

the lower temperatures; above room temperature there was little variation of characteristics. In most cases the square-law dependence of current upon voltage was obeyed over this whole temperature-range. High-speed switching characteristics of the diodes were described in a paper by A. M. Conning (University of Birmingham). For both 'switch-on' and 'switch-off' operation steady-state conditions were reached in a time less than 3 μ sec., the response time of the measuring equipment; charge storage effects in the diodes were undetectable. The final paper of this session was given by G. T. Wright and discussed the design of a proposed amplifying dielectric triode, which should possess a high input resistance, a large gain-bandwidth product, and be relatively insensitive to temperature changes. Calculations showed that the presence of shallow trapping levels (< 0.30 eV.) should result in the mutual conductance at high frequencies (> 10 Mc./s.) being many times greater than at audio frequencies.

The opening paper of the fifth session was given by W. J. Merz (R.C.A., Zurich) on the subject of ferro-electricity. Present ideas of basic mechanisms in 'soft' and 'hard' ferro-electrics were reviewed and outstanding problems such as nucleation and losses above the Curie point considered. In the following paper, by K. W. Plessner (British Dielectric Research, London) and R. West (United Insulator Division, T.C.C., Chessington), the influence of the chemical composition of high permittivity ceramics upon their electrical properties was discussed. The application of chemical processes on an industrial scale was then considered. J. H. Bruce and J. R. Balmer (Radio Research Establishment, Malvern) then discussed the need for thin-film capacitors and the suitability of an evaporation method for producing these. Experimental techniques and results for silicon monoxide

capacitors were described. The last paper of the session was given by R. C. Kell (G.E.C., Wembley), who discussed piezoelectric ceramics. It had been found that niobate ceramics retained their piezoelectric properties at temperatures considerably higher than ceramics based on barium titanate and that their properties showed less variation with temperature. In particular, sodium-cadmium and lead-barium niobates were more suitable than barium titanate ceramics for use in vibration detectors, ultrasonic generators, and resonators for filter networks.

The final session of the conference included contributions from S. Duinker (Philips, Eindhoven) on a square-loop ferrite device for the fast scanning of electroluminescent cross-bar systems; from D. W. G. Ballentyne (Siemens Ediswan, Harlow) on the possible explanation of electroluminescence as a disorder phenomenon; from R. M. Glaister (G. V. Planar, Ltd., Sunbury) on relaxation polarization dielectrics; from E. A. D. White (G.E.C., Wembley) on the effects of additives on the properties of barium titanate ceramics; from J. C. Burfoot (Queen Mary College, London), who discussed switching in ferro-electrics; from Mr. F. H. Stieltjes (Philips, Eindhoven), who discussed losses in ferro-electrics with particular reference to their use in parametric amplifiers; and G. T. Wright on the trap content of dielectrics with particular reference to the characteristics of dielectric diodes.

The conference emphasized that very great potentialities exist for the exploitation of dielectrics in devices although only limited practical progress has yet been made. There is no doubt, however, that the number and diversity of outstanding problems make this a most attractive field for both fundamental and applied research.

G. T. WRIGHT

THE NATIONAL RESEARCH DEVELOPMENT CORPORATION OF GREAT BRITAIN

IN view of the stress laid on the work of the National Research Development Corporation by Prof. C. F. Carter and Prof. B. R. Williams in "Science in Industry" and of the interest in the Corporation which Lord Hailsham has already shown, the Corporation's annual report for the year July 1, 1958-June 30, 1959, will doubtless be closely examined by scientists and technologists as well as industrialists (National Research Development Corporation. Report and Statement of Accounts for the year 1st July, 1958, to 30th June, 1959. Pp. ii + 22. London: H.M. Stationery Office, 1959. 1s. 3d. net). This year's report is limited to a factual account of the year's work, but the report comments on the greater attention now paid to the Corporation's work by the scientist and industry as well as by the general public, and confidence is expressed that the Corporation's unique experience will enable it to play an ever increasing part in the application of scientific ideas to industry. Revenue from inventions rose to £189,761, and there was also a non-recurring item of £92,978 from sale of patent rights. Government departments and research councils assigned patent rights in 119 cases, compared with 86 in 1958-59, 59 of the total of 187 coming from universities and 5 from industrial research associations, compared with 49 and 1, respectively, out of 147 in 1957-58.

Of 681 inventions communicated to the Corporation during the year, compared with 612 the previous year, 287 were from Government departments and research councils, 27 from Commonwealth official organizations, 60 from universities, 8 from industrial research associations and 296 from private firms and individuals, 263 in the United Kingdom. Holdings of British and foreign patent applications totalled 2,794, including 419 United Kingdom patent applications and 580 granted patents, 820 overseas applications and 975 granted patents.

Among new projects initiated during the year or reaching a stage suitable for report are Dr. I. E. Bush's automatic apparatus for chemical treatment and scanning of chromatograms, which has speeded up procedure considerably; the development of the new antibiotics called the cephalosporins, particularly cephalosporin C, which is resistant to destruction by penicillinase; Prof. E. C. Cherry's television compression system using a variable scanning velocity so adjusted as to keep the transmitted frequencies within a desired bandwidth. An experimental system based on a 30-line picture has been constructed, and a further experimental system operating on 405 lines is being developed. A contribution has been made towards the cost of equipment to assess a proposal for an improved rolling mill, using rolls supported in

hydrostatic bearings, and the Council decided in September 1958 to sponsor the development of Mr. C. S. Cockerell's inventions relating to "Hovercraft", and has formed a subsidiary company, Hovercraft Development, Ltd., to be responsible for its interest in this project. Financial assistance is being provided to complete the development of equipment capable of continuously processing hides and so giving increased capacity allied to smooth-running production and control. As a result of arrangements made by the Corporation to develop and exploit a new type of ditch cleaning media, a British manufacturer is building five prototypes, and the test results of the National Physical Laboratory on the robust and reasonably effective stabilizer designed in 1956 have now been checked on a full-scale ship.

Reference is also made to further developments in a process for producing acetylene by partial combustion of methane, to satisfactory negotiations for

financial support of the computer-controlled machine tool project to be taken over by more appropriate organizations; the completion of a further design study permitting detailed assessment of the economic advantage of Fanshawe's oil-well drilling rig, and of the initial three-year programme of work on the ion-exchange membrane project, under which a process has been developed for continuous electrochromatography. Considerable further development will be required before the hydrogen-oxygen fuel cell can be launched on a commercial basis. New licensing arrangements were set up with a leading ice-cream manufacturer, who is now in production for the project for a freezing mill after treatment with ultra-sonic waves and pouring into waxed paper containers, and the process appears to offer prospects in the Middle East. Following successful testing and demonstration of the prototype flexible container for transporting oil, seven others have been ordered for use in different parts of the world.

SOLAR STILLS IN IRAQ

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EXPERIMENTS with solar stills and related units have been in progress at the College of Science, Baghdad, to provide fresh water for Bedouin communities, and to investigate the concentration of natural to heavy water.

Several designs of solar still were tested. Fig. 1 shows a still with a hemispherical 'Perspex' canopy. The base flange was held by screw clips on a gasket in a circular water channel. The complete unit included a flat-plate collector used as a preheater to increase the output of distilled water. The hemispherical still and a prismatic type with a glass canopy have been in continuous operation without maintenance since 1956. Only recently have fine superficial cracks appeared in the 'Perspex'. In other respects these stills, of essentially simple design, have been satisfactory. Curves of water yield versus time and temperature versus time curves for the hemispherical 'Perspex' and prismatic glass stills, with no pre-heating, are plotted in Fig. 2. The effect of dropwise condensation on the 'Perspex' unit and back reflection is shown by the relative positions of the curves. The total water output and the dimensions of the stills are given in Table 1.

On the basis of 3.60 litres or 0.79 gal. per square metre per day, the output, for a coverage of 1 acre, would be some 3,200 U.K. gal./day. Similar results were obtained by Lof¹ at 0.69–1.07 gal./sq. metre/day. In alternative units, the amount of water from a solar still is approximately 1 lb./sq. ft./day.

In addition to providing fresh-water for small communities, in remote areas, another application is being considered. Thus, natural water contains 1 part of heavy water in 6–7,000 parts; therefore,

Table 1

| Solar still | Depth of water | Yield of water (litres/sq. m./day) |
|--------------------------------------------|-------------------|------------------------------------|
| Hemispherical canopy, radius 1.5 ft. | $\frac{3}{4}$ in. | 2.5 |
| Prismatic canopy, 6.0 ft. \times 2.2 ft. | $\frac{3}{4}$ in. | 3.6 |

very large quantities of water have to be vaporized or processed at heavy fuel costs. The relative volatility of heavy and ordinary water increases with decreasing temperature; this suggests the possibility of using solar evaporation and fractionation, which can proceed at relatively low temperatures and no fuel costs. One method of investigation is based on the flat-plate solar heater shown in Fig. 1, from



Fig. 1