

The report defines an electrical technician in the following terms. "An electrical technician is a person who carries out in a responsible manner approved techniques which are *either* common knowledge amongst those who are technically expert in his branch of industry *or* specially prescribed by professional electrical engineers. These techniques are not those of the craftsman, though they may involve manual skill; in many cases they include the skilled use of delicate and complicated instruments and may also require the intelligent and accurate use of approved methods of calculation. They involve practical experience of some limited branch of electrical engineering combined with the ability to complete the details of a project using well-established practice. . . . To become an electrical technician a person must have received a technical education up to a standard at least, and preferably beyond, that of the Ordinary National Certificate in electrical engineering, and in addition must have had training and experience in the particular sphere of electrical engineering in which he is to work."

It is scarcely necessary to emphasize that such a definition embraces a technically important and numerically large section of the electrical industry. At an early stage in the report it is stated that the inquiries upon which it is based "have revealed two main facts. First, that the status of electrical technicians is not nearly so well defined, nor the importance of their systematic training so fully appreciated, as is the case with professional electrical engineers on the one hand or with craftsmen on the other. Professional engineers have been trained for several generations by a system originating in pupilage, while craft training has its roots in medieval apprenticeship, but there is no well-established tradition of training for intermediate occupations."

After listing a typical range of occupations commonly followed by the electrical technician and giving a number of illustrative examples, the report proceeds to a consideration of the qualifications which he needs and to the educational provisions required to meet them. It is considered that, for most technicians, an Ordinary National Certificate course will provide a suitable theoretical foundation; but some reduction in the standard of mathematics normally required may be desirable. Beyond the stage of the National Certificate, courses for technicians will be of a much more specialized character than Higher National Certificate courses. "The courses should be so designed that they can be followed without the assistance of collateral studies, and examinations should be available to which appropriate awards will be given by an examining body such as the City and Guilds of London Institute. The courses should rely as little as possible upon mathematical knowledge, but they should include a large proportion of graphical and of practical work."

The report then deals with practical training. "A most important condition of training is that a trainee should follow a carefully planned and supervised course including, especially in the early stages, formal instruction. In the subsequent stages, training will of necessity largely take the form of experience to be gained by working in different departments or branches of an organization. To help to ensure progressive training, and to attract the right type of recruit, technician apprenticeships extending over a period of four or five years should be offered." Part-time day release, conditional upon satisfactory progress, should be allowed throughout the entire

period of apprenticeship. It is recommended that all technician apprenticeship schemes, whether in manufacturing or in operating organizations, should provide for an initial period of about eighteen months duration of training in suitable crafts.

The recommendations of the report are in general terms, and no attempt is made to develop detailed schemes for particular branches of the industry. The views put forward in the report were, in the main, endorsed in the discussion which followed its presentation, it being generally agreed that the institution of suitable schemes of training for technicians is a matter of first importance in the technical development of the electrical industry.

CHEMICAL RESEARCH LABORATORY REPORT FOR 1949

THE report of the Chemistry Research Board for the year 1949* which, over the signature of its chairman, Sir Norman Haworth, accompanies the report of the Director of the Chemical Research Laboratory, refers to the careful review of the research programme of the High Polymers and Plastics Section of the Laboratory made by the High Polymers Committee. The recommendations of this Committee that the study of the ion-exchange and allied properties of high polymers should continue to be the chief work of the Section, and that research should be begun on the relationships between the properties and chain-length of carefully fractionated linear polymers, with the immediate object of finding improved methods of determining molecular weight distribution, have been endorsed by the Board. In consequence, the work on adhesion has been terminated, as the whole of the available staff is required to make an effective contribution to these first two topics. During the year under review, the Section examined in detail the reaction of polyvinyl chloride with methylamine and ethylenediamine with the view of elucidating the mechanism of the reaction. Exploratory experiments on derivatives of sulphonated cross-linked polystyrene have also been made, and the Director's report includes a brief account of both investigations as well as of those on the preparation and sulphonation of cross-linked polystyrene and the ion-exchange properties of the product. In collaboration with the Low Temperature Research Station, Cambridge, it has been shown that the more basic amino-acids—leucine, histidine, lysine and arginine—can be separated by development displacement from a column of sulphonated polystyrene resin of low degree of cross-linking. In further work on glues for light alloys, the effect of pre-treatment of metals with different adhesives was compared.

An outstanding feature of the Corrosion Group's activities is the increasing amount of time devoted to extra-mural contacts and the handling of technical inquiries, and the Board's report directs special attention to the development of an inhibitor of corrosion consisting of sodium benzoate with a small proportion of sodium nitrite. This has been used effectively in glycol anti-freeze mixtures in the

* Department of Scientific and Industrial Research. Report of the Chemistry Research Board with the Report of the Director of the Chemical Research Laboratory for the Year 1949. Pp. vi+96. (London: H.M. Stationery Office, 1950.) 3s. net.

cooling systems of motor-vehicles with cast iron cylinder heads and blocks with the usual assembly of other metals. The mixed inhibitor can also be incorporated in rubber latex, which can then be used to form a protective film on machined parts. A study of boiler-tube corrosion was initiated during the year on behalf of the British Shipbuilding Research Association. Besides work on corrosion-testing technique, the Corrosion Group has continued its study of the low-temperature oxidation of mild steel, and an electron diffraction camera has been installed which should considerably assist the study of surface films on metals. Sets of the apparatus developed in the Laboratory for the speedier testing of protective coatings on surfaces against the effect of atmospheric corrosion have been made by the British Iron and Steel Research Association and distributed to other laboratories for trial.

The functions of the Microbiology Section have been extended to include the maintenance of cultures of industrially important bacteria, with ultimate responsibility for the maintenance of a National Collection of such bacteria. Bacteria previously held at the National Collection of Type Cultures have been taken over; but it was anticipated that it would take until the end of 1950 to examine and catalogue them. The fundamental investigations on the biochemistry of sulphate-reducing bacteria have been intensified, and the competitive inhibition of this reduction by selenate is being applied experimentally by incorporating selenate in protective coatings for ferrous pipes buried in sulphate-bearing clay soils. Biological methods for the control of the nuisance of evil-smelling pools produced by the activities of these bacteria are also being investigated.

Work for the Division of Atomic Energy, Ministry of Supply, on the analysis and concentration of uranium in minerals and ores has continued on an increasing scale, including the development and application of methods, based on solvent extraction in conjunction with the use of cellulose and other solid adsorbents, for preparing and analysing inorganic substances, including uranium products. Other work of the Radiochemical Group on the precipitation of uranium and other metals from solution under controlled conditions has also proved valuable in the development of enrichment processes for uranium from low-grade ores. Besides chemical methods of analysis, this Group has made numerous studies in radioactive methods of analysis, and reports substantial progress in polarographic methods for the direct determination of uranium in solutions containing other metals.

The Inorganic Group, which is now equipped with a Jarrell-Ash grating spectrograph, has successfully completed a semi-scale trial of its method for extracting germanium and gallium from flue dust by fusion with caustic soda and obtained an 80 per cent overall yield. A new investigation on the conversion of phosphate rock into forms of fertilizer which are easily assimilated by plants and in which less sulphuric acid is required has yielded promising results in preliminary work with mixtures of nitric and sulphuric acid. In chromatography, a method has been developed for the quantitative separation of nickel, manganese, cobalt, copper and iron in solution as chlorides on paper strips, and the method for nickel, cobalt, copper and iron has been extended to separations on cellulose columns. Much of the work of the Spectroscopic Laboratory has been concerned with the quantitative examination of products

derived from eluates obtained in this work with cellulose columns.

A prominent part of the work of the Organic Group is now the determination of accurate physical and physico-chemical data for pure organic compounds, and besides informal discussions between the Director of the Chemical Research Laboratory and Prof. D. M. Newitt, the Superintendent of the Physics Division of the National Physical Laboratory, to co-ordinate work in this field, there has been co-operation with the Hydrocarbon Research Group of the Institute of Petroleum. In consequence, the Laboratory has undertaken responsibility for procuring and distributing a range of standard pure hydrocarbons required for calibrating mass-spectrometers and other purposes. The Purification and Measurements Section has developed methods for the purification of β - and γ -picoline and 2:6-lutidine and also new thermodynamic tests for vapour-liquid equilibrium data in ternary systems. An apparatus has been designed for the automatic recording of freezing-point curves, and a method worked out for the determination of 4-methyl-2:6-di-tertiary-butyl-phenol in industrial mixture by infra-red absorption spectroscopy, as well as for the determination of small quantities of water in pyridine homologues. In the Organic Intermediates Section, progress is reported in identifying and synthesizing insecticidal compounds contained in the piperidine- and other nitrogen-containing fractions. Two homologous series of N-substituted piperidines are being synthesized for evaluation, and further work has been done on the hydrogenation of diphenylene oxide and o-diphenol, as well as on the polymers and co-polymers of acenaphthylene. A considerable amount of effort has been given to the synthesis of carbon-13 labelled intermediates from enriched potassium cyanide, and progress is reported in the elaboration of adequate methods for intermediates. A number of poly-functional halides and bases have been prepared for the synthesis of ion-exchange resins, and to obtain a non-polar lubrication standard the hydrocarbon, docosane, was synthesized from lauric acid.

GOVERNMENT EXPENDITURE IN THE WELFARE STATE

RECENT reports from the Committee on Public Accounts have indicated that the mounting scale of expenditure on the universities and similar institutions and on the Department of Scientific and Industrial Research is leading to requests for closer public accountability of such expenditure, even by those who are most concerned to safeguard the independence of the universities and who are alive to the danger of cramping research activities by petty restrictions. Possibly the spirit of such requests may be satisfied by a greater disposition on the part of these organizations to recognize that full publication of results as early as possible is a return which the nation is entitled to expect, as indeed was pointed out by one speaker at the British Association meeting in Birmingham; but it is clear from two recent broadsheets issued by Political and Economic Planning that there is a real danger, and that some new means of accountability may have to be devised to satisfy the nation that there is no excessive waste and that a reasonable return is being secured.