

Technical Education.

ADDRESS DELIVERED BY PROFESSOR GALBRAITH, AT THE OPENING OF THE ENGINEERING LABORATORY OF THE SCHOOL OF PRACTICAL SCIENCE, TORONTO.

Mr. Chairman, Ladies and Gentlemen:

The subject of the paper which I propose to read this evening is "Technical Education."

In selecting this subject I was influenced not only by its appropriateness to the occasion, but also by the fact, as it appears to me, that there is more or less vagueness in the public mind as to its objects and methods.

The word technical is derived from the Greek *texnē*, an art, handicraft or trade. The idea involved in this word is the bringing forth or making of material things as distinguished from thoughts and mental images. It is not always safe, as you know, to infer the modern meaning of a word from its derivation. Nevertheless it happens that one of the great branches of technical education as at present understood, is exactly defined by the old Greek word, namely, the training of apprentices in the arts and handicrafts. Technical education in this sense has been in existence since the days of Tubal Cain, the instructor of every artificer in brass and iron; and to it we owe the greater part of the material progress which has been made since the world began.

In these later days, however, a new application has been found for the term. In consequence of the growing competition for trade among civilized nations, and the recognition of the relations of art and science to production, schools for giving artistic and scientific training to those engaged in industrial pursuits are becoming acknowledged as one of the necessities of modern times. These are known as technical art schools and technical science schools. It is to the latter alone that I propose to direct your attention this evening.

From the time of the revival of learning in the middle ages down to the present century the energies of the universities and schools have been directed in channels having little or no connection with the material necessities of civilized beings. The sole exception has been the schools of medicine. That this should have been so may seem strange, but it appears to me that we have not far to go for the explanation.

The universities and schools are not the originators of knowledge. They are simply collectors and distributors. Natural science is a thing of modern growth. It had to reach a certain stage of development before the community could become interested in it; and not until a demand for scientific knowledge had been created could it be admitted into schools of learning. How long, for example, is it since the physical sciences have been made a part of our Ontario curriculum?

Herbert Spencer, in an essay on Education, says: "That which our school courses leave almost entirely out we thus find to be that which most nearly concerns the business of life—all our industries would cease were it not for that information which men begin to acquire as they best may after their education is said to be finished. And were it not for this information, that has been from age to age accumulated and spread by unofficial means, these industries would never have existed. Had there been no teaching but such as is given in our public schools, England would now be what it was in feudal times. That increasing acquaintance with the laws of phenomena, which has through successive ages enabled us to subjugate nature to our needs, and in these days gives the common laborer comforts which, a few centuries ago, kings could not purchase, is scarcely in any degree owed to the appointed means of instructing our

youth. The vital knowledge, that by which we have grown as a nation to what we are and which now underlies our whole existence is a knowledge that has got itself taught in nooks and corners, while the ordained agencies for teaching have been mumbling little else but dead formulas."

It seems to me that these words of Spencer should be taken rather as an indictment of the community than of the schools. There has been, and may yet be to some extent, opposition on the part of men permeated with the older culture to the introduction of the physical sciences into the schools, but this opposition is disappearing as the sciences grow and prove their fitness for a place in the educational system.

One of the main obstacles to the introduction of the teaching of science, even after its importance had been fully recognized, was the large outlay required for the necessary apparatus. Scientific investigation is both qualitative and quantitative. The teaching of science on the qualitative side consists in the enunciation and illustration of principles. The apparatus required for this purpose is comparatively inexpensive, and may be improvised to a great extent by the teacher. In many cases, no apparatus at all is required—simple observation of natural phenomena being sufficient. The case is altogether different when the principles of science are to be investigated quantitatively. Instruments for making precise observations and measurements must be used. These instruments are expensive and cannot be made by teacher or student. The highest mechanical skill is required for their manufacture, and patience, time and opportunity for their use. Laboratories have to be equipped, and the whole time of teacher and student given up to work with the hand, eye and ear.

It is not to be wondered at that the introduction of science into the curriculum has been slow. Now that it has been accomplished the question naturally arises, Wherein exists the special necessity for the establishment of technical scientific schools? I think it may be answered thus:

In all schools for the teaching of professions and callings, whether we choose to consider them technical or not, it is an admitted necessity that the teachers should be practical men in such professions and occupations. What would be thought of a medical school in which the teachers were not physicians? of a law or divinity school in which they were not lawyers or theologians? In like manner the teachers in technical schools should be engineers, architects, manufacturers, artisans, miners and agriculturists if it is possible to get them. The difficulty which exists at present to a large extent, but which will disappear with the progress of technical education, is that there are very few men in the above professions and occupations who have had a sufficient training in science to make them successful teachers—their knowledge is practical, not scientific. The teacher in a technical school should be more or less acquainted with the various trades—with the methods in vogue for handling and transforming material. He should know how things are done and made in actual life and on the commercial scale. He ought to have a better perspective, so to speak, than the purely scientific man in reference to the needs of his students, and should be able to meet them more nearly on their own plane, and interest them in science by selecting his illustrations from their work, actual or prospective. It is of the first importance that he should keep himself informed in the latest manufacturing processes. This cannot be done by reading. The text-books are always years behind the times in this respect. Manufacturing and engineering periodicals are better, but still they convey little or no idea of the scale on which work is done. Personal observation, travel, and engaging in outside work

whenever possible are the only methods whereby the teachers in technical schools can gather the proper material for illustrating scientific principles and maintaining the interest of students in their work.

The principal work of a technical school is the teaching of science and not, as many suppose, to turn out fully fledged engineers, architects, manufacturers and tradesmen; all that it can pretend to do is to turn out partially educated men. The graduates must supplement the work in the school by practical experience in after life before they acquire the right to call themselves practical men.

The practical work of the school differs in many respects from the practical work of actual life. Where it is work of the same kind, as for instance, drawing, designing, the use of surveying instruments, lathe work, smith work, etc., yet the feeling of reality and responsibility is lacking. It is a very different thing to make mistakes in school work from making mistakes in similar work in actual life. A man is vastly more impressed by the necessary punishment which follows mistakes in the serious business of life than he can be by the arbitrary penalties instituted by the faculty.

Again, there is a great body of knowledge necessary to complete a man's practical education which it would be only an utter loss of time to attempt to give in a school, simply because there are no well-defined threads of scientific thought upon which to string it. Three-quarters of the information to be found in an engineering hand-book would be useless in the curriculum, although all-important in practice. Such knowledge becomes useful only when impressed by experience.

The establishment of engineering laboratories marks a new departure in technical education. Surely it will be said, the work in these laboratories is practical. So it is, but not perhaps in the sense in which the question is put. The steam engine in an engineering laboratory is not used for the same purpose as the factory engine. In the shop it is used for manufacturing purposes; it is placed in the laboratory for the purpose of being experimented upon. In the laboratory it is tried at different speeds, worked condensing and non-condensing, with varying steam pressures, with and without steam-jacketing, with different amounts of lead and cushioning, with different counterbalances for crank and connecting-rod, with varying clearances, with simple and multiple expansion. The work done at the main shaft is accurately measured; likewise the work in the cylinder—the feed water and condensing water are weighed—the degree of dryness of the steam determined. In short, in the laboratory all the conditions which may affect actual practice are experimentally investigated. It is only in this way that the principles governing the construction and action of engines can be fully determined.

What would an employer do with a man who should attempt any such work with the factory engine? He would simply give him to understand that his usefulness was gone, and that he had better look for employment at the School of Practical Science.

Again, since the teaching of principles is the main object of a school of applied science, it seldom happens to be useful to complete any of what is ordinarily called practical work, as would be necessary in actual life. To do so would occupy too much time. Practical constructions involve so many and various considerations and methods, that the attempt to complete them would simply be reverting to the old state of affairs when the apprentice gained his knowledge altogether on actual work. The study of the sciences would be so much interrupted and confused by such a method as to be of very little value.

(TO BE CONTINUED.)

UNPROVOKED ASSAULT ON UNIONISM.

THE PROPRIETORS OF TWO OTTAWA PAPERS DISCHARGE UNION EMPLOYEES

And Replace Them by Imported and Domestic Rats.

Ever since the change of proprietorship of the Citizen, over a month ago, it has been whispered about that changes would be made in the mechanical staff of the office, as it was generally believed that the new proprietor and his manager were anxious to secure the cheapest kind of labor in the market irrespective of quality. The proceedings in that office on Monday afternoon proved that the rumors in circulation were not without foundation, as the manager went up into the composing room and informed the men, who were busy at work distributing type for next day's issue, that their services were no longer required. They were then paid their week's wages and discharged. Several rodents from Detroit and Montreal were on hand to take possession of the vacant frames, and the paper has since appeared, but so unlike its former self that even its friends have some difficulty in recognizing it.

Twelve men, including Mr. Boudreault, who acted as night editor and foreman, have been summarily thrown out of employment. Mr. Boudreault has been connected with the Citizen for the long period of nineteen years, having entered the establishment as "devil."

The trouble in the Journal office, which has been going on for some time, is a strike for wages. The proprietor, F. D. Ross, has been paying the Union scale, but the men say he only gave them half the ordinary amount of work, allowing them to work only half the usual number of hours, and as a result their wages averaged the princely sum of \$4.20 per week. The paper is being got out by non-union labor, and the men are issuing a weekly called Fair Play in which they give their version of the story.

GOOD FOR THE BOYS.

Formation of a New Fife and Drum Corps.

A short time ago several members of labor organizations in this city conceived the idea of forming a fife and drum band from among the sons of organized men, and the idea being favorably entertained by others, a committee was formed, trustees for the band property elected and other preliminaries settled. A competent instructor has been engaged and the boys have had a few practices, making satisfactory progress for the short time they have been under his tuition. About twenty-five boys, ranging in age from 10 to 16, have thus far been enrolled, but there are vacancies for a few more, and parents who may be desirous of seeing their sons members of the band and obtaining for them a good grounding in the rudiments of music, at a very small outlay, should apply on Tuesday evening at 8 o'clock at the K. of L. Hall, Chaboillez street. The committee are confident that the band will have attained such proficiency as to warrant them in placing it at the head of next Labor Day procession. Several friends have promised to contribute towards the cost of procuring drums, and among these the committee have thankfully to acknowledge from Peter Lyall, Esq., \$10.00; Mr. B. Feeney, \$5.00; River Front Assembly, \$5.00.

Mr. Labouchere writes: My attention has been called to a system said to be in force in Germany, by which a man may be imprisoned for assault on his wife or children without causing the punishment to react to the further disadvantage of his victims. The plan consists in imprisoning him only on his holidays. He is taken every Saturday when he leaves work and locked up till Monday morning, and this process is repeated until he has done his "month," or whatever the term may be. The idea is ingenious, but I do not see how it could be worked effectually except in a country where the whole population are under close police supervision.

INSURE your Property and Household Effects, also your Places of Business and Factories, against Fire, with the old, Reliable and Wealthy

PHENIX
INSURANCE CO'Y, OF HARTFORD.

| | |
|----------------------------|-----------------|
| CASH CAPITAL..... | \$ 2,000,000 00 |
| PREMIUM INCREASE 1891..... | 3,007,591 32 |
| LOSSES PAID TO DATE..... | 29,027,788 02 |

Head Office for Canada: 114 St. James Street, Montreal.

GERALD E. HART, General Manager.

CYRILLE LAURIN, } Montreal Agents. Sub-Agents - { G. M. DUPUIS, GABRIEL
G. MAITLAND SMITH, } and PERRAS.

AGENCIES THROUGHOUT THE DOMINION.

**The Montreal Brewing Company's
CELEBRATED**

Ales and Porters

Registered Trade Mark—"RED BULL'S-EYE."

INDIA PALE ALE, Cabsuled
X X X PALE ALE

SAND PORTER
STOUT PORTER

If your Grocer does not keep our Ales, order direct from the Brewery—Telephone 1168. The MONTREAL BREWING CO., Brewers and Malsters, cor. Notre Dame and Jacques Cartier streets.

FURNITURE

TO SUIT

**EVERY HOME AND
EVERY PURSE!**

HAVE YOU ONE OF OUR

\$3.00 PLATFORM ROCKERS?

IF NOT, PLACE YOUR ORDER AT ONCE.

H. A. WILDER & CO.,

232 to 238 McGill Street.

OPEN EVENINGS.