

technical school certificates, time spent in the technical school for special instruction being taken into consideration ; also giving assistance towards special scholarships in connection with their trade, and generally taking an interest in the educational movements of the day, which tend so much to raise their status, morally and financially.

There may be a few instances where firms having a very large number of hands might establish classes in connection with their works, such, for instance, as may be found at the works of Messrs. Howard and Bullough, machinists, Accrington, or at Messrs. Mather and Platt's, Salford. In the former case the firm employ considerably over two thousand workpeople ; about 20 per cent. of these are from thirteen to twenty-one years of age. All apprentices are required to attend the school until they are twenty-one years of age. The fee is 2s. 6d. per session for each subject, or 6s. for three, one compulsory subject being mathematics. A considerable number of free studentships are awarded. The first room is fitted with machinery manufactured by the firm ; the second is the lecture-room, with accommodation for two hundred students ; and the third the physical and mechanical laboratory. The subjects taught are mathematics, magnetism, and electricity, applied mechanics, machine construction and drawing, and cotton-spinning. Mathematics is divided into three classes—A, B, and C. The student must show proficiency before passing from A to B, which deals with higher rules of arithmetic, and arithmetic as applied to geometry ; it also includes plane geometry. Class C deals with higher divisions of the same subject. In magnetism the general properties of magnets are explained, as also magnetic induction, the permanent magnetism of hard steel, and terrestrial magnetism. Frictional and voltaic electricity are exhaustively dealt with, and the practical application of electricity to cotton machinery. The students make records of all experiments made, and the references they deduce from them are inspected. Applied mechanics is exhaustively dealt with from its most rudimentary principles and forms up to its most complex application shown in machines constructed by the firm. In cotton-spinning the City and Guilds of London programme is followed. The work is supplemented by practical work upon the machines immediately after the lecture. There is in addition a practical machine-fitting class. Efficiency as an apprentice in the work of any department in the shop entitles the student to a remission of fees for classes, and to successive advances of 1s. per week, besides other privileges. Athletics and swimming form part of the school's curriculum.

Both the firms mentioned above send workmen abroad constantly, and have found that the system of instruction adopted has placed at their disposal men who are not simply mechanics in the ordinary sense of the word, but men who are able to turn their attention to the various branches of work required. One of the managers remarked that, instead of his being required to look after each separate job, the young fellows can now make their own drawings, work to them, and fit the work together and erect it, where it used to require a separate man for each department.

The admission of amateurs to trade classes has been a keenly discussed point. The question arises, has a public institution supported by public funds any right to refuse a student admission to any particular class, or the opportunity of learning any trade ? Or, again, would it be just to prevent an architect or sanitary engineer from attending a plumbing class ? In many schools I found the classes limited to trade students. I would suggest that a student be entitled to enter any class applicable in any sense to his employment.

2. SCIENCE.

I have previously referred to the fact that care must be exercised to see that there is no overlapping of classes and instruction. In the case of science subjects, in three of our centres there are university colleges, with apparatus and appliances to hand for the teaching of these subjects. Where such is the case I would urge efforts being made to establish evening classes for ordinary and artisan students, such classes to be worked in conjunction with our technical schools under arrangement with the university authorities. In no case are our centres large enough to support two sets of classes, or to engage more than one specialist in each department. By concentrating all efforts in this direction the best possible system of instruction might be organized without any undue strain upon our finances. Should such an arrangement be fortunately come to I would recommend capitation being paid upon such classes as if they were held in a technical school. It would, of course, be necessary to form a small joint-committee of the technical school and university college for the management and development of such classes.

Mathematics and Mechanics.—In the larger towns classes in this subject are already in operation. In country centres where no technical school exists these classes would fall under the continuation-class section. It cannot be too strongly urged upon students connected with mechanical and electrical engineering trades that their success largely depends upon their ready solution of mathematical problems.

The following text-books were in use in the Manchester and Birmingham Technical Schools :—*Mathematics*: Layng's "Euclid"; Brook Smith's "Arithmetic"; Todhunter's "Spherical Trigonometry"; Loney's "Co-ordinate Geometry"; Edwards's "Differential Calculus" and "Integral Calculus." *Works of reference*: Hall and Knight's "Higher Algebra"; Smith's "Treatise on Algebra"; Hall and Knight's "Elementary Trigonometry"; Casey's "Sequel to Euclid"; Lovett and Davidson's "Trigonometry."

Theoretical Mechanics, Solids, and Fluids.—The principles of mechanics are explained by means of experiments, and the aid of the lantern, which, I may here state, is very widely used throughout technical schools for illustrative purposes.

Solids: Books of reference are: Worthington's "Dynamics of Rotation"; Parkinson's "Elementary Mechanics"; Ganot's "Natural Philosophy"; Wormell's "Mechanics"; Twisden's "Mechanics"; Deschanel's "Natural Philosophy"; Garnett's "Dynamics"; Taylor's "Mechanics"; for honours stage the text-books are: Todhunter's "Analytical Statics"; Williamson's and Tarleton's "Dynamics."