and therefore in this book is only mentioned in that category, apropos of which the reviewer was surprised to find a remark about foxes killing weakly sheep. That hill foxes commonly take the small lambs of mountain sheep is well known, as it is that the lowland foxes will very occasionally lift a weakly or dead lamb; but that foxes often tackle sheep, even weakly ones, is definitely another matter. The reviewer, with more than forty years experience of the deeds and misdeeds of foxes, has never come across a case.

The chapter on the enemies of game, which treats of the birds and mammals that are adversaries, also many that are quite harmless, such as the barn owl, contains much that is useful; but the chapter devoted to the preservation of game is the one that provides most food for thought. Its remarks on the changed and changing balance of Nature, on the effect of shooting, plus game preservation, on British wild life, together with comments on the 'bird crank', the collector, the scientific ornithologist, etc., and the controversies that have arisen between them, are well worth reading and much to be commended, as are the author's liberal views on the preservation of the rarer predators.

F. PRIT

ELECTRIC POWER SYSTEM CONTROL

Electric Power System Control

By H. P. Young. (Monographs on Electrical Engineering, Vol. 11.) Second edition, revised and enlarged. Pp. xii+369. (London: Chapman and Hall, Ltd., 1946.) 25s. net.

A HOUSEHOLD electricity supply installation exemplifies in the simplest form and on a small scale the power systems, the control of which is described in the book under review. In the case of the household model in Britain there is usually only one source of supply. Its capacity is of the order of 5 kilowatts at 230 volts. It is subdivided at a distribution box from which circuits of about 1 kW. capacity radiate to the different parts of the premises and supply lights, radiators, cookers, power plugs and the like. Each circuit is controlled by a simple hand-operated switch, and provision in the form of fuses is made for automatically disconnecting circuits which become faulty. All apparatus and wiring is well protected against mechanical damage so that faults are infrequent.

In the power systems which supply domestic and industrial consumers, the distribution is at 400/230 volts and each distribution circuit is of about 200 kW. Supplying the distribution system, there is a network of higher voltage cables working at, say, 11,000 volts, each capable of carrying about 4,000 kW. The 11,000 volt systems are in turn supplied by 33,000 volt or 66,000 volt systems, with proportionally higher power-carrying capacities.

All these systems are interconnected by the Grid, which operates at 132,000 volts and which has standard circuits of 90,000 kW. capacity.

The Grid and the correlated systems already mentioned are subjected to hazards from lightning, aircraft, accidents and tempests. It is not economically practicable to preclude the occurrence of faults arising from such causes, so that efficient means for

disconnecting faulty sections must be provided. The circuit-breakers and associated relaying systems for the Grid must disconnect almost instantly faults which may reach magnitudes of the order of 2,000,000 kW. During the War, faults of maximum severity occurred very frequently, and the almost perfect continuity of electricity supply during that abnormal period provided final evidence of the value of an interconnected power system to Britain.

In peace, the main objects of power systems are to secure maximum overall economy of production and the best practicable degree of continuity of supply.

It is now well known that the Grid has made an important contribution to the national welfare by reducing the average fuel consumption per kilowatt hour generated by some 15 per cent compared with pre-Grid generation by smaller power systems working independently.

An extremely satisfactory standard of reliability of service has likewise been attained.

The book under review draws largely from Grid practice. It provides technical information regarding the equipment which is used to control individual components in generating stations and interconnected working of power systems. It also provides a clear picture of the underlying principles of parallel operation.

Circuit-breakers, which are probably the most important component in the control of a power system, are admirably dealt with, and the latest forms of oil and air-blast types are adequately described.

Apparatus and methods for control and regulation of voltage, frequency and power flow also receive sufficient attention to satisfy the needs of users of electrical power plant. All of the foregoing components have been evolving for almost fifty years, and they are approaching stability of form and principle. There are, however, items of control equipment which have only been brought into being since the Grid was started in 1927. These are instruments and relays for indicating in a central control room electrical measurements such as power flows. These remote indications, as they are termed in electricity supply circles, are transmitted over telecommunication channels or actual power lines by high-frequency carrier currents. The same principles as are used for indications can be applied to remote control of plant and equipment, and the present trend is towards such control.

Mr. Young gives a good exposition of remote control and indication as at present used on the Grid system. It is probable that there will be great and even revolutionary developments in this branch of power system control, when the possibilities of apparatus used for war purposes become more widely appreciated.

A comprehensive bibliography is provided which will help those desirous of exploring the subject more completely. The diagrams and illustrations, although rather lacking in character, are adequate for their purpose.

The first edition of the book appeared in 1942 and the second in 1946. As only a few thousand people are intimately interested in power system control, this constitutes an excellent testimony to the value of Mr. Young's book. The reviewer considers that the book is an excellent basic treatise on a subject of growing importance, and hopes that further editions will appear as and when technical developments justify them.

C. W. MARSHALL