

**THEORETICAL TRAINING FOR APPRENTICES—OUT-  
LINE OF THE EDUCATIONAL FACILITIES  
PROVIDED AT THE BRITISH GOVERN-  
MENT ARSENAL**

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**B**Y the needs of the returned soldier, our attention has been focussed on vocational training. The re-education of soldiers unable to follow their pre-war occupations has given an impetus to the subject, but the teaching of the theory and practice of trades side by side has previously been recognized only to a limited extent.

This does not mean to say that a system of teaching trades in schools and not in factories is advocated, but a great deal of useful ground work may be obtained in a school. The bill that Dr. Cody has before the Ontario legislature makes provision for adolescent vocational training. This article will show what has already been accomplished in Britain and may be useful as a suggestion for the syllabus to be adopted by the Ontario Department of Education.

The need of the ordinary shop apprentice, particularly in mechanical or electrical engineering, for theoretical training which shall proceed along with his practical experience, has had little attention. In this article will be described a system of apprenticeship followed by the British Government for many years in its dockyards and arsenals. It is the system in the Royal Arsenal, Woolwich, with which the writer shall deal, but this differs only slightly from that at the two government establishments near London, the gunpowder factory at Waltham Abbey, and the small arms factory at Enfield.

**Distinction in Nomenclature**

The admission of engineering apprentices to the Royal Arsenal is governed to a certain extent by social considerations, in that there are two classes of apprentices, those whose parents can afford a university education and those whose parents cannot. It must be understood that something like this system applies also to apprenticeship in private firms, but the question of ability to get a university course does not enter, its place being taken by the payment by the parents of a premium to the firm. Premiums are also the rule in civil and municipal engineers' offices.

A distinction of nomenclature is made. The premium apprentice in a private firm is called a "pupil," and the non-premium an "apprentice," also, in the government factories, the university man is a "student" and the non-university a "trade lad." It must be understood that it is much more difficult for a person without means to get a university training in England than in North America; for one thing the sessions are usually for nine months, leaving only three months for working at a paying business, and the students do not make use of the idea of taking on outside work during session; nor is there the opportunity for highly paid summer labor as there is in America.

In theory the difference in training is supposed to be that the "pupil" keeps his eyes and thoughts on principles of management, and not so much on ability to use tools, whilst the apprentice concerns himself solely with the idea of being a skilled mechanic.

The entry for a student into the Royal Arsenal is by one of two ways. If he is an engineering graduate of one of the universities and applies for admission and is accepted, he is given a three-year course in the shops, with sufficient pay to keep him in board and lodging (if his ideas are modest). His course may be withdrawn at any time if the student does not show application, is irregular in attendance or his conduct is not satisfactory.

If, however, he has only matriculated and guarantees that he will take a university course, he is given one year's practical training at the same rate of pay as an apprentice, then proceeds to the university, and after graduation returns to the shops for two years to complete his course.

The training consists of a very general experience in mechanical engineering, the pupil being transferred from shop to shop until he has a ground work of fitting, turning, smithing, millwright's work, pattern making, moulding (brass, iron and steel casting), draughting and testing materials. In each shop his work is supervised by one particular mechanic, who receives one cent an hour additional to his pay for his trouble.

The writer does not know of any place in the world where the opportunities for obtaining practical knowledge are greater. If the pupil has a particular bias in any direction, say explosive engineering, an opportunity for training would be given him in the "Danger Buildings," i.e., explosive factory. A similar remark applies to central station power-house work.

**Trade Lads**

The ordinary apprentice, who probably enters with the sole outlook of becoming a skilful artisan, must be between 14 and 16 years of age, and pass a competitive examination, of which the following is the syllabus:—

*Elementary Mathematics*

**Arithmetic.**—The application of the principles to whole numbers, decimals and fractions. Contracted methods of multiplication and division. Ratios, proportions, percentages, averages. The metric system.

**Algebra.**—The application of the simple algebraical laws. Simple factors, easy equations of the first and second degree, and problems involving such equations. Simple graphs.

**Geometry.**—The subject matter of Euclid, Books I. and II., with simple deductions. Euclid's proofs or sequences will not be insisted upon.

*Elementary Physical Measurements and Applications*

**Written Paper.**—Determination of lengths, areas and volumes. Determination of mass and weight. Determination of density and specific gravity. Comparison of English and French system of weights and measures. Applications of the laws established. The questions set will be such as to test whether the candidate has himself performed simple experiments in measurements.

**Practical Work.**—Candidates who pass satisfactorily in the written paper will be examined in the laboratory, and will be required to make one or more of the simple measurements mentioned above.

*English*

A short essay on one of three given subjects.

Writing a passage from dictation.

Questions to test knowledge of the correct usage of words, etc.

*Drawing*

Candidates will be required to make a sketch of a simple piece of machinery from a copy, or to make a sketch of a group of common objects.

Candidates will also be examined to test their knowledge of, and their facility in the use of, the rule, compass, and protractor in simple problems in plane geometry.

This examination is however not so simple as the syllabus would make it appear. The number of boys taken varies from year to year, but on an average less than 20% of those writing the examination are successful. Those who head the list are usually made fitters and turners, those next smiths, then pattern-makers and wheelwrights. Such, we suppose, is the opinion of authority of the relative value of the trades, but the boys are asked on a special form to state any preference for trade or department.

The trade lad is given a longer time in the shops than is the student. The first three years are strictly his apprenticeship, as after that period he is considered an improver, and can work on piecework if there are vacancies in that sort of shop. At the age of twenty-one it was customary to discharge him, but, of course, the war altered that for the time being. A few lads, not more than 10%, were kept on and gradually raised in pay, but it took ten or twelve years before they reached the union rate.