FULMER RESEARCH INSTITUTE

ANNUAL REPORT FOR 1947-48

THE Fulmer Research Institute, opened in July 1947, is similar in constitution to the Battelle and Mellon Institutes; its first annual report includes a brief description of the main departments—chemistry, physics and engineering, metallurgy, heat treatment—and of their more important equipment. During the eighteen months under review, the staff increased from forty-five to sixty-five, and sixteen workers with university degrees or equivalent qualifications and sponsors' nominees are now engaged in the laboratories under the director of research, Mr. E. A. C. Liddiard. The scientific staff is headed by Dr. P. Gross and Dr. A. H. Sully.

Only a general account of work in progress is given in the report. The team working under Dr. Gross has been mainly concerned with further studies of the reaction between metallic aluminium and aluminium trichloride vapour at 900–1,000° C. and at a few mm. of mercury pressure to give aluminium monochloride, $AlCl$. The vapour thus formed decomposes again on cooling into the trichloride and aluminium, and the reaction is expected to provide the basis of a new process for extracting and refining aluminium by 'catalytic distillation'. A semi-technical plant is under construction, and the process may possibly permit the extraction of aluminium by carbo-thermic reduction of low-grade ores. Experiments on the possibility of refining other metals by a similar technique indicate that silicon, boron and nickel can be distilled in this way.

An investigation is also in hand to develop materials with improved properties at high temperatures, particularly chromium-base alloys, and for this purpose a high-frequency generator and furnace have been constructed. Machines have also been designed and constructed in the laboratory workshops for measuring the creep of alloys in tension and in compression up to 1,000° C., and have given results of surprising accuracy. Pure alumina crucibles and other shapes have been made by slip casting and firing in the laboratories, and in view of the good service obtained, research has been extended to the refractories field. The recrystallization of refractory oxides is being studied by X-ray diffraction, and a comprehensive investigation is being made of the mechanism of precipitation in high-purity aluminium-copper alloys, with particular reference to the effects of third elements on lattice spacing. The constitution of aluminium-tin alloys has been studied with particular reference to the solid solubility of tin in aluminium and to the effects of tin on mechanical and physical properties, casting characteristics and hardening by precipitation. The properties of fluxes used in remelting aluminium cuttings and turnings are being investigated with the object of increasing their efficiency in preventing oxidation and decreasing metal losses, and a comprehensive investigation on the corrosion of aluminium alloys used in buildings is in progress. The causes and prevention of blisters and similar defects in plated aluminium articles are being studied, and various problems associated with the development of high-speed knitting machines have been solved.

Some 138 inquiries, some outside the field of light alloys or metallurgy, were dealt with in the period. A list of published notes and papers is appended, together with the names of sponsors and a list of staff.

GLASSHOUSE RESEARCH

THE annual report of the Experimental and Research Station at Cheshunt always sets forth a crop of useful results; but the latest one, which is for 1947 (the Station, Turner's Hill, Cheshunt, Herts; 1948), provides the answers to many questions on glasshouse culture. J. Littlewood and O. Owen publish the results of extensive experiments on the relation between the amounts of plant nutrients in the soil and those in the plant, with particular reference to methods of soil extraction used in advisory analyses. They conclude that extractions for potash with $N/2$ acetic acid, and for phosphoric acid with distilled water, give the most practically useful results. This is important; but even more urgent is their insistence on the determination of total nitrogen for advisory purposes, and it is impossible not to agree most strongly with this conclusion. O. Owen and G. W. Winsor have also studied in detail the question of nitrification in glasshouse soils. Farmyard manure is now scarce, and O. Owen has a useful paper on the use of sodium alginate as a substitute for it in tomato composts. The preliminary trials show that it is quite satisfactory.

The tomato moth, *Diataraxia oleracea*, causes serious injury in some commercial glasshouses. A very detailed paper by E. R. Speyer and W. J. Parr assesses its economic importance, describes the various stages of its life-history, and reviews methods for control. The pest was responsible for an annual loss of crop worth £30,000 in the Lea Valley in 1918, was later controlled to negligible proportions as a result of Lloyd's advice to spray with lead arsenate, and again assumed serious proportions following war-time changes in cropping. D.D.T. can now be used successfully against this insect; but the paper also discusses the value of other substances and methods for control. The uses of insecticides for other particular purposes are described by W. H. Read. Azobenzene fumigant and petroleum emulsions provide about equal control of red spider, and the use of hexaethyltetraphosphate is promising.

Didymella stem rot is a serious trouble. It is shown by P. H. Williams to be more severe when nitrogen is in excess in the soil, and its spores can withstand freezing temperatures. W. H. Read has tried treatment with ethyl mercury phosphate; but this does not, as yet, provide a hopeful means of control. R. Howles shows, *inter alia*, that tomato plants kept turgid by the provision of adequate water had less severe virus symptoms than when less water is given. The control of soil pathogens by means of antibiotic substances is a fascinating possibility, and E. Grossbard has found that *Penicillium patulum* will produce a growth-inhibiting substance when cultured on sugar-beet pulp or straw with glucose. The substance is antibiotic to several organisms, including *Bacillus carotovorus*, *B. phytophthorum*, *Phytophthora parasitica* and *P. cryptogea*.

More general investigations, under the control of Dr. W. F. Bewley, director of the Station, include a comparison of sterilizing by steam and by formaldehyde, the use of straw between rows, the effect of withholding lime and phosphate, the usual variety trials, and experiments on watering. These have all yielded results suitable for immediate practical application, and represent the delivery of the digested work of the Station to the industry it serves so well.

J. GRAINGER