

preceded by lectures—all the work should be practical, the instruction consisting of problems bearing on the trade, which would lead them to understand the changes undergone by metals exposed to air, the action of water on metals, &c. The object of the course, however, should be to make them observe and think. In teaching this class of men lectures were of no value.

The text-books generally in use in the London technical schools were—for lectures, Jago's, Newth's, and Thorpe's "Chemistry"; and for practice, Clowes and Coleman's, Valentine's, Jago's, and Cohen's "Chemistry."

In Manchester and Birmingham the following text-books and works of reference are suggested: Inorganic chemistry—elementary text-book: Roscoe and Hunt's, or Taylor's, "Chemistry for Beginners"; Furneaux's "Elementary Chemistry." Reference works—Roscoe and Schorlemmer's "Inorganic Chemistry." Advanced stage—text-book: Taylor's "Student's Chemistry," or Von Richter's "Inorganic Chemistry," or Newth's or Emerson Reynolds's "Experimental Chemistry." Reference works—Roscoe and Schorlemmer, Vols. I. and II.; Thorpe's "Dictionary of Applied Chemistry," Vols. I., II., and III. Honours stage—text-books: Tilden's "Chemical Philosophy," Remsen's "Principles of Chemistry," Newth's or Thorpe's "Inorganic Chemistry," Clowes and Coleman's "Quantitative Analysis." Organic chemistry—text-book: Perkin's "Organic Chemistry" is generally used in all stages. In honours Richter's is also used. The works of reference in the honours stage are Roscoe and Schorlemmer's "Treatise on Chemistry," Parts 1 to 6; Watt's "Organic Chemistry," edited by Tilden; and the various chemical journals. Practical inorganic chemistry—text-books: Grant's "Laboratory Guide and Analytical Tables," Valentine and Hodgkinson's "Qualitative Analysis," Thorpe's "Quantitative Analysis," and Taylor's "Analysis Tables." Reference works—Fresenius's "Quantitative Analysis" and Sutton's "Volumetric Analysis." Practical organic chemistry—text-book: Gatterman's "Organic Analysis"; Cohen's, Chapman Jones's, and Streatfield's "Practical Organic Chemistry."

There is a generally expressed opinion that much of the science teaching is regulated by the requirements of the Science and Art Department examinations, and with a view to obtaining the necessary grants. The London County Council is endeavouring to relieve this pressure by additional funds, in order that more original work may be encouraged amongst the classes, and less of examination facts and definition of terms.

*Electrical Work.*—In all the more important institutions visited provision is made for electrical teaching. In evening classes the most important work is apparently conducted at the Finsbury and South-west London Technical Colleges. The main objects of instruction are to train students in the application of the laws of physics to industry, and to lead them to see how by such application industrial operations can be improved and cheapened. The instruction is given partly by lectures, but mainly through the laboratory-work of the students themselves. Their knowledge thus takes practical form, and is no mere book-knowledge.

The first year's course on electrical technology is as follows: On simple applications of electricity and magnetism: Electrical instruments making, galvanometers, electro-magnets, electric bells, primary batteries, thermopiles, lightning-conductors. Second year's course: On the more advanced applications of the laws of electricity and magnetism (students must have passed the first year's course): Dynamo electric machines, electric lighting, electric transmission of power, transformers, arc-lamps, glow-lamps, and advanced methods of electric testing.

At the South-west London Polytechnic a special feature is made of the practical work which follows the lectures. This is divided into four sections, through which the students pass in rotation. Section A—Electrical testing: Includes the calibration of instruments, measurement of resistance, &c. Section B: Includes practical instruction in electrical jointing and connecting, starting and running dynamos, repairing faults, &c. Section C: Specifying and estimating and taking out quantities. Section D: Engine, dynamo, and motor tests. All these sections have been remarkably successful, so much so that it has been impossible to accommodate the students, and duplicate classes have perforce been established.

The practical physics course is attended by first-year students of all the college departments. In this course the fundamental laws of physics are taught in relation to, and as explanatory of, the various industrial processes in which they are exemplified. Special attention is paid to heat and the laws of thermo-dynamics as being of primary importance.

The remainder of the course is devoted to optical instruments. The electrical laboratory contains many arrangements of apparatus for an organized series of quantitative experiments, each set being complete in itself. Students find ready to hand apparatus necessary for carrying out a large number of experiments. Printed instructions are supplied to students of each experiment. The advanced students, in groups of three, take charge of the electric lighting of the college for a week at a time, attending to the whole of the lighting plant, keeping a record of the life and running of the lamps. They also make measurements on the transmission of power, take indicator diagrams of the steam-engine and gas-engine, measure the electrical power, and send in to the senior demonstrator a report every week of the efficiency of and general working of the installation. Students also assist in running leads in the college, and receive practical instruction in jointing, &c., testing insulation of leads, calculating proper size of wires to avoid fire risks, and working out estimates for lighting generally.

In Manchester and Birmingham the following text-books are in use: Jamieson's "Electricity and Magnetism," Poyser's "Advanced Magnetism and Electricity," Gunn's "Numerical Examples." Honours: Youbert's "Electricity and Magnetism," translated by Foster and Atkinson; Henderson's "Laboratory Manual," Vols. I. and II.; Sylvanus Thompson's "Electricity and Magnetism"; Ayrton's "Practical Electricity." For electrical engineering: "Electric Lighting, and Power-distribution," by Perren Maycock; Slingo and Brooker's "Electrical Engineering"; Joyce's "Examples in Electrical Engineering"; S. V. Thompson's "Dynamo Electric Machinery." For telegraphy: Preece and Sivewright's "Handbook of Telegraphy"; Herbert's "Electricity in its Appli-