

confidence in the nation's future, more than three hundred representatives of Canada's commercial, industrial and cultural life were able to share in the thoughts and concerns of a few of their fellow-countrymen through this conference.

The papers form an invaluable commentary on Canadian thinking to-day, and on Canada's prospects to-morrow. Fortunately, the Canadian Westinghouse Co. has now published the papers in book form*, thus making available for a much wider audience the deliberations of this very balanced and comprehensive conference.

ROBERT W. STEEL

* Published by the Macmillan Co. of Canada, Ltd., 70 Bond Street Toronto. 3.50 dollars.

THE SPORTS TURF RESEARCH INSTITUTE SILVER JUBILEE

TO mark the silver jubilee of the Sports Turf Research Institute, a conference and open day were held at its headquarters, St. Ives Research Station, Bingley, Yorkshire, on July 1. A most satisfactory attendance, including representatives from sports clubs, sports associations, education authorities and municipalities throughout the British Isles, was presented with a very full day's programme in which major items were experiment plot demonstrations, educational exhibits, displays of modern machinery and the presentation of various papers on turf topics at intervals during the day.

The director of the Institute, Mr. R. B. Dawson, spoke about the developments of scientific turf management during the past twenty-five years, stressing particularly the big improvements in design and range of equipment that have taken place. He referred also to the growth of the experimental and other work of the Research Station. Mr. J. R. Escritt (soil chemist) discussed the relative importance of physical and chemical properties of soils for turf production, and Mr. J. Drew Smith (plant pathologist) dealt with turf diseases and his own work on fungicides. The fourth paper, given by Mr. G. Wright, a member of the Board of Management, described turf research work in progress at several research centres in the United States, emphasizing the big problems created in some parts by climatic factors adverse to good turf production.

The Institute (formerly known as the Board of Greenkeeping Research) has the stated aim of raising the general standard of sports turf. It is supported by subscriptions from numerous interested bodies, including sports clubs, golf clubs, industrial welfare clubs, sports associations, public authorities and education committees. Management of the Institute is in the hands of a Board of Management which includes representatives of the main sports controlling bodies, namely, the English Golf Union, Scottish Golf Union, Golfing Union of Ireland, Welsh Golfing Union, Football Association, Football League, Ltd., Lawn Tennis Association, Rugby Football Union, Rugby Football League and the English Bowling Association. The Board has available both scientific and practical advisory committees for consultation. In pursuance of its object, the Institute has a comprehensive research programme for investigating problems of general turf management, problems of individual management of turf for particular purposes and, of course, the control of weeds, pests and

diseases. Extensive field trials running to many hundreds of plots are backed by useful laboratory facilities.

Field work at present in progress at the Research Station (and demonstrated on the open day) includes trials on height of cut, top-dressing materials, long-term fertilizer treatment, weed control, disease control, grass growth stunting and seeds mixtures. Although the main experimental ground bears a considerable number of trials, many experiments can only be carried out satisfactorily at outside centres; for example, at present a new series of simple trials on seeds mixtures for renovating football grounds is in progress. Turf diseases and their control are receiving particular attention at the moment, with attempts to produce cheaper and more efficient materials for controlling known turf diseases. It is interesting to note that this concentration on disease problems has revealed that one or two new diseases previously unrecognized occur quite frequently, and work is proceeding on methods of control.

Knowledge gained from the various trials is passed on through the advisory work of the Institute, through instructional courses for groundsmen, greenkeepers and other interested persons and also through lectures given by members of the staff at various centres throughout Great Britain. In addition, an annual *Journal* is produced and also brief quarterly *Bulletins*, both these publications being circulated to all affiliated members. The advisory services are being increasingly called upon, and more and more is being demanded of the staff concerned in this work.

The Institute was founded in 1929 by the golf clubs through the four national Unions; but the great expansion of activities, particularly since the Second World War, in various other directions, led to a reorganization and the formation of the Sports Turf Research Institute. The status of the organization as an independent non-profit-making scientific body was recognized by the granting of a licence from the Board of Trade in August 1951, thus permitting the Institute to be registered and to operate without the use of the word 'Limited' in its title. The former Board of Greenkeeping Research ceased to exist on September 3, 1951. It has become increasingly obvious that the Institute has an important part to play in the future as in the past. More and more its advice is called upon in the construction of new playing fields for all kinds of bodies. In particular, the educational programme of producing more new school playing fields demands a great deal of attention from the Research Station in order to enable the education authorities to produce fields of sufficient quality without unnecessary expenditure of public funds.

DEVELOPMENT AND UTILIZATION OF WATER RESOURCES

THE eighteenth session of the United Nations Economic and Social Council, which opened in Geneva on June 29, discussed among other items a report on the Development and Utilization of Water Resources*. This report was prepared as a result of earlier resolutions calling for information on the work being done by the specialized agencies and

* United Nations: Economic and Social Council. Report on the Development and Utilization of Water Resources. Pp. 20. (London: United Nations—London Information Centre, 1954.)

other international organizations engaged in the broad field of water control and utilization.

The complex nature of the inter-relationship between the various factors which have an influence upon, or are in turn affected by, the availability of water is first stressed—the needs of agriculture, inland navigation, industrial and domestic demands, electric power and the like are considered in relation to techniques of conservation to prevent excessive run-off, soil erosion and flood damage. The report then directs particular attention to three aspects: the first need in any activities on water control is the organization of a continuous collection of hydrological data which must be available for a considerable stretch of years to be of any value; in this connexion the suspension of the United Kingdom Inland Water Survey (referred to in *Nature* of November 7, 1953, p. 823) is again seen to be a retrograde step.

Secondly, attention is directed to the topic of watershed management, as this is regarded as an important but neglected aspect of water conservation. It is claimed that effective control in these initial stages reduces the need for river-training works and downstream flow-control measures. It is suggested that there is a regrettable lack of understanding of watershed management, not only on the part of the general public but also among those who are responsible for the political and economic decisions which are often made on water supply. The need exists to build up a body of information on this subject and also to arrange for its dissemination, perhaps through Unesco. The third aspect selected for special attention is the use of water for industrial purposes. This is considered to be the largest single factor making for the increased demand for water which is being experienced in most countries of the world to-day. Some dramatic illustrations of the growth of this demand are given: in 1950 the industrial use of water in the United States was higher than the agricultural use, and the Paley Commission estimates that by 1975 industries will use two-thirds of all sweet water and that availability of water will be the main determining factor for industrial location. To produce a ton of steel now requires 65,000 gallons of water, and to refine a barrel of crude oil requires $18\frac{1}{2}$ barrels of water; a ton of sulphate paper needs 64,000 gallons, while almost astronomical figures are required for thermal generating stations and atomic power stations.

To meet these and related problems of water pollution, the report considers the possibility of a more effective integration and co-ordination at various levels of the interested agencies and organizations. A strong case is made for the creation at national level in each country of a 'water board' representing all the interested government departments and local government bodies concerned with any of the numerous aspects of water conservation and utilization. This is a recommendation that might well receive careful consideration in the United Kingdom, although we are not alone in this lack of one central body: few countries have so far succeeded in co-ordinating their local activities on water development. Until this has been done, however, there seems little hope of efficient and successful co-ordination and co-operation at the regional and international level. Meanwhile, it is recommended that the United Nations Organization should encourage the holding of technical conferences and meetings of existing hydrological agencies. The

United Nations Organization should also serve as a clearing house on water matters and perform such other functions as it may appropriately undertake in implementation of the Economic and Social Council's resolution on water control (Resolution 417, XIV).

W. G. V. BALCHIN

NETWORK ANALYSER OF THE ELECTRICAL RESEARCH ASSOCIATION

THE alternating current network analyser has now become established as an essential tool for the design, operation and study of electrical power systems. The direct representation of the electrical characteristics of the network components by variable calibrated elements with suitable sources of alternating current, flexible means of interconnexion and sensitive measuring equipment readily applied to any point on the network makes possible examination of a complicated network for power flow, transmission efficiency, stability and fault conditions with an ease and accuracy quite beyond the range of human computation, while permitting an experimental approach as yet impracticable with a digital computer. The same equipment can in principle be used in the study of any systems capable of representation by linear differential equations and certain non-linear problems within a range dependent on the versatility of the components and measuring equipment.

The network analyser constructed by the Electrical Research Association, the first completed section of which was exhibited to the technical and scientific press on April 28, has been designed for application to the widest possible range of problems. To this end the equipment can operate at any frequency from 160 c./s. to 16 kc./s., so that frequency can be a variable or one of the unknowns in a problem. The maximum accuracy is at the 'base' frequency of 1,592 c./s. ($\omega = 10^4$). This versatility is accompanied by the possibility of extension to a size not less than that of any existing analyser. The equipment is believed to be unique in providing steady-state, transient and harmonic solutions on the same installation.

The impedance elements, mounted in racks, are connected by twin cables to terminals on a 'plug board' and thence by pairs of flexible cords to plugs which can be inserted into sockets in an interconnecting board to form the nodes of a network. The potential drop across a 20 milliohm shunt in series with one of the flexible cords associated with each element, and the potential difference between any two nodes of the network may be connected by a selection system to the terminals of the central measuring equipment which indicates simultaneously current, voltage, load and reactive load at the selected points. Two independent selection systems, which can be cross-connected, make this measuring equipment extremely versatile. Monitoring and fault-finding indications are provided.

Physically small components used in the network elements yield an inexpensive and compact design with short interconnecting leads and thus increased frequency-range. Small components require a low power-level, to avoid thermal effects in resistors and non-linearity in inductors. The level adopted is 2.5 mW., 500 mV. and 5 mA. for the base (that is, 100 per cent) values, with a range up to 400 per cent