases be advisable to form evening schools, especially for teaching geometry, arithmetic, physical and natural science, and drawing, as well as the elements of agriculture, etc.; not necessarily all in any one school, but as many as there might be demand for. Teachers might be encouraged to form such schools by special legislative grants. The training of the Normal School would be a sufficient preparation for them.

In the more populous districts, where manufactures are generally carried on, these evening schools might be developed into Mechanics' Institutes, providing scientific libraries, reading rooms, educational classes, and courses of lectures. They might be encouraged by grants of money from the public Exchequer, as they are in Ontario. If such grants led to the establishment of working Institutes, the Province would get back more than its money's worth.

For special trade-schools our manufactures are not yet ready. Our factories of any one kind are too few and too scattered, and such schools can exist only when some one form of manufacture is largely developed. Even then it is held by many educators to be more advantageous to provide apprentices with facilities for acquiring a knowledge of the scientific principles which underlie their trades, and to leave the workshop to develop manual skill, than to take the education of apprentices entirely out of the hands of the employer.

Our High Schools should of course teach mathematical, physical and natural science and drawing among their general subjects. As those of their pupils who are to receive no higher education are chiefly to be engaged in farming, commerce, and navigation, the special technical subjects should be agriculture, navigation, and book-keeping and other commercial subjects. These subjects are already included in the courses of some of our High Schools. But no provision is made for the training of High School teachers in them. Such teachers ought to have a much more profound knowledge of science and drawing than common school teachers. If our Normal School is to train them, it must undertake university work in addition to the school work, which it must do to educate common school teachers. These forms of work are however better kept

separate, as for instance we have seen them to be at Zurich, and in Ontario. Hence our High School teachers should be university men, and the University or Universities, if we are to have more than one, in which teachers of high rank are trained, ought to have the means of giving thorough training in the subjects we have mentioned.

Among the employments which I have enumerated above, there are several which demand for those who are to follow them with the greatest success, in some cases to follow them at all, a higher education than the High School can afford. These are farming and lumbering, mining, civil and mechanical engineering, manufactures, and some forms of mechanic arts, as house and ship building. For the education of the men who are to be engaged in the higher departments of these industries or professions we ought to have a technical college with schools of agriculture and forestry, mining and metallurgy, civil and mechanical engineering, architecture, naval architecture, and manufactures.

The educational equipment such schools would require depends upon the number of subjects which should be taught in them. Let us take first the school of agriculture and forestry. Farmers should understand the nature of soils and manures, the structure and food of certain plants and animals, the breeding and the treatment of the ordinary diseases of those animals, the laying out, draining, and irrigating of farms, the construction of gates, fences, frame buildings, ploughs, wagons, even nowadays steam engines and machinery, and, as our farmers are fruit growers and lumberers as well, the growing of forest and fruit trees. We therefore require instruction in chemistry, agriculture and forestry, biology, veterinary science, portions of civil and mechanical engineering, and drawing; and to understand these subjects a student must have had a sufficient training in mathematics and physics. Hence our first school requires instruction in eight subjects. Science, however, cannot be learned from books or teachers alone, but by actual experience as well. Hence our agricultural school must be provided with a farm on which the students can work; and this farm should be worked actually by the students, a given amount of manual labour being required as part of the curriculum of the school.

A miner should know how to distinguish minerals, how to determine where they are, how to get at them, how to plan, survey, ventilate and work his mine, how to separate and reduce ores and perhaps how to refine metals. Hence our school of mining and metallurgy should provide instruction in mineralogy, geology, mining, engineering, drawing, assaying and metallurgy.

The courses of study, through which civil and mechanical engineers, architects, and ship-builders should be led, have many subjects in common. They should include the pure sciences of mathematics, physics, chemistry and geology, all the branches of

the applied sciences of civil and mechanical engineering, architecture and naval architecture, and the art of drawing.

The knowledge required by manufacturers is of so varied a character, depending as it of course does upon the kind of manufactures in which they are engaged, that it is difficult to name any series of subjects which they should study, or to devise any curriculum through which they should be led. It is of great importance, however, that they should have the means of acquiring a knowledge of raw materials, of the sources of motive power, of mills and machinery, of mechanical manufacturing methods, of the application of chemistry to manufactures, as in tanning, dyeing, etc., of the application of physics to manufactures, as in electro-plating, etc., and of drawing and designing. That being so, our school of manufactures should provide instruction in chemistry, physics, departments of mechanical engineering, chemical, physical and mechanical technology and drawing; and the study of some of these subjects would be impossible without mathematics.

As the same subjects are in many cases common to different departments of technology, there can be no doubt as to the propriety of making the above schools departments of one Technical College. If that were done, one Professor of any given subject would be sufficient, and the subjects in which instruction would be necessary for all the above schools would be the following:—Mathematics, Physics and Physical Technology, Chemistry and Chemical Technology, Metallurgy and Assaying, Biology, Agriculture, and Forestry, Veterinary Science, Civil and Mechanical Engineering and Mechanical Technology, Architecture and Naval Architecture, Drawing, Geology and Mineralogy, and Mining Engineering. I have grouped the subjects in the above list so as to indicate the number of Professors that would be required if the schools were in full working order. At starting, the groups of subjects might be made larger and less numerous, for classes would not probably be required in all for some time. They must not, however, be made so large as to render the schools inefficient In the above list are eleven groups. We might start in all the schools I have mentioned with ten or nine Professors. If we should start with a smaller number of schools, we would of course require a smaller number of Professors.

The Professorships which I have just enumerated include all those which we have found to be necessary for the training of our High School teachers. Hence, with our present staff in the Normal School, and with these Professors in one University, we would be able both to introduce the necessary technical subjects into our Common and High Schools and to establish all the higher training in technology which the Province at present needs.

It would be possible of course, at the outset, to restrict ourselves to the provision of an elementary education in the higher depart-

ments of technology. That would perhaps meet the wants of the majority of the students whom we would attract. Farmers' sons would perhaps for the most part be able to spend but a short time at the College. Miners might wish to be educated for subordinate positions only. Manufacturers might wish but a few courses of lectures. If we did restrict ourselves to the elements, we could reduce the number of Professors. For each would be able to take a larger number of subjects. I have no means of knowing what class of students such a College would draw. But even if the large majority were men wishing only a partial training, there would nevertheless undoubtedly be some demand for complete training. For we now import civil, mechanical, and mining engineers, architects and manufacturers; and our young men are to be found at Guelph and at various engineering schools. Even if the demand were at first small, it would be well for many reasons to supply it First —The services of home educated men can be secured usually at less expense than those of imported men, while their knowledge of the country and its customs will in general make them better business managers. The supply of such men would therefore give a considerable impetus to the development of our resources. Secondly—The restriction of our College to elementary work would not reduce to any very great extent the necessary staff. In a technical college especially, the teaching of even elements must be up to date, exact and thorough; and the power to teach elements well requires a knowledge of the deeper parts of a subject. Hence it would be a mistake to give a Professor a large number of subjects. We would risk the efficiency of even his elementary teaching. Thirdly—If our Professors had a large number of subjects to lecture on their whole time would be taken up with preparation, and the Province would lose one great advantage of possessing a staff of technical teachers, viz., their original work. Our Professor of Agriculture might be expected, for example, not only to teach his subject, but to study the application of its principles to Nova Scotian conditions as well. It would be his duty to conduct experiments on agricultural problems, and thus to advance the science in a way that would be directly beneficial to our farming. A vast amount of work of this kind has been done by Agricultural Professors in Europe and America. They are very often supplied by their Colleges or by Government with special farms for conducting experiments. In 1857 there were in Europe 11 such experimental stations. In 1877 there were 80. In the United States there are experimental stations in connection with almost all the Agricultural Colleges—and Connecticut and North Carolina have State Stations. Ontario has one at Guelph. Much of the knowledge which is thus gained is of general value; a great deal is only of local importance, but in the locality of the greatest importance. Such work as this might be expected not only from the Professor of Agriculture, but from others

as well ; but it would be rendered impossible if we imposed a great variety of subjects upon them. I think I may conclude, then, that our technical school should aim at giving not only partial training to men who are to be in subordinate positions, but complete training as well to men who are to occupy the highest positions. The Technical College, therefore, which Nova Scotia ought to have, should be provided with nine or ten Professorships.

Before endeavouring to make an estimate of the probable cost of such a college I would like to indicate the relative importance of the various departments, in order that we may know which can, with least loss to the community, be omitted, should the cost of the whole prove too great for our present resources. To me it seems most important of all that we should have science and drawing well taught in our High Schools, and that because an elementary knowledge of these subjects is, from the points of view of both culture and ability, of great importance to all our boys, whatever the employment in which they are to be engaged, and because it lays a foundation on which the energetic ones among them can build for themselves. Many men would study the application of science to their daily work, if only they had made the start at school. The first steps are the most difficult. For this purpose the University instruction provided by the Province should be sufficient to give a thorough education in the necessary subjects to our High School teachers. The necessary subjects will require the services of four or five Professors.

Of all the departments of higher training enumerated above, that of agriculture is probably the one from the lack of which we suffer and are likely to suffer most. Whatever may be the truth as to the exodus from Nova Scotia to the United States, there can be no doubt as to the exodus from our Province to the North West. The North West is drawing away our population because of the attraction of its rich virgin soil. Our Province is old. The virgin freshness of our soil has passed away. Agriculture in Nova Scotia can be made remunerative only by those who know how, by the trained. Agriculture in Manitoba is possible for the novice. The inference is plain. It must tend to keep our farmers at home if we teach them how to make farming remunerative here. A good agricultural school will go far towards stopping the exodus. But a good school will do more than that. There is a class of immigrants who would prefer settling in an old country like Nova Scotia, to becoming pioneers of civilization on the prairie, experienced farmers, who have some little capital, but not sufficient to keep their farms in Great Britain. If they could get farms at low prices in Nova Scotia, and if they saw that we were making strenuous efforts to develop our agriculture, and would provide their sons with education which would make them successful farmers, they might be drawn hither. If so, the very exodus, by carrying away the most

unsuccesful, probably the most ignorant of our farmers, and lowering the price of farms, would be a blessing. We must remember, however, that the other Provinces are bidding for these men too, and offer them great inducements. If we want them we must increase our attractions, and the best way to do that is to rise at once to the level of the other Provinces in educational facilities by establishing an agricultural school and an experiment station.

There is another reason why we should just at this time take this course. The growing demand for cattle in Europe has given an impetus to this export from Canada. In Nova Scotia we have peculiar advantages for carrying on that trade. There is only perhaps one point in which our farmers are at a disadvantage with those of the other Provinces, and that is Education. Ontario has its large Agricultural School. Quebec has a Veterinary College, and agricultural schools. Even P. E. Island has its model farm. But our farmers have no means of getting any training in the breeding of cattle. If we don't take care, the consequence will be that all the advantages of our geographical position will be neutralized by the advantages our competitors have in being trained breeders.

Still another reason is to be found in the excellent natural facilities offered by this Province for dairy work. For the manufacture of butter and cheese it is not too much to say that we have facilities unequalled in America. Our dyke lands and intervales, with our great rainfall, provide admirable grazing and abundant feed for milch cattle. Our proximity to Europe assures us of an unfailing market. England alone yearly spends upwards of £12,000,000 stg. in buying butter. Yet lack of training effectually prevents our farmers from competing for a share of this sum with Denmark, Holland and the United States. The establishment of a proper agricultural school, with model dairy, would enable our farmers to make our export of dairy produce equal in value to that of any one of our present exports.

For all these reasons it is especially desirable that we should secure at once educational facilities for our farmers. It won't do to trust to their going abroad, to Ontario or to the States. They will go only in small numbers, and we want them educated in large numbers. The only way to get the thing done is to establish a school at once. And hence I hold that next in importance to the introduction of thorough science teaching into our Schools, is the founding of an Agricultural College.

Next in possible, if not in actual, importance among our industries is mining. But though our mineral resources are rich, they have so far not done what they might to enrich the Province. And one reason is that we are unable to develop them ourselves. Too many of our mines are owned and worked by non-resident foreigners. Such mines have to all intents and purposes been added to the resources of other countries. Nova Scotia is but little the better of

their possession, though they might have been sources of great wealth, had we undertaken to work them ourselves. Our capitalists hang back because mining has not been found so profitable in their experience as other less natural industries. Without doubt that is to a great extent due to the fact that mining here is carried on at a great educational disadvantage. The necessary skilled labour has to be imported, and that costs. A large salary for a thoroughly trained mining engineer is a large item in the expenses of a small mining company. The tendency therefore has been to carry on operations without paying it, and to do as well as possible without the trained engineer. As a consequence the workings taken in hand have been carried on with great waste, and much labour has been expended where there was absolutely no prospect of return. Were we training some of our young men to be mining engineers, their services could be obtained at comparatively low rates; capitalists could readily obtain advice, which would prevent them from engaging in fruitless undertakings, and would direct them to the places where their capital could with greatest prospect of profit be invested; while operations once undertaken, would under competent guidance, be carried on with greater economy than is possible at present. An efficient mining school would therefore, in all probability, give a great impetus to the development of our mineral resources.

In the case of shipbuilding, also, one of our chief natural industries, there are special reasons why we should establish training schools at once. Our ships must come into competition with those of all other nations. They are articles of which there can be almost no home consumption. Whatever the effect of our protective tariff on other manufactures, we would seem to be basing on experience if we expect it to exert no beneficial influence on this industry. Lest, then, shipbuilding should have in Nova Scotia the fate it has met with in other protected countries, we should counteract the relative increase in cost of construction, which the tariff tends to produce, by an improvement in the quality of the article produced. The only certain means of accomplishing that end is the education of our shipbuilders. We must begin to turn out trained naval architects, and for that purpose we should have in our technical school a department of naval architecture.

To sum up, then, we stand in greatest need of thorough university training for our High School teachers and of an Agricultural School. Our next most clamant want is a Mining School, and the order of necessity in which the other departments stand is probably Naval Architecture, Mechanical Engineering, Civil Engineering, House Building and Manufactures.

For the thorough training of teachers a staff of four or five Science Professors is necessary. Two more would give us an Agricultural School. Two more would enable us to have an efficient department of Mining; and the subjects of the other

departments are so similar that one or two more Professors would give us a fair equipment in them also.

We are now able to make some estimate of the expenditure necessary for the establishment of such a college as that sketched above, and to discuss the best mode of establishing it.

Let us suppose first that the technical college is started independently of all existing colleges. In that case a building would have to be provided, with laboratories and apparatus, a farm, and instructors. The average salary for instructors may be taken at $1500. Some would have to be higher to attract sufficiently good men. Others might be smaller, in cases in which the services of men engaged in professional work could be secured. The farm would yield an income; but, as its educational work would necessitate a larger staff than an ordinary farm, and as experimental work is not remunerative, we may put its expenses at $2,000. The initial outlay of capital may be estimated as follows:

Building	$40,000
Laboratory equipment and apparatus	5,000
Farm and farm buildings	15,000
	$60,000

We may therefore estimate the annual expenses of such a college as follows:

Professors' salaries	$15,000
Farm expenses	2,000
Incidental college expenses	1,000
Interest on capital at 5 per cent	3,000
	$21,000

In the present financial state of the Province, so great an expenditure is probably impossible. Should we restrict the college to the most important departments—Education, Agriculture, and Mining, the cost would be reduced by about $3000 a year. But the balance is still too great. Even if we sacrificed the Mining Department and saved thereby other $3000, the necessary expenditure would still be greater than the Legislature would probably vote. Should the college be devoted wholly to our most important industry, Agriculture, its expenses might be reduced by about one-half. The expenditure of the Guelph College in 1881, exclusive of the sums paid to students for their labour and the additions made to capital account, was as follows:

Salaries of staff	$ 8,750
College expenses	2,700
Farm expenses	4,500
	$15,950

To meet this expenditure, the farm was expected to bring in $4,500; and fees, $1,000. The balance, which had to be met by Government grant, was therefore $10,450. This sum does not include interest on the outlay on buildings, etc., which has amounted now to $200,000. If, by starting very modestly, we managed to make our annual expenditure, say, $2,000 less than that of Guelph, an Agricultural School might be brought within the bounds of possibility. We may conclude, then, that if the Technical College should be founded independently of existing colleges it could have but one department, and that only moderately equipped.

It would be possible, however, to utilise the Science Professorships existing in some one of our colleges, by establishing these schools in connection with it. This course could with greatest advantage be pursued in connection with Dalhousie College. Its governors are appointed by Government; it has three endowed scientific chairs—a greater number than any of the other colleges; and being in the metropolis, its students enjoy the tuition which the Provincial Geologist voluntarily offers to the public. If, then, the Technical College were founded in connection with Dalhousie College, provision would require to be made for only 6 or 7 Professors. A comparatively small expenditure on the building would make it sufficiently large, and its apparatus, library and laboratories, and the Provincial library and museum would be available. The original expenditure would therefore be reduced to the following :—

Enlargement of building, (say)	$10,000
Apparatus	2,000
Farm and farm buildings	15,000
	$27,000

The annual expenses would therefore be :—

Professors' salaries	$10,500
Farm expenses	2,000
Incidental college expenses	500
Interest on capital at 5 p. c	1,350
	$14,350

—an amount which is still probably too great for the public funds to supply. Restriction of the technical work to agriculture and mining would restrict this amount by about $3,000. The balance, $11,350, may be regarded as within the bounds of possible expenditure; so that, by utilising the scientific chairs of Dalhousie College, it would be possible for the Province to establish efficient Schools of Agriculture and Mining, and to provide facilities for the thorough education of High School teachers in subjects bearing on technology.

If so much would be gained by utilising the scientific chairs of Dalhousie College, there would be much greater advantage in utilising the same chairs in all our colleges. At present we have

three scientific chairs in Halifax, two at Windsor, two at Wolfville, and two at Sackville, all I believe endowed. The occupants of these chairs can do nothing towards the formation of an efficient Technical School, because of the impossibility of co-operation and division of labour. Put them all in one place, that they may divide up the work between them, and a great deal may be done. Let us suppose these four colleges to adopt the policy of consolidation; and King's, Acadia, and Mt. Allison to contribute to the central college four chairs. Our Technical College would in that case require only three others. As, however, the endowments of the chairs in the denominational colleges yield, I believe, only about $1,000 a year, it might be necessary to bring their salaries up to the average. The initial outlay of capital would be the same as if the technical schools were founded in connection with Dalhousie; unless indeed the lands which the Province granted in the past to King's College should furnish a farm, in which case it could be less. The annual expenditure for our Technical College would then be as follows:—

Three professors' salaries	$4,500
Partial payment of four professors' salaries	2,000
Farm expenses	2,000
Incidental college expenses	500
Interest	1,350
	$10,350

Thus, if the colleges should adopt the policy of consolidation, and if the Technical College should be established in connection with the united college, all the departments of technical education which we have found to be necessary in the present state of the Province, could be equipped in sufficient strength for less than half the annual expenditure which would be necessary, if the Government founded an independent School of Technology. $10,350 a year is a sum which I think I may assume the Province able to pay for so important an object. It is $4,850 less than was paid for the Higher Education between 1876 and 1881, and only $1,950 more than the House of Assembly agreed last session to distribute annually among the colleges. $8,400 would have been a large amount to pay for the small educational benefit which that sum would have produced when distributed among six colleges; but $10,350 would be a small amount to pay for the immense benefit which a Technical College would confer upon the Province. Although, therefore, the Legislature was unwilling to vote the former, they might readily be expected to vote the latter. Consequently the question, "Are we to have all these Technical Schools?"—depends upon a prior question, "Are we to have Consolidation?"

Consolidation would render possible not only the immediate foundation of these schools, but also their future development into higher stages of efficiency. Even if the Legislature could found a

School of Technology, the strengthening of the departments it might start with, and the addition of new departments which the growth of the country might render necessary, would be matters of very great difficulty, if the Province at the same time had to keep six Arts Colleges up to the times. The progress of our people in appreciation of sound and thorough education may be hoped to be such as to render it necessary in a short time for all our Arts Colleges to make great additions to their equipment. To equip one college in such a manner as to place our educational facilities on a level with those of Ontario, Quebec, and the United States, would necessitate a large expenditure. When the Province has done that six times over, little available capital will be left to develop our Technical School. If, however, we should undertake the possible task of maintaining only one college, we could well afford at the same time to make to the strength of our technical schools such additions as the growth of the Province would render advisable.

We have seen that consolidation of our colleges would render possible the immediate establishment of a complete school of technology, if King's, Acadia, and Mount Allison between them could hand over to the united college an endowment to the extent of $4,000 a year. It may be, as some say, that in the event of consolidation they would require all their funds for founding theological colleges and building Halls of Residence in the University town. If that be so, it would at least be possible for the Legislature to found at once, by utilising the endowments of Dalhousie College, schools of agriculture and mining; and consolidation, which in that case would refer to endowments which are to be raised rather than to those which exist, would by concentrating the interest of the whole community on the united college, very soon enable us to add the schools which at present we would have to omit.

The moral is plain. We ought certainly to consolidate our Universities, unless it can be shewn that consolidation would bring with it evils so great as to outweigh the benefits which I have indicated. But that cannot be shewn. On the contrary it has been clearly demonstrated that the efficiency of our higher education in all its departments, whether literary, philosophical, scientific, or theological, would be greatly increased by consolidation, and that the religious training which some of our colleges endeavour to secure, by providing their students with Halls of Residence, subjecting them to collegiate discipline, and bringing them into daily contact with men of acknowledged piety, could be secured as truly and in as large measure in connection with a large university as in connection with a small one. In view of these conclusions, which, I think, may be considered firmly established, the opponents of consolidation take upon themselves a serious responsibility. They follow a course which the world's experience shows is likely to be disastrous for the Province, for the sake of maintaining a number of colleges for

which the most they seem to be able to say is that they exist, that they have done good work, and that their supporters are attached to them. This attachment we all both understand and share. It has been born of sacrifices made in the cause of education and religious equality. But since in the matter of our educational policy, reason and sentiment point in opposite directions, it behoves us to consider carefully, whether we are to allow ourselves to be carried away by feeling on a course which leads to stagnation, or guided by intelligence towards progress and prosperity.

But the mental inertia of conservative instinct is hard to overcome, sectarian prejudice is strong, and the wrongs which denomination has done to denomination in our past history are not yet altogether forgotten. Time may therefore be necessary to convince the people of the Province both that better educational means than we now possess are a necessary condition of progress either in culture or in wealth, and that our churches may, and must, beat their spears into pruning-hooks and unite their educational forces with those of the State, in order to obtain them. That time may not be long. While, however, public opinion on this matter is gradually being matured we dare not remain inactive. The Upper Provinces, already far ahead of us, are advancing rapidly. Even the other Maritime Provinces have made a start. If we stand still, we shall soon find ourselves hopelessly behind. If, then, we cannot have University Consolidation now, we ought at any rate to take the next best course, and make temporary provision for the more important technical departments by utilising the scientific chairs in the Provincial colleges. We have seen that such provision would not involve any too heavy drain upon the Provincial exchequer.

It may seem insulting to the intelligence of Nova Scotia to assume the possibility of opposition to so reasonable a scheme. But there can be little doubt that even this proposal would not meet with universal favor. It may be hoped that the opposition would be weak. But should it be sufficiently strong to close even this door of hope, the Legislature can at least make provision for the establishment of a modest agricultural school, either independently of all other educational institutions or in connection with the Normal School.

And we might hope that the founding of such a school would be but the first step in a course of development which before a very long time would provide for the young men of Nova Scotia, what the young men of other countries now enjoy, viz., the means of obtaining thorough education in those departments of knowledge, which would enable them to utilise the natural resources of their native land.