

ments, to achieve settlements of our war-time lend-lease relations which will permit, generally, a sound world-wide economy and will contribute to international peace and to our own national security."

Operational Control of Electricity Supply Systems

SUPERVISORY equipment for the remote control of plant has proved to be thoroughly reliable and to facilitate efficient operation of electricity supply systems. In a paper read in London on March 14 by W. Kidd and E. M. S. McWhirter before the Institution of Electrical Engineers, the authors give the reasons for, and the steps taken to develop, the common-diagram control system, which enables an almost unlimited number of substations, etc., to be controlled completely from one diagram and control panel, and is sufficiently flexible to cater for the growth of an undertaking. It describes a wall-type system diagram which automatically indicates which substations have changed conditions, and therefore the area involved in any disturbance. The system diagram is equally extensible to accommodate new feeders and substations with a minimum of operating disturbances. Particulars of the circuits and apparatus, and comparisons of floor area, pilot and cost economies are given in the paper, together with information relating to an installation dealing initially with seventy-eight substations, to which others are being added.

The authors believe that, by the development of the ideas explained in the paper, the use of supervisory remote-control equipment has been extended on normal automatic-telephone switching practice to a wider application than was practicable with individual systems for large numbers of substations. This results in an economy of cost of equipment, of cost for control buildings, and of effort of the control staff. Operational control of large electricity supply systems will undoubtedly produce new requirements and problems as industrial, traction and domestic loads increase; but it is believed that, in the system described, a basis for meeting these requirements without adversely affecting present facilities has been provided.

Quaternion Centenary Celebration

THE centenary of the discovery of quaternions by Sir William Rowan Hamilton has already been the subject of an article in *Nature* (152, 553; 1943). The Royal Irish Academy has now published (*Proc. Roy. Irish Acad.*, 50 A, 69; 1945) a record of the celebration in Dublin on November 8, 1943, which was attended by Mr. de Valera and two of his Ministers. Owing to the War, representatives of science from outside Ireland were unable to be present in person, but some of them sent messages or articles. The late Prof. G. D. Birkhoff of Harvard stressed the part that Hamilton's ideas played in the development of mathematics in the United States. Vectorial theory could be regarded as, to a large extent, latent in quaternions, like a fine melody in a great symphony. Vectors were more useful in classical physics, quaternions in the special theory of relativity, and tensors in gravitational relativity. Mathematicians and theoretical physicists should study all three with their historical development.

Sir Edmund Whittaker gave an account of the sequence of Hamilton's ideas, pointing out the gaps and apparent lack of harmony in existing accounts. With regard to Hamilton's recognition of the necessity

for non-commutative multiplication, Whittaker says: "This was the supreme moment in the history of mathematical symbolism. It began the creative process which yielded not only quaternions, but all the other systems which broke away from the old rules—Cayley and Sylvester's matrices, Boole's symbolic logic, Grassmann's *Ausdehnungslehre*, Gibbs's dyadics, and the Heisenberg-Dirac algebra of quantum mechanics. Dr. A. J. McConnell dealt with the many distinguished members of Trinity College, Dublin, in the first half of the nineteenth century, including the mathematical physicists Hamilton, Lloyd, MacCullagh, Jellett and Haughton, the astronomer Brinkley, and the geometers Salmon, Booth, Hart, Charles Graves, Ingram and Stubbs. Dr. McConnell also printed the hitherto unpublished manuscript by Hamilton containing his first account of quaternions, written on the evening of the discovery. There are three other papers which demand more technical knowledge from the reader: "Quaternions and Matrices", by Prof. A. W. Conway; "A Modern Presentation of Quaternions", by Prof. F. D. Murnaghan, of Johns Hopkins University; and "The Icosian Calculus", by the Rev. J. R. Colthurst. The volume contains two plates: one a reproduction of an etching of Hamilton, the other a photograph of the first entry in his note-book of quaternion formulæ.

Mechanization of Sugar Beet Production

THE Ministry of Agriculture, in agreement with the Ministry of Food, is sending a small mission to North America this autumn during the sugar beet harvest season to study progress there in research and development work on the mechanization of sugar beet cultivating and harvest. The party will consist of Mr. J. Bradley, principal scientific officer in charge of the engineering side of the National Institute of Agricultural Engineering; Mr. W. J. West, senior scientific officer on the agricultural side of the National Institute of Agricultural Engineering; Mr. F. E. Thornhill, agricultural officer from the British Sugar Corporation factory at Allscott, Salop; and Mr. H. S. Taylor, agricultural officer from the British Sugar Corporation factory at Brigg, Lincs. They will visit the principal growing areas in North America during harvest and will study practical operations in the field and in the factories in addition to the research and development work being undertaken by university centres, sugar factories and agricultural machinery manufacturers. It is hoped that the information and experience gained will be of considerable value to workers in this field in Great Britain, at a time when the problem of developing suitable machinery to meet the needs of British growers at the peak periods of cultivation and harvesting is of vital urgency. Special attention will be devoted to problems connected with the segmentation of sugar beet seed, the development of beet seed drills and the mechanization of sugar beet harvesting.

Narcotic Drugs

THE two plants from which the raw materials of all the manufactured drugs covered by the International Conventions of 1925 and 1931 originate are the opium poppy and the coca bush. The former is used for the manufacture of morphine, heroin, codeine, dionine and other drugs, and the latter for the manufacture of cocaine. Unlike opium, coca leaves are little used in the form of medicinal preparations but are used in large quantities in the preparation of non-narcotic beverages. The Central Opium Board