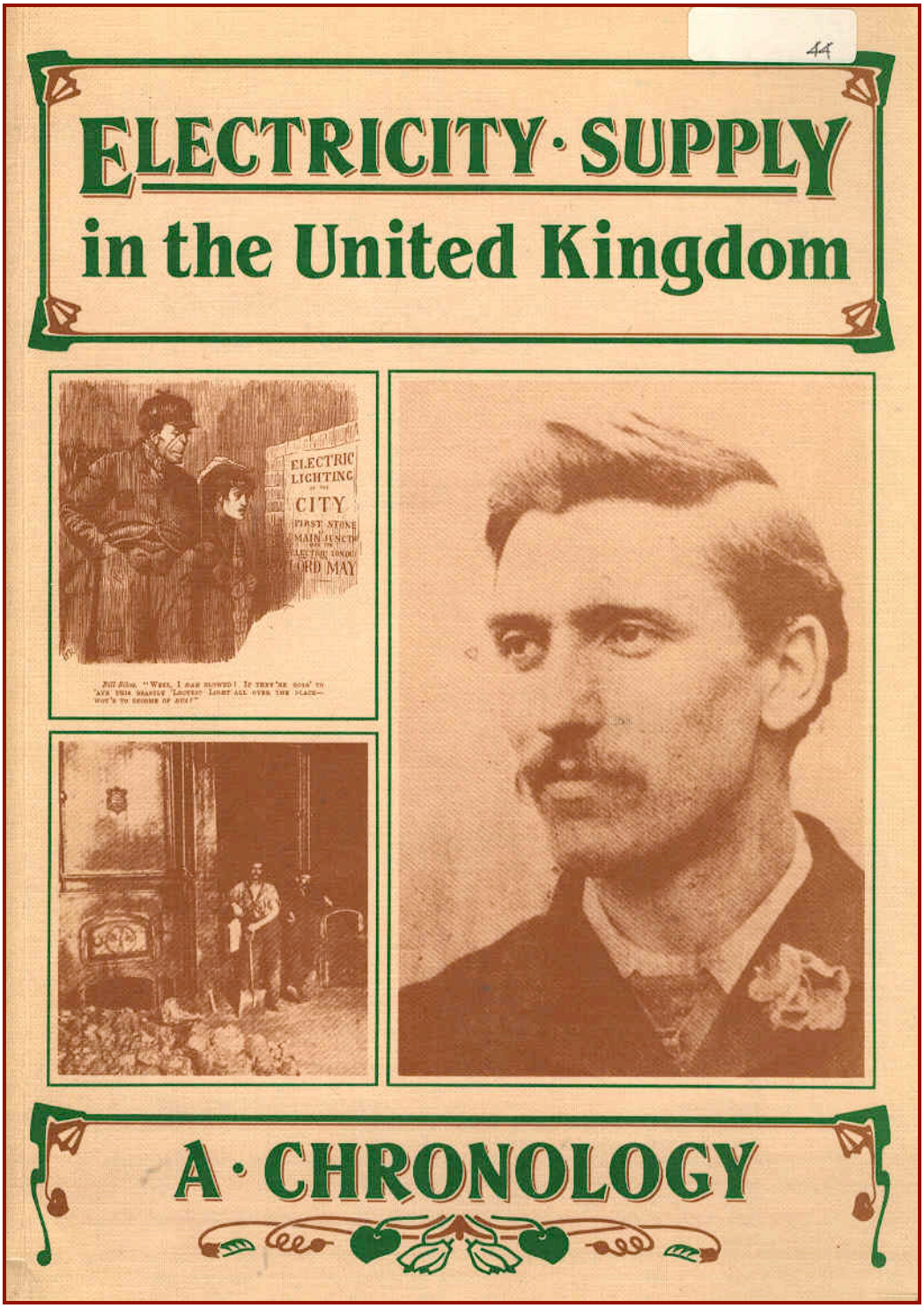


An Electricity Council Book of 201 pages, 1987 (first published 1973)

Punch Carton 21 February 1891 *Sebastian Ziani de Ferranti (age25)*
Hastings Electricity Works 1909

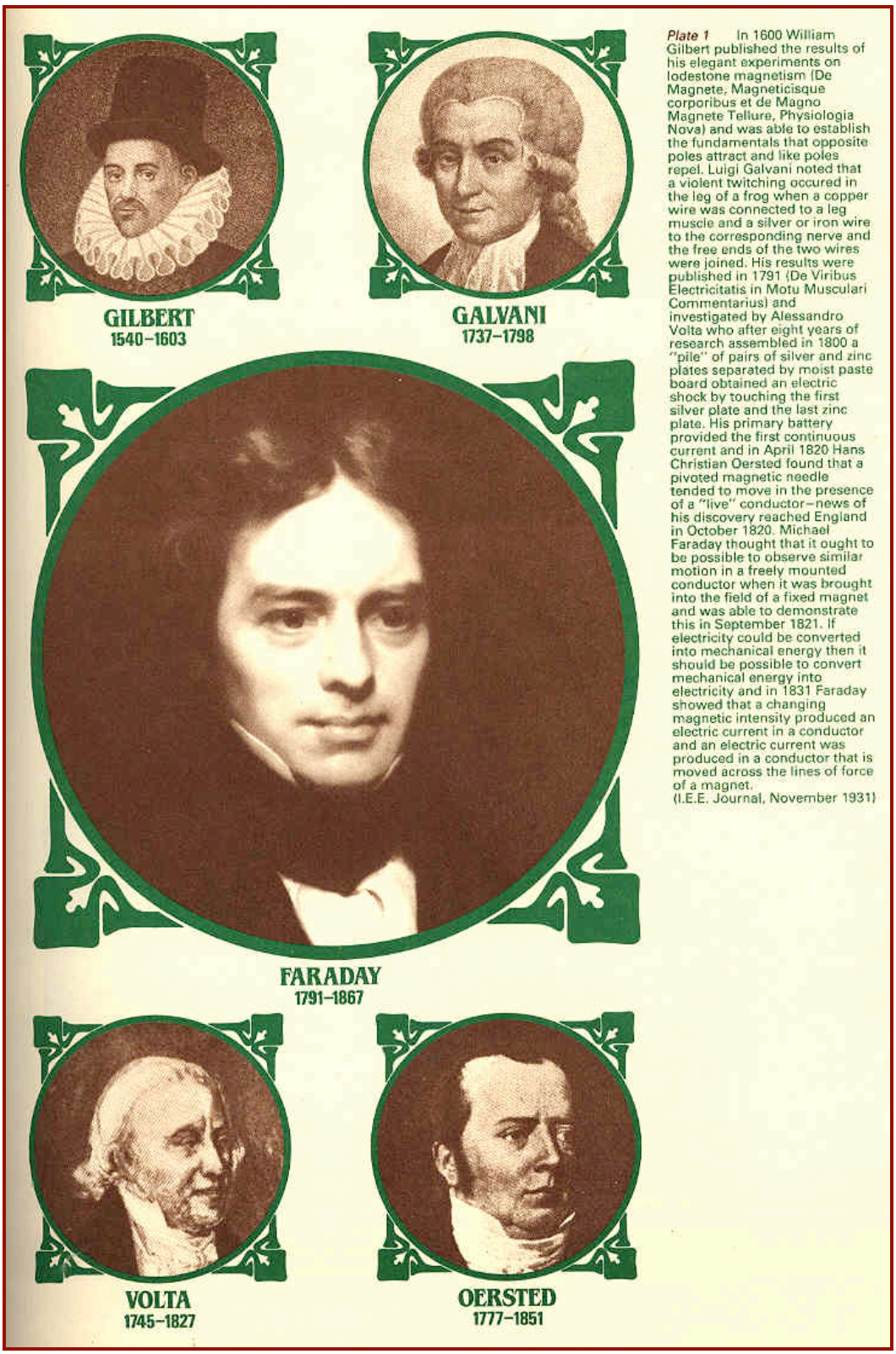


Plate 1 In 1600 William Gilbert published the results of his elegant experiments on lodestone magnetism (De Magnete, Magneticisque corporibus et de Magno Magnete Tellure, Physiologia Nova) and was able to establish the fundamentals that opposite poles attract and like poles repel. Luigi Galvani noted that a violent twitching occured in the leg of a frog when a copper wire was connected to a leg muscle and a silver or iron wire to the corresponding nerve and the free ends of the two wires were joined. His results were published in 1791 (De Viribus Electricitatis in Motu Musculari Commentarius) and investigated by Alessandro Volta who after eight years of research assembled in 1800 a "pile" of pairs of silver and zinc plates separated by moist paste board obtained an electric shock by touching the first silver plate and the last zinc plate. His primary battery provided the first continuous current and in April 1820 Hans Christian Oersted found that a pivoted magnetic needle tended to move in the presence of a "live" conductor—news of his discovery reached England in October 1820. Michael Faraday thought that it ought to be possible to observe similar motion in a freely mounted conductor when it was brought into the field of a fixed magnet and was able to demonstrate this in September 1821. If electricity could be converted into mechanical energy then it should be possible to convert mechanical energy into electricity and in 1831 Faraday showed that a changing magnetic intensity produced an electric current in a conductor and an electric current was produced in a conductor that is moved across the lines of force of a magnet.
(I.E.E. Journal, November 1931)

Some pioneers of electricity

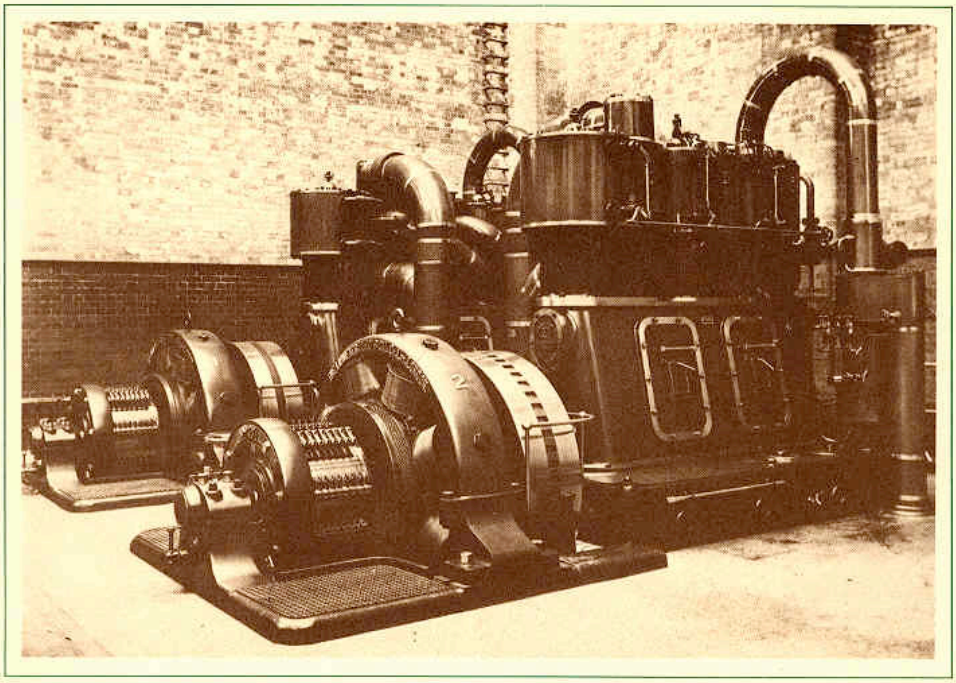
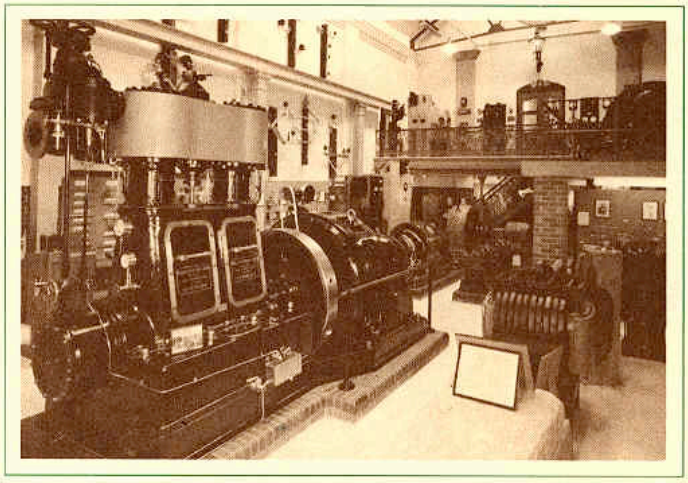
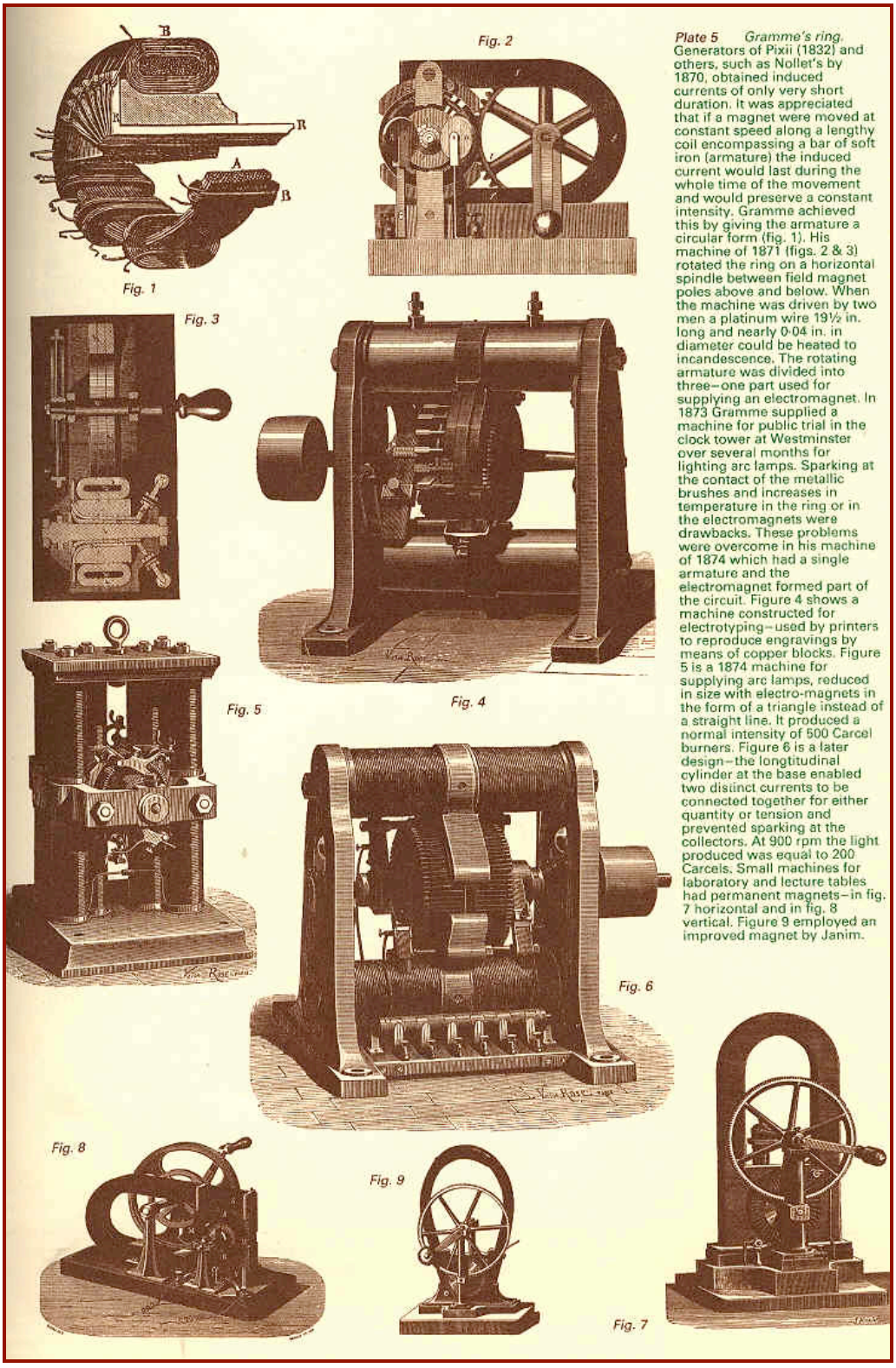


Plate 6 Top–Willans central valve reciprocating engine introduced in the 1880's. Its high rotational characteristics made it particularly suitable for the direct driving of generators, avoiding rope-drive, and this combined with the reliability due to its mechanical perfection, soon gained for it an overwhelming predominance in power station work. For several years it had no real competitor until the Bellis high-speed engine with its advantages of double-acting cylinders and forced lubrication, entered the same field. These engines were not suited for outputs much in excess of 1·5 MW and the demand for larger powers was satisfied by the introduction of the Parsons steam turbine from 1889.
(E.C. Archives)

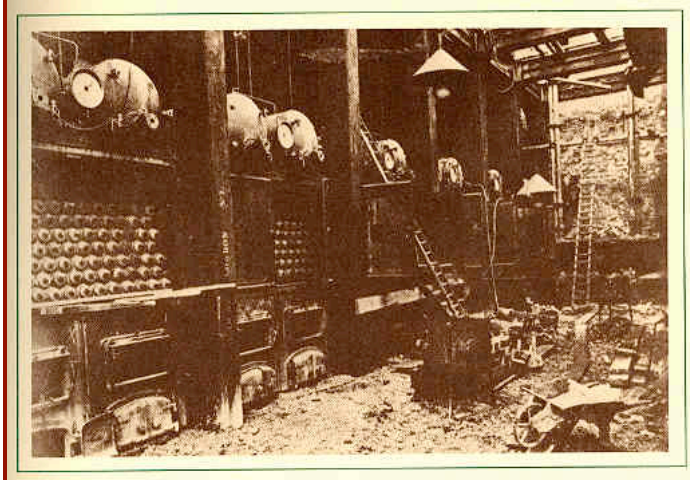


Right–Bellis and Morcom 300 hp engine driving a G.E.C. 200 kW generating set (c. 1913). Now restored and located in the lower gallery at the Southern Electricity Museum, Bargate, Dorset. (Courtesy Southern Electricity Museum)

Willans reciprocating engine 1880s (top)
Bellis & Morcom 300 hp engine, 200 kW GEC generator c.1913



A variety of generators from around the 1870s



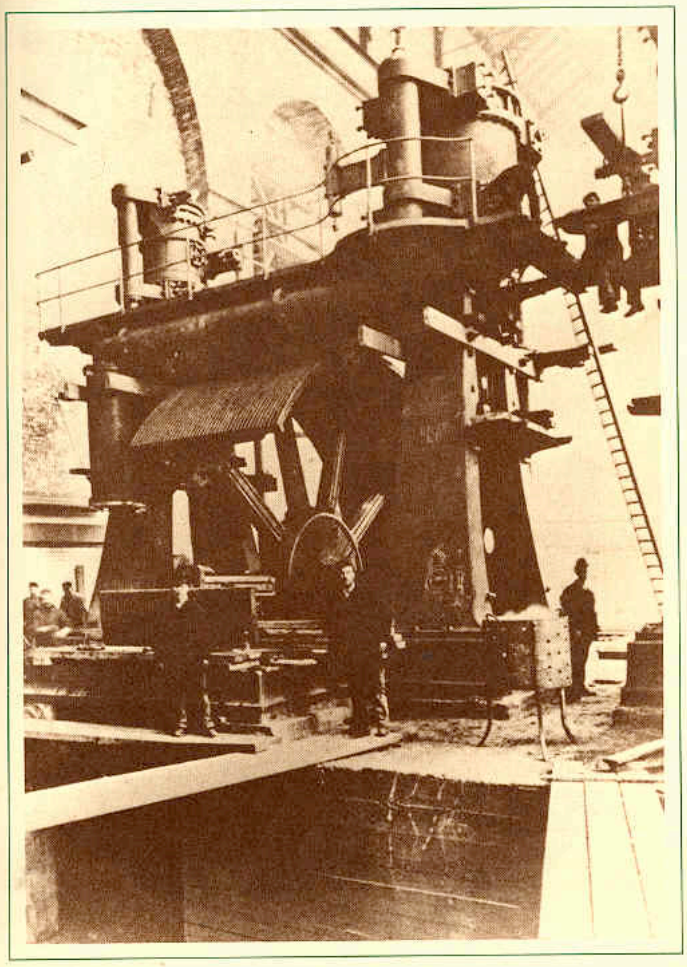


Plate 7 *Deptford Power Station under construction 1889.* Work on site commenced April 1888 and carried on night and day–by midsummer 1889, 24 Babcock and Wilcox boilers with a total steaming capacity of 414 k lb/h had been installed.

Left–B. & W. hand-fired boilers of type W.I.F. (wrought iron front). Power stations needed high pressure and rapid steaming capacity–requirements which the water-tube type successfully met. By October 1889 engines and alternators of 3,000 hp were operating and the provision of regular supplies began on 16 February 1891.

Below–Compound vertical inverted 1,500 hp Corliss marine-type engine by Hick Hargreaves. Diameters of cylinders were 28 in. and 56 in., and the stroke 4 ft. Running speed was 78 rpm with drive by means of 40 × 5 in. cotton ropes fitted to the drum/flywheel of each machine–22 ft. in diameter and weighing 60 tons. (E.C. Archives)

Deptford Power Station under construction 1889 (top) Corliss engine

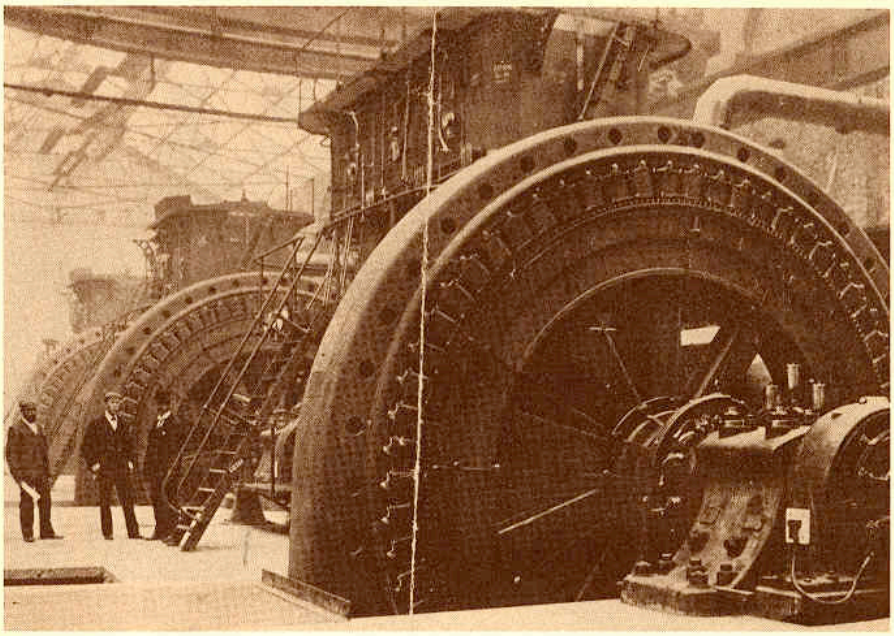
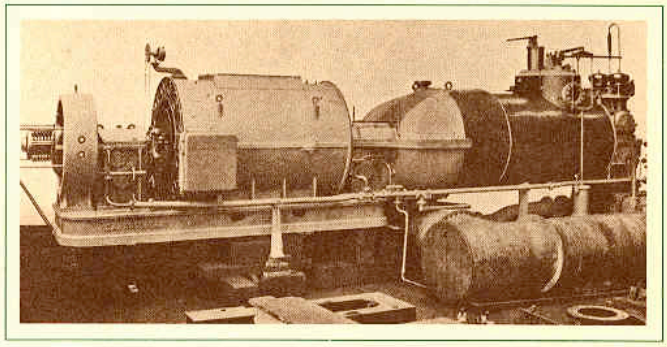
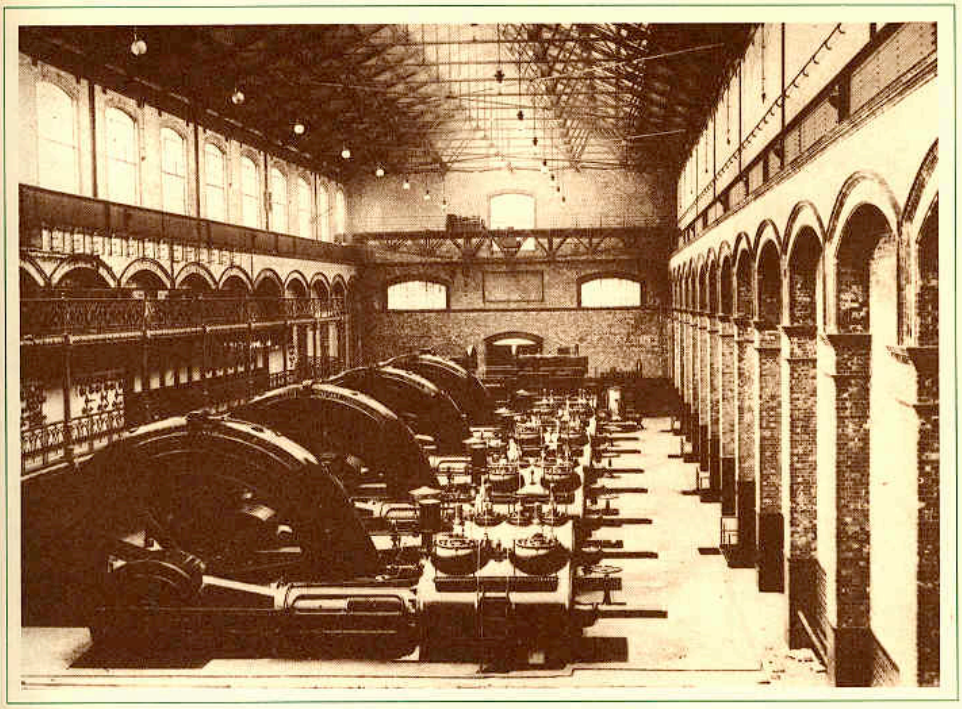


Plate 10 Above–*Willesden (Acton Lane) Electricity Works of the Metropolitan Electric Supply Company*–engine house at 9 October 1899. The station replaced the Manchester Square, Sardinia Street, Amberley Road, Rathbone Place and Whitehall Court stations. Transmission was over five miles at 10 kV two-phase, 60 Hz, each phase carried by a separate two-core concentric cable having the outer conductor earthed at the power station. The three Westinghouse engines were of the enclosed compound vertical marine type, with cylinders 36 in. and 55 in. diameters by 36 in. stroke, running at 120 rpm and each powered a 1·5 MW Westinghouse alternator. (E.C. Archives)



Right–A 2 MW Parsons turbo-alternator set (1904) installed at the *Carville "A" station, Wallsend, of the Newcastle-upon-Tyne Electricity Supply Company Ltd.* It generated at 6·6 kV, three-phase, 40 Hz at 1,200 rpm. Steam conditions at the turbine stop valve were 440°F and 200 lb/in². The set had previously been at Neptune Bank before it was shut down, and moved from Carville to the Philadelphia Station to make way for Parsons sets of 3·5 MW. Carville was designed by Merz and McLellan and was an important breakthrough in station design, with a capital cost of £15/kW compared with the average figure of £40/kW. ("The steam turbine as applied to electrical engineering" by Parsons, Stoney and Martin. I.E.E. Journal Vol. 33, No. 167, 1904)

Willesden (Acton Lane) Electricity Works 1899
2 MW Parsons turbo-alternator 1904



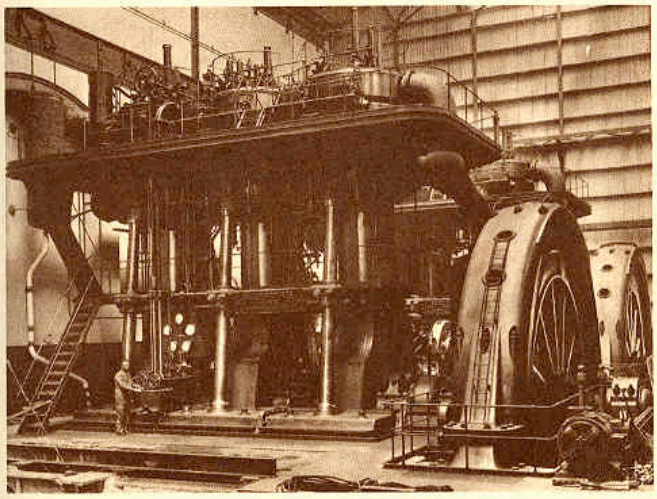


Plate 11 *Bow generating station* of the Charing Cross and Strand Electricity Supply Corporation Ltd.—engine room 1905.

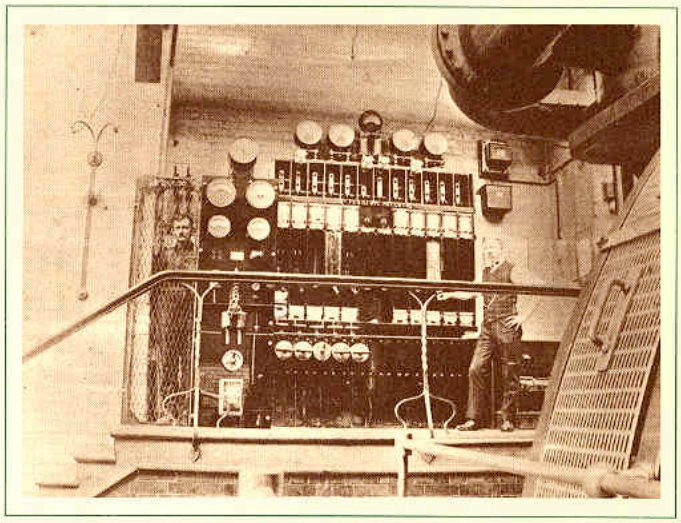
Above—four 1·6 MW (2,500 hp) horizontal cross-compound Sulzer engines with Lahmeyer flywheel alternators on the centre of the crankshaft.

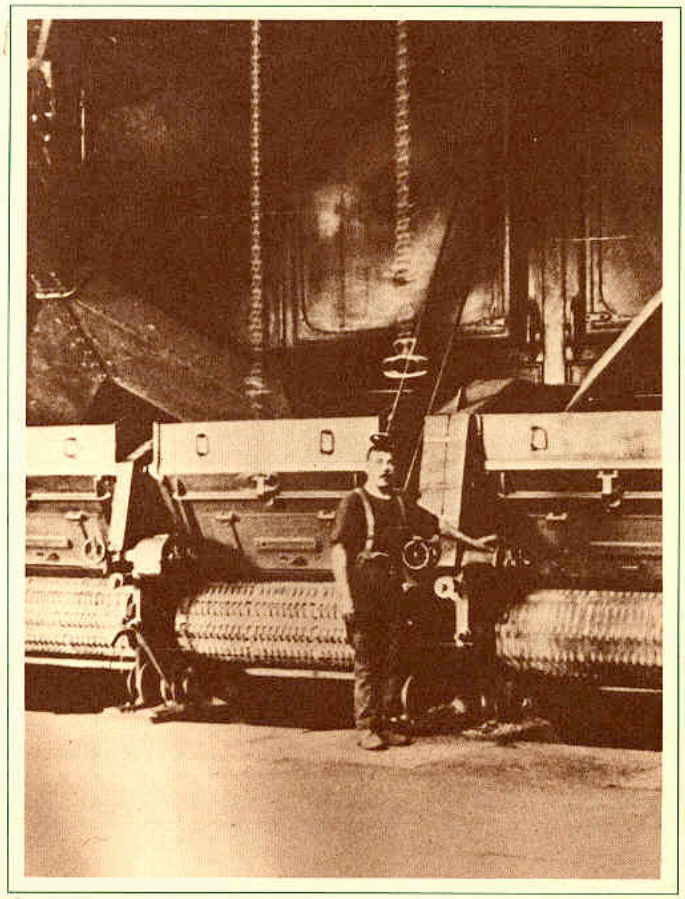
Left—a pair of 4 MW vertical three-crank compound Sulzer engines driving Lahmeyer alterntors from the end of their crankshafts which were completed in 1904 and 1905. An HP cylinder 50¼ in. in diameter was located between two LP cylinders 70⅞ in. in diameter, all with a stroke of 51¼ in. The engines reached 33 ft. 4 in. above floor level and weighed 450 tons each without the alternator. The plant ran at 83·3 rpm.
(E.C. Archives)

Bow Generating Station of the Charing Cross & Strand Electricity Supply Corporation 1905
Two 4 MW Sulzer engines driving Lahmeyer alternators 1905

Plate 12 Right–Switchboard for 330 kW PS at Watford 1897. Plant comprised three Raworth universal engines coupled direct to Mordey inductor alternators.

Below–Nos. 5 & 6 boilers at Walthamstow showing bunker-fed travelling grates c. 1925. Seven Babcock & Wilcox boilers steamed 14·1 MW of plant in nine sets–the largest 5 MW. (E.C. Archives)





330 kW switchboard at Watford 1897
Boilers with travelling grate stokers, Walthamstow c.1925

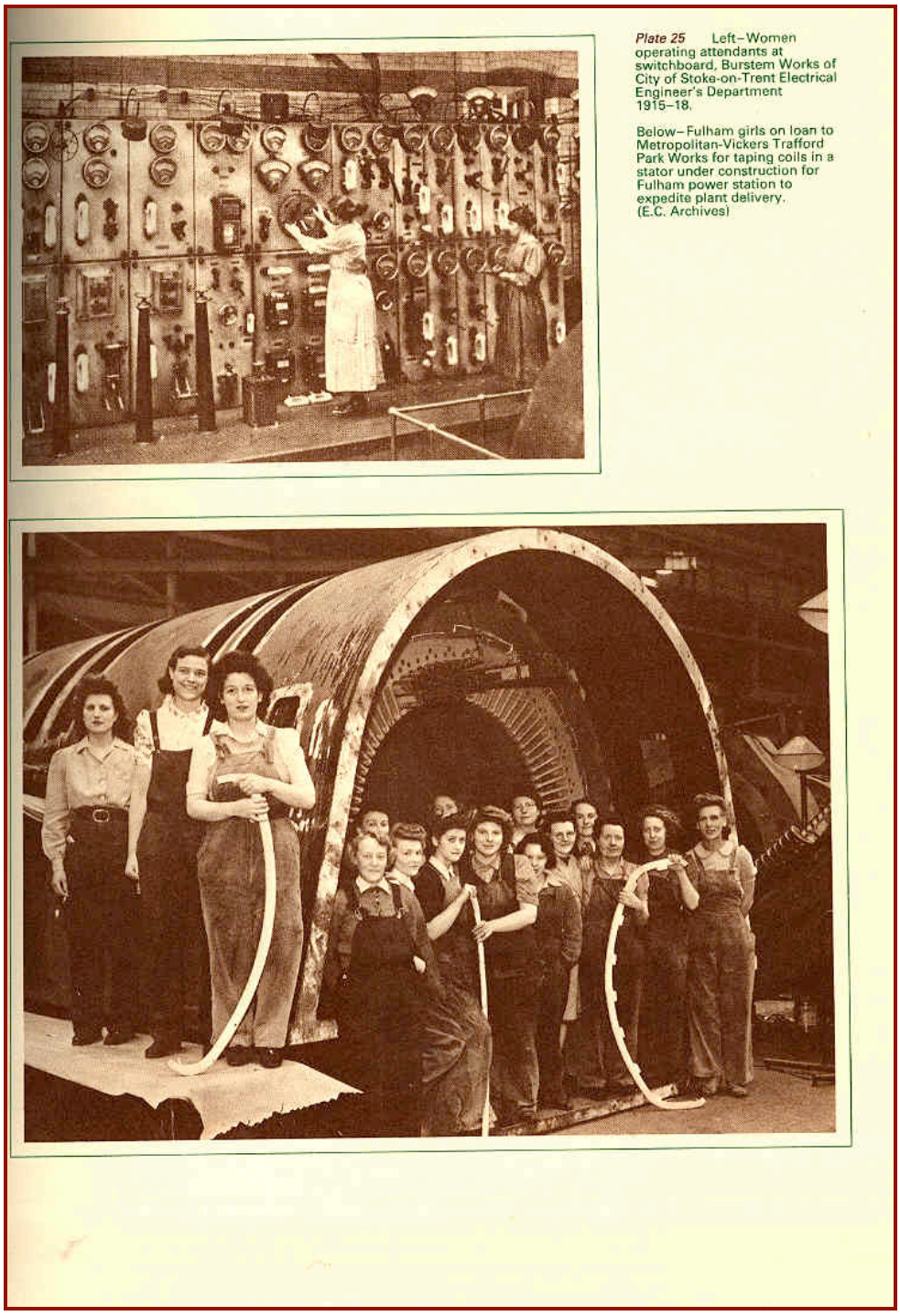


Plate 25 Left–Women operating attendants at switchboard, Burstem Works of City of Stoke-on-Trent Electrical Engineer's Department 1915–18.

Below–Fulham girls on loan to Metropolitan-Vickers Trafford Park Works for taping coils in a stator under construction for Fulham power station to expedite plant delivery. (E.C. Archives)

Women switchboard operators, Stoke on Trent 1915-18
Metropolitan-Vickers Trafford Park Works

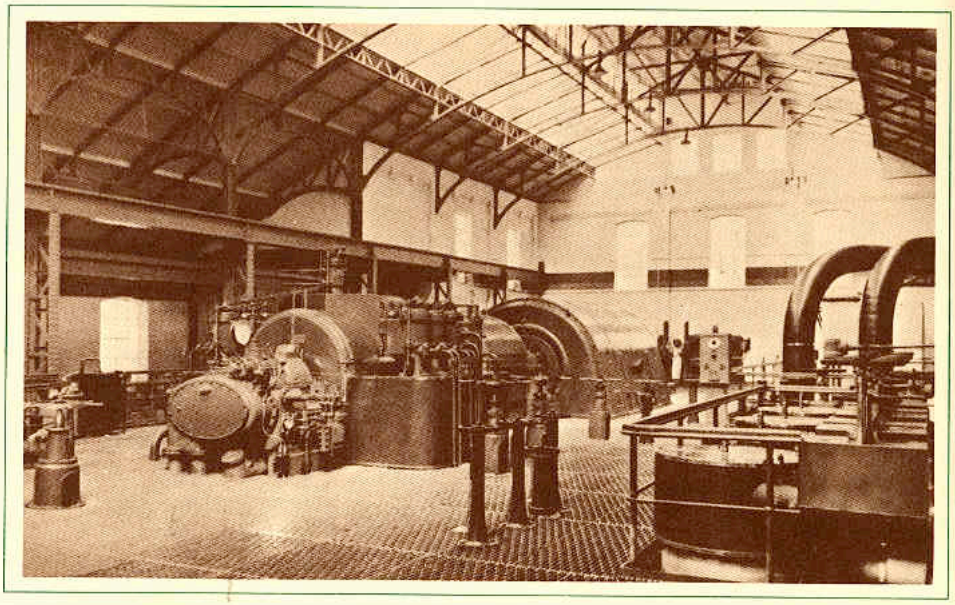
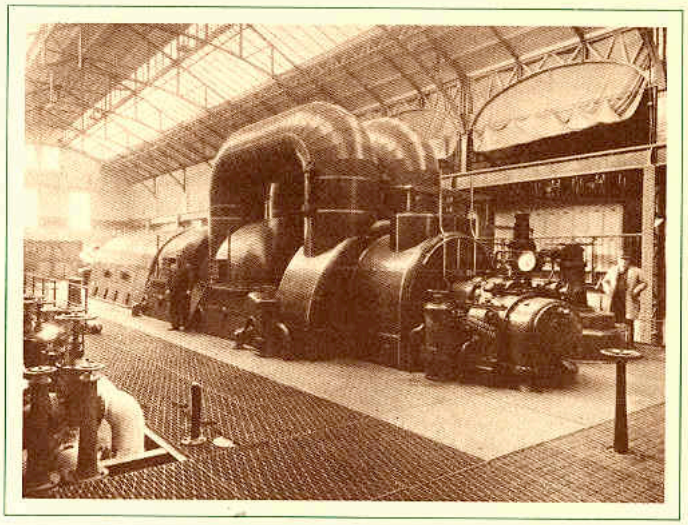
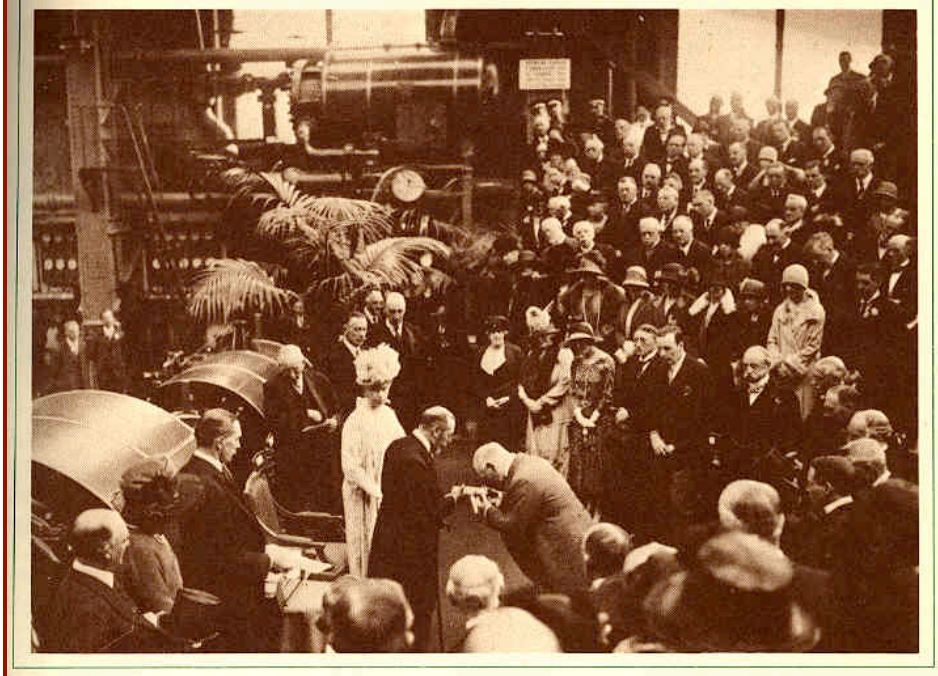


Plate 28 The Brimsdown "A" and "B" stations of the Northmet Power Co. embodied generating plant unique in its time and of high efficiency. A 53 MW cross-compound set by Metropolitan-Vickers of very advanced steam conditions commissioned at the "A" station in 1938.

Above – The 19 MW primary HP set and right the 34 MW condensing LP set. Both sets generated at 33 kV direct to busbars. Stop valve steam conditions were 1,900 lb/in^2 at 930°F with reheat at 160 lb/in^2 to 810°F. Steam was provided by two 210 klb/h Loeffler boilers manufactured by Mitchell.
("Engineering" May 26 & June 2 & 9, 1939)



Generating sets 1939
Brimsdown station of Northmet Power Co 1938



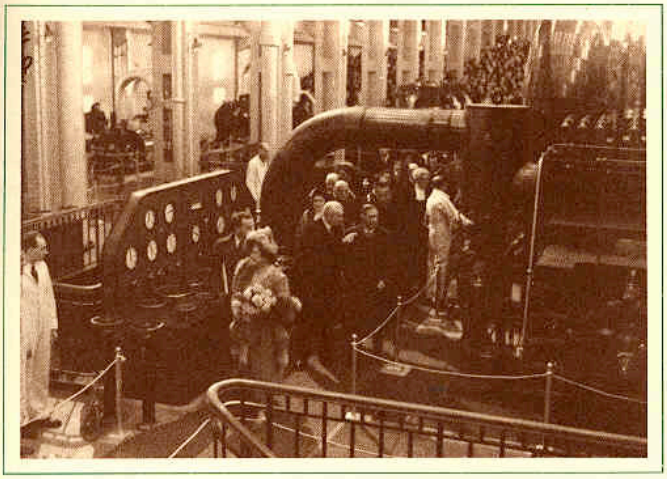
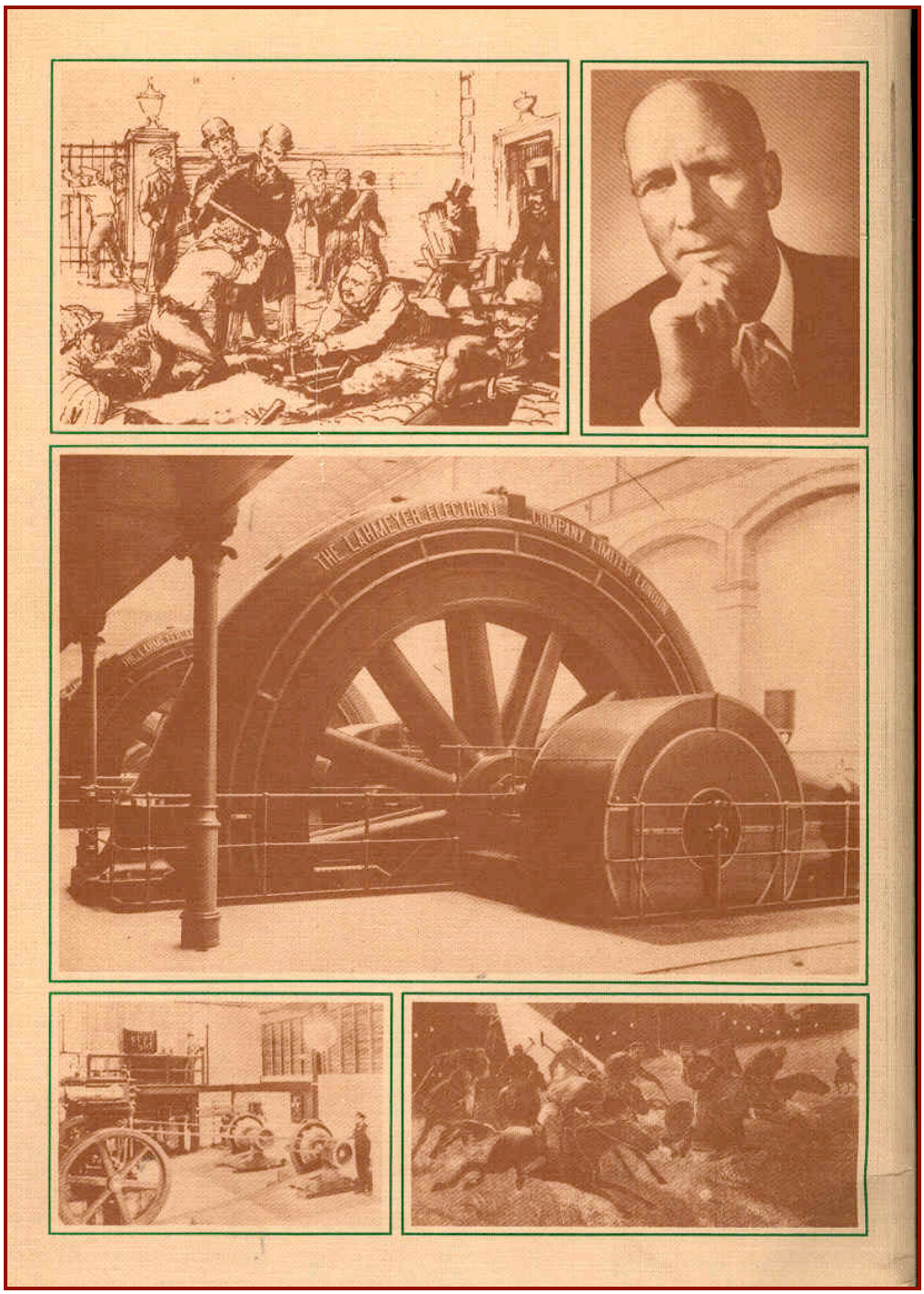


Plate 29 Above–Barking "A" official opening by King George V and Queen Mary on 29 May 1925 with Sir Harry Renwick, Chairman of the County of London Electric Supply Co., presenting his address in casket. The 240 MW station comprised 4 × 40 MW and 4 × 20 MW Parsons sets with steam conditions 350 lb/in^2, 700°F. Set no. 1 had reheat at 40 lb/in^2 to 700°F. (E.C. Archives)

Left–Kingston "B" official opening by King George VI and Queen Elizabeth on 27 October 1949–the first new station to commission after nationalisation on 1 April 1948. When completed in 1950 the station had 4 × 30 MW sets by British Thomson-Houston with steam conditions 600 lb/in^2 at 825°F.
(E.C. Archives)

Opening of Barking "A" by King George V & Queen Mary 1925
Kingston "B" opening by King George VI & Queen Elizabeth 1949



Safety Cartoon *Lord Hinton of Bankside*

Lahmeyer alternator 1902

50 hp ac generator 1891 *Polo match by electric light 1885*