

of malaria-carrying mosquitoes. Excess of rotting vegetation in contact with the soil will thus exert a dual benefit.

A provisional attempt has been made to classify ferruginous waters. A ferruginous water is defined as one that contains a minimum of two parts per million of iron in solution or colloidal suspension. Many so-called 'rusty' waters show merely a deposit of rust-coloured sediment which has been thrown down at an earlier date; a deposit of this kind affords no proof that the water continues supercharged with iron. On the other hand, superficial films of 'rust' supply a more immediate indication of the presence of an unstable excess of iron in water. Such iron may be derived (i) from underground mineral sources such as pyrites, (ii) from vegetation rotted under anaerobic conditions in marshy soil, the iron-containing humus forming organic complexes with the iron present in the superficial soil, or (iii) in small amount, from the rotting of vegetation alone in the water.

On the biological side the work is incomplete. Observations on the natural fauna and flora of ferruginous waters have been rather limited; but such waters are characterized by an almost complete absence of water insects, aquatic helminths, Crustacea and Algæ. It has been found by experiment that mosquito larvæ (*Anopheles maculipennis* var. *atroparvus*), newly hatched from the egg, are unaffected by the iron-containing waters provided they are fed; but when placed in samples of such waters without added food they soon die of starvation. It is, therefore, concluded that mosquito larvæ fail to develop in rusty water from lack of food, which is ascribed in the main to the inimical effects of colloidal iron upon the growth of Algæ, Protozoa and other micro-organisms. There is no evidence that iron-containing surface films will suffocate the larvæ.

## FUEL RESEARCH

THE Melchett Lecture for 1944 of the Institute of Fuel was delivered on October 12 by Dr. J. G. King on the "Pattern of Fuel Research". Under this title he gave an account of the progress of fuel research seen as a whole, with main branches and sub-sections fitting together into patterns although the work may have been done in many places, by various organizations and individuals.

The three main patterns chosen were the hydrogenation, the gasification and the study of the constitution and properties of coal. Dr. King gave a survey of the development, from the first observations of Bergius in 1912, of the hydrogenation of solid coal, of the liquid products of carbonization and of petroleum. Actually the conversion of solid coal to liquid fuels ranging from heavy oil to light spirits and hydrocarbon gases involves an interwoven sequence of stages. Behind the large-scale operations now in use stands an immense volume of patient experiment to fix the choice of catalysts, temperature, pressure and other conditions necessary for success, some of which has been done at the Fuel Research Station under Dr. King's direction.

The carbonization of coal in ovens or retorts carries the limitation that only about one fourth of the raw coal can be recovered in the gaseous form. By gasification in the gas producer, it is possible to recover nearly all the fuel in a fluid form but unsuitable for

public supply. It came to be recognized that by substituting oxygen for air and working at pressures above atmospheric, the products of gasification could be modified in chemical composition to give a product more suited for public distribution. It happens that in our generation, the technique of oxygen production has so developed as to make it possible to use oxygen in fuel manufacture—at least in some countries. In Great Britain the Joint Research Committee of the Institution of Gas Engineers and the University of Leeds has pursued the problems involved for nearly ten years. It is found that a range of technique is possible, from direct hydrogenation of coal to methane, reaching to a synthesis of methane from the product of pre-gasification of coke by oxygen and steam. These investigations are now in the stage of large-scale operation. In the long run, the successful achievement of this part of the pattern of fuel research can have far-reaching effects.

Dr. King's third main branch of the pattern covers the study of coal constitution and properties both physical and chemical. This includes the immense volume of work done in laboratories all over the world. It would appear that the results of this work, though marked often by ingenuity and industry, have been, in the main, of academic value only, and no clear pattern is revealed. It is thus unlike the first two branches, which concern themselves with the developments of processes. The study of constitution and properties must, however, be of assistance to them.

Dr. King's lecture can be commended as an excellent picture of the pattern of current research on fuel.

## FORTHCOMING EVENTS

### Saturday, December 2

INSTITUTE OF PHYSICS (LONDON AND HOME COUNTIES' BRANCH) (at the Royal Institution, Albemarle Street, London, W.1), at 2 p.m.—Conference on "The Selection and Training of Personnel for Industry" (to be opened by Major F. A. Freeth, F.R.S.).

GEOLOGISTS' ASSOCIATION (at the Geological Society of London, Burlington House, Piccadilly, London, W.1), at 2.30 p.m.—Dr. G. M. Lees: "The Geology of the Oilfields of the Middle East".

SHEFFIELD METALLURGICAL ASSOCIATION (joint meeting with the IRON AND STEEL INSTITUTE and the SHEFFIELD SOCIETY OF ENGINEERS AND METALLURGISTS) (at the Royal Victoria Station Hotel, Sheffield), at 2.30 p.m.—Discussion of Papers presented to the Iron and Steel Institute.

### Monday, December 4

ROYAL SOCIETY OF ARTS (at John Adam Street, Adelphi, London, W.C.2), at 1.45 p.m.—Dr. S. K. Kon: "Milk"; (3) "Milk in relation to Human Nutrition—Recent Aspects" (Cantor Lecture).

FARMERS' CLUB (at the Royal Empire Society, Craven Street, Strand, London, W.C.2), at 2.30 p.m.—Mr. H. R. Davidson: "Pigs in the Long Range Policy".

ROYAL GEOGRAPHICAL SOCIETY (at Kensington Gore, South Kensington, London, S.W.7), at 5 p.m.—Dr. J. K. St. Joseph: "Air Photography in Archaeology".

SOCIETY OF ENGINEERS (at the Geological Society, Burlington House, Piccadilly, London, W.1), at 5 p.m.—Mr. E. S. Waddington: "The Welding of Aluminium"; Dr. H. G. Taylor: "Light Alloy Welding".

### Tuesday, December 5

ROYAL ANTHROPOLOGICAL INSTITUTE (at the Royal Geographical Society, Kensington Gore, London, S.W.7), at 1.30 p.m.—Mrs. Olive Murray Chapman: "A Journey across Madagascar".

BRITISH SOCIETY FOR INTERNATIONAL BIBLIOGRAPHY (at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2), at 2.30 p.m.—Mr. W. C. Cooper: "The Classification and Indexing of Technical Aeronautical Information"; Dr. J. A. Wilcken: "Abstracting, Indexing and Classification".

ROYAL INSTITUTION (at 21 Albemarle Street, Piccadilly, London, W.1), at 5.15 p.m.—Sir Henry Dale, O.M., G.B.E., Pres.R.S.: "Modern Developments in Chemical Therapeutics"; (i) "Beginnings of Chemotherapy".

INSTITUTION OF CIVIL ENGINEERS (STRUCTURAL AND BUILDING ENGINEERING DIVISION) (at Great George Street, Westminster, London, S.W.1), at 5.30 p.m.—Prof. A. J. Sutton Pippard and Letitia Chitty: "Some Problems presented by Cable Bracing".

QUEKETT MICROSCOPICAL SOCIETY (at the Royal Society, Burlington House, Piccadilly, London, W.1), at 7 p.m.—Exhibits.