2,000 YEARS OF ENGINEERING

SIR CLAUDE GIBB's presidential address to Section G (Engineering) traces the development of engineering from prehistoric times up to the present day and concludes with a prediction of future developments.

Engineering was born of the requirements of man, who, during his gradual development from a barbaric savage, fashioned tools and weapons to obtain food and to protect himself from the beasts of the forests. With the growth of civilization, man required irrigation schemes, canals, docks and harbours, good roads, palaces and temples, and the engineer had to use much ingenuity to provide these wants.

Ancient Greece furnished us with a number of eminent engineers, including Alexandrinus, Hero of Alexandria and Archimedes, and their work formed the basis for our knowledge of many subjects. The Romans also did much to further the art of engineering, the building of roads being one of their greatest achievements.

As the mining industry in Great Britain developed, some form of pumping engine and raising gear became necessary. Engineers turned their attention to this problem, which resulted in the introduction of the reciprocating engine. Engines of this type were also used for driving the paddle-wheels of sea-going vessels, and this eventually led to the introduction of screw propulsion, and the general use of steam engines at sea.

Some cheap and quick method of transporting coal from inland collieries to the river shipping points led to the construction of steam locomotives for coal haulage, and later the steam locomotive was adapted to passenger-train service.

Tribute is paid to the work of the engineers and physicists who gave us the laws of thermodynamics. Watt, Count Rumford, Carnot, Joule, Sir William Thomson, Rankine and Clausius all played their part, and it was the work of these physicists that made possible the rapid advances in steam engineering.

Due to the activities of many inventors, the beginning of the nineteenth century was an important period in the history of electricity. Electric generators came into being, and the electric telegraph services were introduced. Later the trans-Atlantic telegraph services, the telephone and electric lighting all made their appearance. Sir Joseph Wilson Swan and T. A. Edison gave us the incandescent electric light; then came the public lighting companies, followed by Ferranti and his work at the Deptford Power Station.

Equally important developments took place in the prime movers for driving the electric generators. Starting with the semi-portable agricultural type of engine, the Peter Brotherhood high-speed direct-coupled engine was introduced, followed by the Parsons epicycloidal engine, the Willans engine, the Bellis engine and finally, in 1884, the Parsons turbine. After the success of the turbine for the driving of electric generators, Parsons attacked the problem of adapting the turbine to marine propulsion and, after many initial disappointments, was equally successful. It was Sir Charles Parsons's work which made possible the large turbo-alternators used in central power stations and the large liners, cargo vessels and naval ships of to-day.

The advent of coal gas at the beginning of the nineteenth century saw the introduction of the gas engine and its development by Otto and Clerk. While these developments were taking place, the discovery of petroleum led to the use of oil instead of gas as fuel, the earliest oil engine to achieve success being the Priestman engine introduced in 1885. The Daimler engine followed; this was the beginning of the modern petrol engine, and its dramatic use for nearly all modern self-propelled vehicles.

The success of the petrol engine on land was followed by its use in the air. During the First World War, rapid advances were made in the design of aeroplanes, and in 1919 the Atlantic was crossed by aeroplane. Research work undertaken by Sir Frank Whittle gave us the jet-propelled aeroplane, and the development work during the Second World War produced the large aircraft used for the present-day long-distance passenger services.

Although efforts had been made at the beginning of the century to introduce gas turbines, it was not until about 1935 that serious attention was again given to the subject. While the War slowed up these developments, work still proceeded. On the Continent, gas turbines for outputs up to 27,000 kW. are in operation and in Great Britain machines of 10,000 kW. and 15,000 kW. are nearing completion.

In recent years considerable attention has been given to the work of the scientific men investigating nuclear energy, and to the possibilities of adapting this source of energy to commercial work. The first atomic pile was put into operation in the United States in 1942, and during the War considerable progress was made. Since 1945 atomic energy establishments have been put into operation in Great Britain at Harwell and at Sellafield.

In predicting the developments of the future, Sir Claude considers large-scale railway electrification is possible, following the production of electrical energy from the use of fissile material. To justify the high initial cost of an atomic energy plant, the production of electrical energy by fission must be carried out on a large scale, and so electrification of railways using electrical energy on a large scale will automatically result. He considers the jet or gas turbine cum jet will be used to the exclusion of all other means of propulsion for all types of aircraft. This type of prime mover meets the requirements so admirably that it is difficult to see how any other form of prime mover can compete. On land, the gas turbine will be used possibly to supplant the Diesel engine; but for very large powers the steam turbine will still be used. He sees no difficulty in making gas turbine units of 100 h.p. which could be fitted to motor-cars within the space now occupied by petrol or Diesel engines, the only problems requiring solution being a low cost and highly efficient regenerative heat exchanger.

Large-scale use of electricity for pump-produced rain and for soil heating will help to solve our ever-growing food shortages, and supersonic frequency electronically produced vibrations will become an everyday thing in our industrial, domestic and medical life.

EARLY CELTIC METAL-WORK IN BRITAIN

THE presidential address to Section H (Anthropology), by Sir Cyril Fox, opens with a reference to the great collection of Celtic metal-work from Llyn Cerrig, in Anglesey, of the period 150 B.C.–A.D. 50, spread out on a workroom bench in a museum in war-time. For a study of parallels to