

(A. F. H. Besemer and K. Hartsuyker, of Wageningen), a new method of applying pest control materials to plants (Prof. P. Froeschel, of Ghent) and a biological method for assessing residual parathion on cabbage leaves (Dr. J. J. Franssen, of Arnhem).

The organizers are to be congratulated on the satisfactory arrangement and smooth running of this successful symposium.

R. L. WAIN

RESEARCH IN RURAL ELECTRIFICATION

WORK AT THE ELECTRICAL RESEARCH ASSOCIATION

AN open week, beginning on May 4, was held at the Field Station at Shinfield, near Reading, of the Electrical Research Association, and Mr. G. R. H. Nugent, parliamentary secretary of the Ministry of Agriculture and Fisheries, a Ministry which makes a substantial contribution to the work of the Association, officially inaugurated the proceedings.

The Electrical Research Association established its Rural Electrification Section in 1938 with the main object of developing equipment and operating techniques which are satisfactory to the farmer or grower and which, at the same time, present load characteristics favourable to the economic supply of electricity. The larger the energy taken by rural consumers, especially during off-peak periods, and the lower the power demand, the greater the possible economy. Mr. Nugent emphasized the benefit of electricity on the farm, especially in saving labour and thus increasing production with the present labour force, and also in providing amenities for farm workers to encourage them to stay on the land rather than to succumb to the attractions of the town. A large, and rapidly increasing, number of farms now have electricity, but too many of them fail to make full use of it. Although electric light and domestic power are certainly valuable, much fuller advantage should be taken of electrical methods in agriculture and horticulture. The Ministry, said Mr. Nugent, is fully in agreement with the aims of the research work at Shinfield; economic considerations are rightly kept to the fore in the development of new applications of electricity on the farm.

At the Field Station, basic research determines the form of equipment and the technique required for electrical operation. This is followed by full-scale tests and later by trials under practical conditions on farms and horticultural holdings in different parts of Britain. The co-operation of the agricultural research establishments and of farmers and growers is an essential feature of work of this kind, and the Association has been fortunate in obtaining such co-operation both from its neighbours—the University of Reading and the National Institute for Research in Dairying—and from others much farther afield.

The underlying principle in many of the investigations is simplicity of operation, with electrical methods involving low kilowatt loadings which can be used for a lengthy period. These are much more welcome to electricity supply than the high short-period loads which present difficult problems in rural electrification.

A number of researches already completed have formed the basis for equipment which is now com-

mercially available. Among these are: barn hay-drying, a method of producing very high quality hay by blowing cold, or slightly warmed, air through grass stacked in the barn; a low-powered automatic hammer mill for farm grinding; a soil sterilizer of the immersion type for potting soil; and soil warming in frames and glass-houses by a simplified method in which a daily 'dose' of energy provides beneficial soil warmth but avoids the large consumption needed to maintain a suitable fixed temperature. Work now in progress on the horticultural plots aims at further improvement of the soil-warming technique and at finding the crops and varieties for which it is most likely to be economical in frames, under cloches and in open ground.

In the glass-houses, electric space-heating is used in combination with soil-warming, and different arrangements and forms of construction are being studied to reduce heat losses and so to minimize operating costs. Artificial illumination, using various kinds of lamps and of lighting fittings, is being applied to the raising of tomato seedlings. Laboratory work on soil sterilization by the electrode method, in which current is passed directly through the soil, is preliminary to *in situ* sterilization of glass-house soil. A model glass-house in the exhibition was fitted with many devices which may be developed in future for the complete control of all the factors involved in growing plants to perfection. Presuming that the plant physiologists achieve their goal, this is the ultimate object of the researches now in progress.

Laboratory work on the agricultural side is concerned with the requirements for drying many kinds of agricultural materials and with their equilibrium moisture content in different atmospheric conditions. Grain drying, grass drying and seed drying are studied experimentally, and a novel form of moisture-meter for grain has been developed. A 'farm of the future' in the display showed many new agricultural applications of electricity which, in combination with existing ones, could be used to provide an approximately constant load throughout the year. They would both save labour and give a high load-factor on the farm.

An electrically driven tractor which has been used for the cultivation work at the Field Station during the past three years has the advantages of simple and quiet operation, low running and maintenance costs, and ample tractive effort over a wide range of speeds.

In conjunction with the University of Reading poultry farm, investigations are being made on the possibilities of electrical methods in poultry husbandry. These include air-conditioning for laying hens, the effect of environment on the growth of chicks, and flash illumination in laying-houses as an energy-saving alternative to the usual artificially extended daylight. The destruction of pests by the use of high-frequency fields, the killing of weeds by an electrical discharge and fish-stunning by passing a current through the water in streams or in the sea, are other subjects studied. An experimental heat pump is used for heating one of the laboratory buildings, and its performance is being tested by comparison with that of a conventional plant in another building with similar thermal characteristics. The heat-pump principle is also being applied to dairy work with the object of using heat removed from milk in cooling it to heat water for washing.

Another display showed something of the researches of the Association on the possibilities of wind-power for electricity generation on different scales of use. A survey, for which several new measuring instruments have been developed, is in progress in western coastal areas of Great Britain and Ireland. Many specially favourable sites have been found, and pilot plants, of 100-kW. capacity, are being built in Orkney and for another site. The performance will be tested as a guide to the design of larger machines for which a basis has already been formed by comprehensive design and costing studies. At the same time, the study includes the design, development and use of smaller plants adapted to typical isolated communities in Britain and abroad where adequate alternative sources of power are difficult to come by. For topical interest, the actual record was displayed of the highest wind-speed yet recorded in the British Isles, namely, 125 m.p.h. on Costa Hill, Orkney, early this year.

LATTICE DEFECTS AND THE ELECTRICAL RESISTIVITY OF METALS

AN informal conference arranged by the Department of Metallurgy, University of Birmingham, and concerned with recent work on the influences of deformation and irradiation on the electrical properties of metals, was held in Birmingham during April 24-25.

Following an introductory survey by T. Broom (Birmingham), which served to enumerate some present-day problems, J. A. Manintveld (Delft) presented new results for the recovery of resistivity of pure metals after heavy deformation at low temperatures. There is general agreement that a well-defined recovery process occurring at around 0° C. is due to the movement of single vacancies; but a satisfactory account of recovery at lower temperatures is lacking. Prof. M. J. Druyvesteyn (Delft) discussed possible processes for this and also gave results of an investigation into recovery of mechanical properties of polycrystalline wires after low-temperature deformation.

Various mechanisms for the generation of vacancies and interstitial ions during deformation were critically reviewed by Prof. N. F. Mott (Bristol), and one of these, the intersection of screw dislocations, was used by H. G. van Bueren (Eindhoven) as a basis for a theoretical treatment of resistivity-extension curves in which a three-halves power law is obeyed. P. Jongenburger (Eindhoven) completed the discussion of vacancy effects in pure metals by describing his calculations of scattering due to single vacancies in copper, silver and gold.

A new theoretical treatment by S. C. Hunter and Dr. F. R. N. Nabarro (Birmingham) of the resistance due to screw and edge dislocations in metals was presented and the need for a calculation of scattering from stacking faults was pointed out. Predictions of anisotropic scattering from single dislocations formed the basis of an account given by C. W. Berghout (Delft) of some experiments on the anisotropy of resistivity of plastically stretched foils. J. F. Nicholas (Melbourne) gave results of an investigation into the validity of Matthiessen's rule for cold-worked metals

and alloys and put forward a qualitative interpretation of the small deviations found.

Resistance changes due to the irradiation of pure metals and the ordered alloy Cu₃Au by electrons, neutrons, deuterons, etc., were discussed by R. A. Dugdale (Harwell). As in deformation studies, recovery experiments reveal effects almost certainly due to the diffusion of vacancies, and indeed recent work at Harwell on Cu₃Au has shown very similar activation energies for recovery of resistivity measured after irradiation, after quenching and after cold-working.

Dr. K. Lücke (Göttingen) reviewed the influence of impurities in copper on the results of deformation and recovery experiments and also gave an account of work on resistance changes in iron due to strain-ageing. Two contributed papers dealt with resistance changes in alloys: Dr. W. H. Aarts and R. K. Jarvis (Johannesburg) reported increases of resistivity during room-temperature annealing of some silver-gold alloys following deformation at low temperatures; Dr. J. O. Linde (Stockholm) wrote giving the results of a study of the effect of deformation on the resistivity of certain binary, ternary and quaternary alloys of silver and gold with transition metals. Finally, J. F. Nicholas (Melbourne) pointed out the lack of any direct experimental or theoretical evidence for the supposition that large resistivity changes caused by the deformation of some alloys are due to the destruction of short-range order.

Many interesting points were raised in discussion and served to reveal the utility of resistivity studies as a means of investigating the structure of metals.

T. BROOM

CROSSED AMORPHOUS AND CRYSTALLINE CHAIN ORIENTATION IN POLYTHENE FILM

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THE structure of polythene film has been investigated by X-ray, optical and polarized infra-red methods. It was found that the polymer chains are oriented differently in the crystalline and the amorphous regions, the respective chain axes being perpendicular to each other. We are unaware of any previous investigations into the orientation in both crystalline and amorphous regions, and as a result this remarkable phenomenon has escaped notice.

Most polythene film is produced by extruding the viscous molten polymer through a slit, passing the resulting sheet downwards into a water quenching-bath, under an idler roller and finally on to a wind-up roller. The whole system is very nearly tensionless to prevent drawing of the film; nevertheless, the films produced do possess some orientation.

The samples available varied in thickness from 0.04 mm. to 0.11 mm. and proved to be of convenient thickness for all three experimental methods, and so no preparatory techniques which might have affected the molecular structure of the film were necessary.