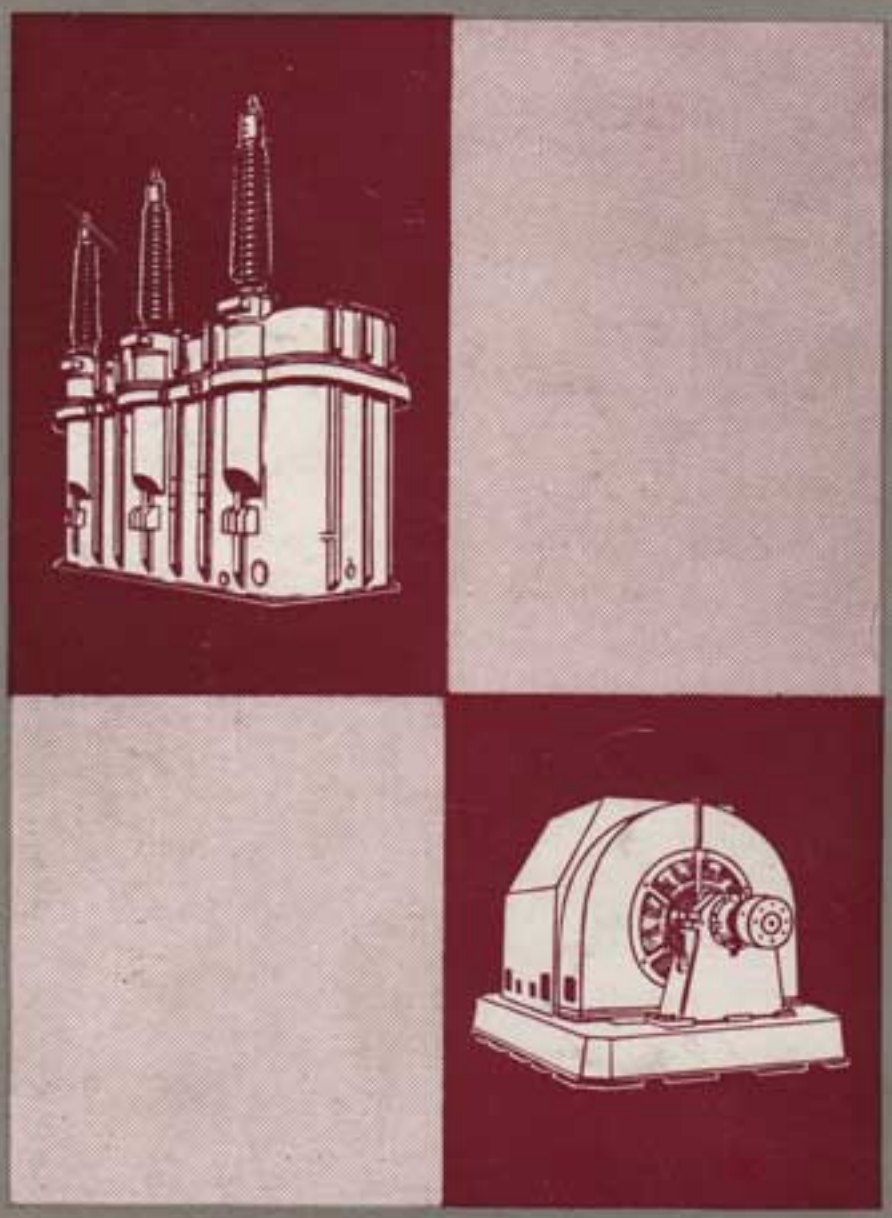
BRUCE PEEBLES

PRODUCTS



Publication No. GP100A

BRUCE PEEBLES & CO. LIMITED EDINBURGH 5 SCOTLAND

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Associated Companies *The following companies are members of the Bruce Peebles Group :*

THE BELMOS COMPANY LIMITED *BELLSHILL, LANARKSHIRE*

Manufacturers of industrial and flameproof switchgear, motor control gear, and rectifier equipments

EVERETT EDGCUMBE & CO. LTD. *COLINDEEP LANE, LONDON, N.W.9*

Manufacturers of electrical indicating, measuring and recording instruments

WHYTE & EDWARD (METALS) LTD. *DOWNFIELD FOUNDRY, DUNDEE*

A non-ferrous foundry supplying sand castings, pressure die castings, and gravity die castings

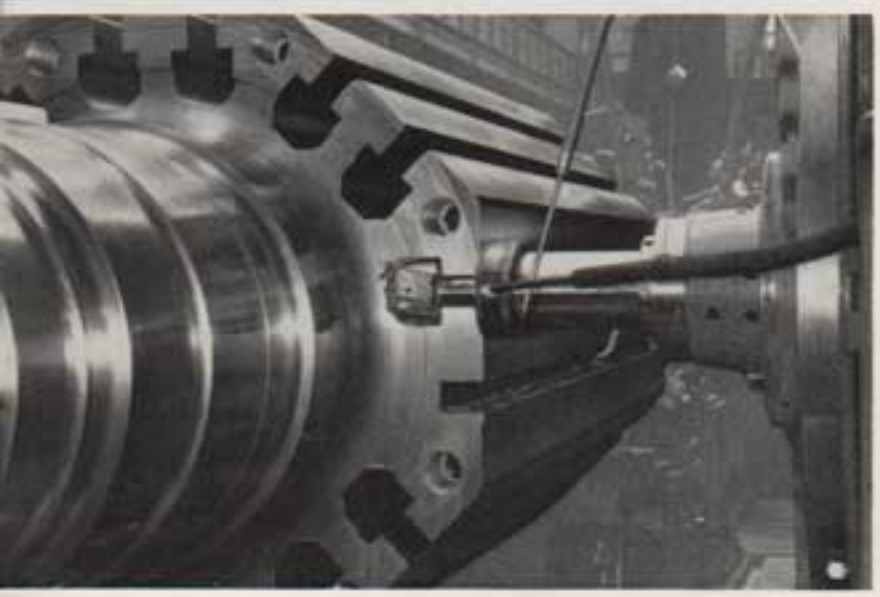
Principal Products

Generator Transformers
Transmission Transformers
System Transformers
Distribution Transformers
Rural Transformers
Flameproof Mining Transformers
Power Transductors
Current-Limiting Reactors
Shunt Reactors
Hydro-Electric Generators
Geared Turbine-Driven A.C. Generators
Engine-Driven A.C. Generators
Synchronous Condensers
Synchronous Frequency-Changer Sets
Salient-Pole Synchronous Motors
Synchronous Induction Motors
Salient-Pole Synchronous Induction Motors
Squirrel-Cage Induction Motors
Slipring Induction Motors
Steelworks Auxiliary Motors
Flameproof Induction Motors
Induction Generators
Induction-Type Frequency-Changers
D.C. Generators
D.C. Motors
Rolling Mill Drives
Automatic Control Systems
Variable-Speed Drives

Our digital computer

INTRODUCTION

180 MVA transformer core and windings



Machining a large rotor forging

Bruce Peebles & Co. Limited are the largest manufacturing electrical engineers in Scotland, and our principal products are power, distribution, and mining-type transformers, and a.c. and d.c. motors and generators of virtually every type. Over sixty years of experience lie behind the design, construction, and application of this extensive range of electrical machinery, and a policy of continuous development over this period has resulted in the name Bruce Peebles becoming identified in the minds of discriminating users with a robust and reliable product of proven and guaranteed efficiency.

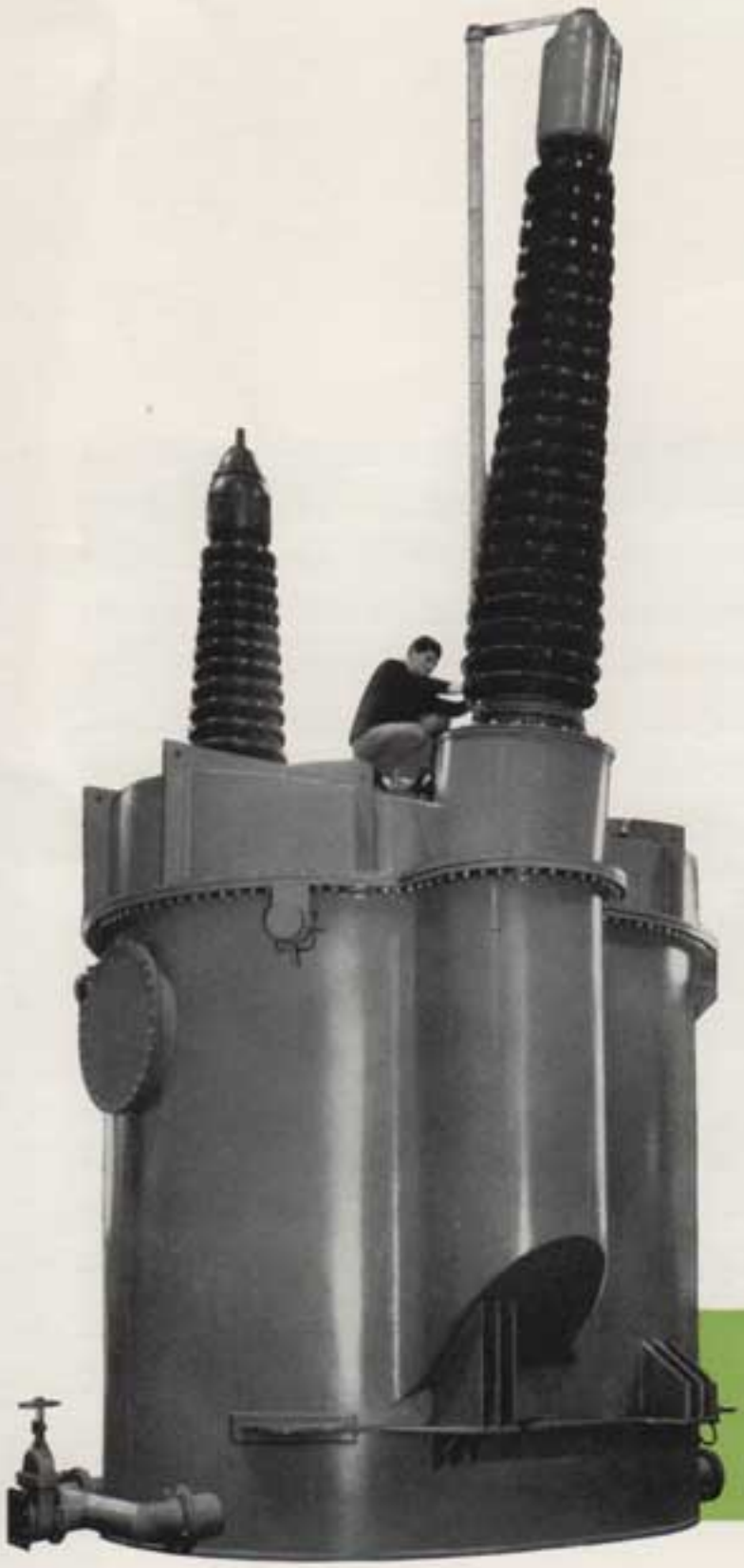
This Publication is intended to provide interested engineers with a brief glimpse of the nature and extent of our manufactures. A full account of our many products—and of those of our associate companies—is of course impossible in a booklet of this kind, and more detailed and technical literature descriptive of specific types and ranges is available on request.

GENERATOR AND TRANSMISSION TRANSFORMERS

The manufacture of generator and transmission transformers is concentrated at the Company's East Pilton factory where new fabrication and transformer manufacturing extensions have been built to cater for the largest and highest-voltage units. Orders are in hand for 570 MVA 22/430 kV generator transformers and 500 MVA 400/275 kV transmission auto-transformers, and our manufacturing facilities have been designed for the building and testing of double-wound units of up to about 1000 MVA and 750 kV.

We may fairly claim to have made significant contributions in recent years to the art and science of transformer design in the United Kingdom.

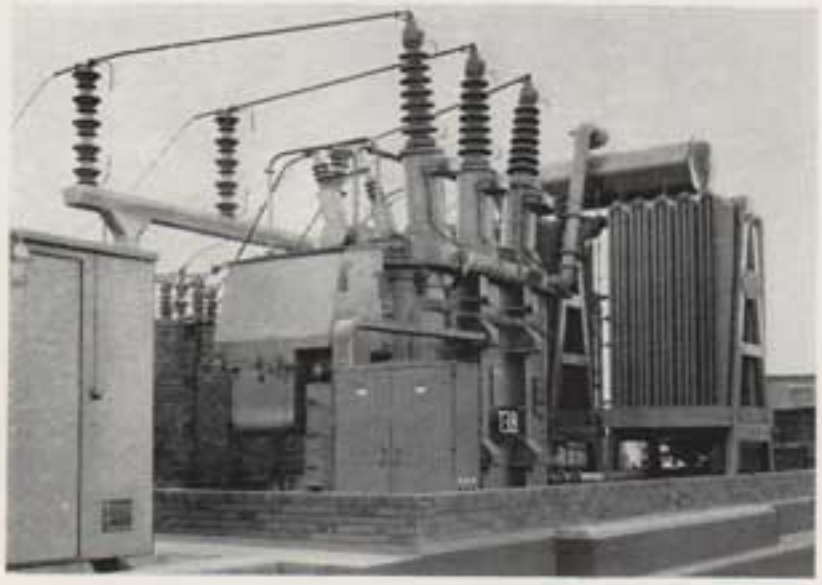
10 MVA 33/11 kV ON-cooled system transformer



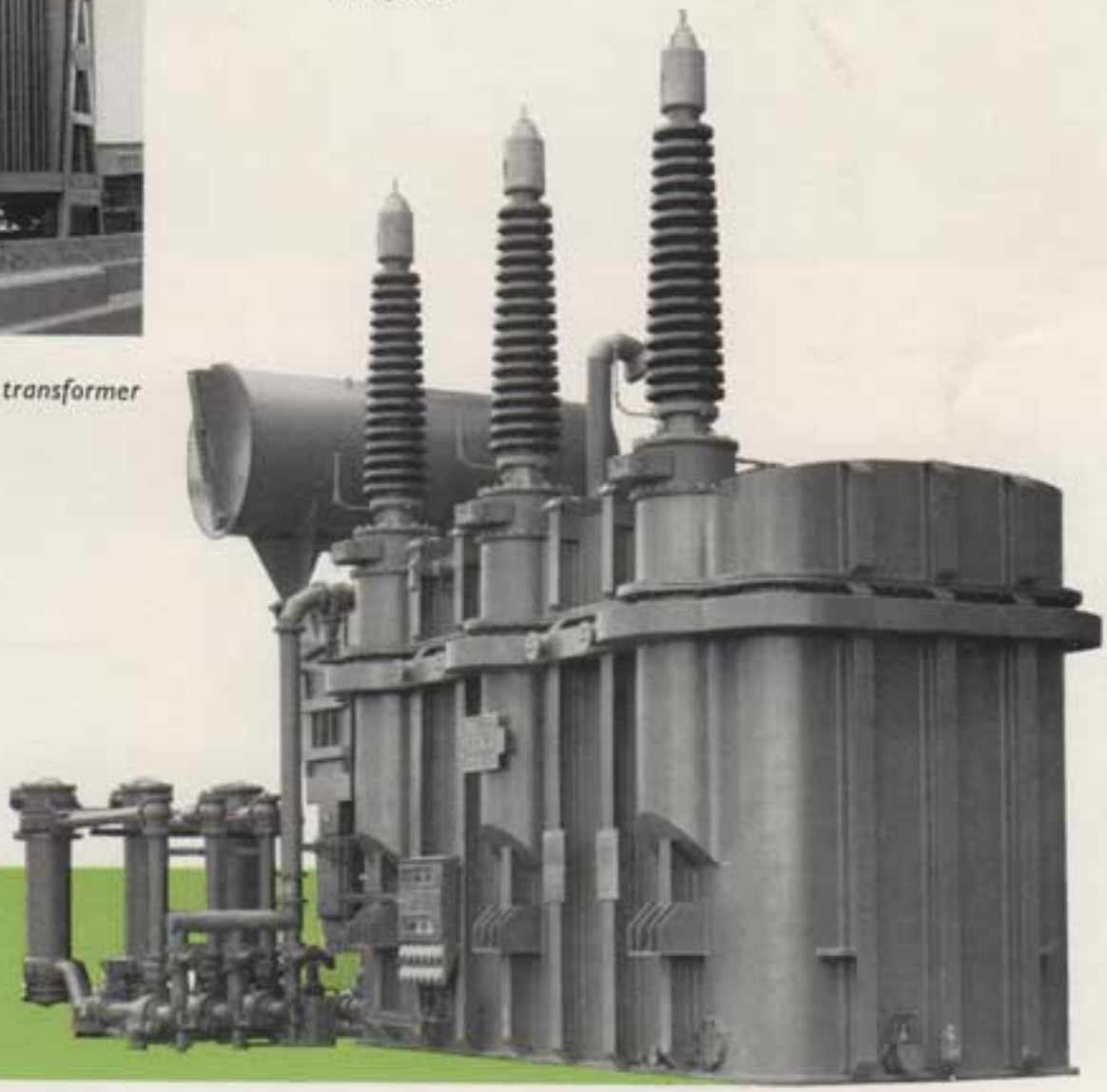
Prototype 400/275 kV auto-transformer prepared for impulse-voltage tests

Prominent instances of the Company's progressive approach to the many complex problems of modern transformer engineering are: one of the first successful applications of a digital computer to the design of power transformers; the use of electrolytic and resistance-type analogues for the solution of complex field distribution problems; the development of a form of glass-fibre-banded boltless core construction for all sizes of power transformers up to the highest ratings; and recent work on the development of sealed-windings site-assembled transformers designed to overcome transport weight limitations for large units or inaccessible sites.

120/240 MVA 275/132 kV ON/OFB-cooled transmission auto-transformer



30/60 MVA 132/33 kV ON/OFB-cooled transmission transformer

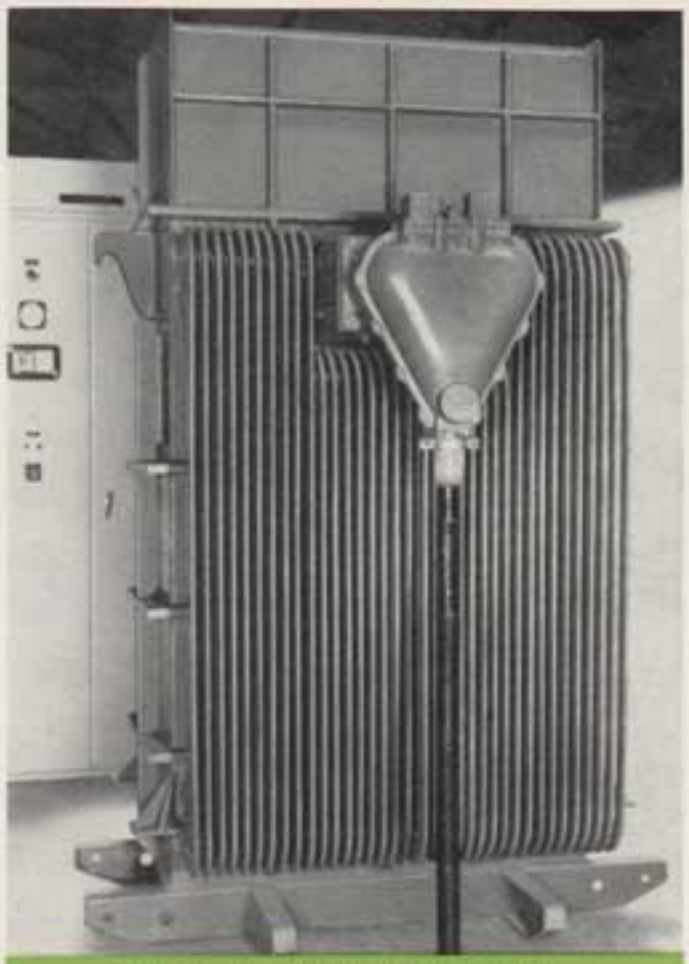


225 MVA 16/285 kV OFW-cooled generator transformer

RURAL, DISTRIBUTION AND MINING-TYPE TRANSFORMERS

Transformers for outputs of up to 1500 kVA at primary voltages of up to 11 kV are manufactured at a separate self-contained factory at Broxburn, West Lothian. The standard range includes single-phase pole-mounting units of from 5 to 50 kVA; three-phase oil-immersed distribution transformers of from 100 to 1000 kVA to British Electricity Boards Specification T 1; and dry-type flameproof mining transformers.

300 kVA 3·3 kV/565 V dry-type Class-C-insulated flameproof mining transformer



1000 kVA 6·6 kV/415 V SN-cooled distribution transformer

500 kVA 11 kV/433 V ON-cooled distribution transformer

15 kVA 11 kV/500/250 V pole-mounting rural transformer

HYDRO-ELECTRIC PLANT

In 1906 Bruce Peebles were responsible for the 6 MW Snowdon hydro-electric project, the first major enterprise of its kind for public supply in the United Kingdom, and for many years the Company has played an active part in the development of hydro-electric power at home and in many countries overseas. Our long record of co-operation with eminent consulting and civil engineers, and with most of the leading manufacturers of water-turbines, has given us much valuable experience of hydro-electric projects as a whole. Today we often undertake, as main generating-set contractors, complete responsibility for the turbine, the generator and its excitation system (including the automatic voltage regulator), the associated transformers and switchgear, and the ancillary protection and local/remote manual or automatic control gear.

2400 kW 3·3 kV 755 r.p.m. screen-protected induction generator

10 MW 187·5 r.p.m. 11 kV closed-air-circuit water-cooled synchronous generators

21 MW 600 r.p.m. 11 kV closed-air-circuit water-cooled synchronous generator

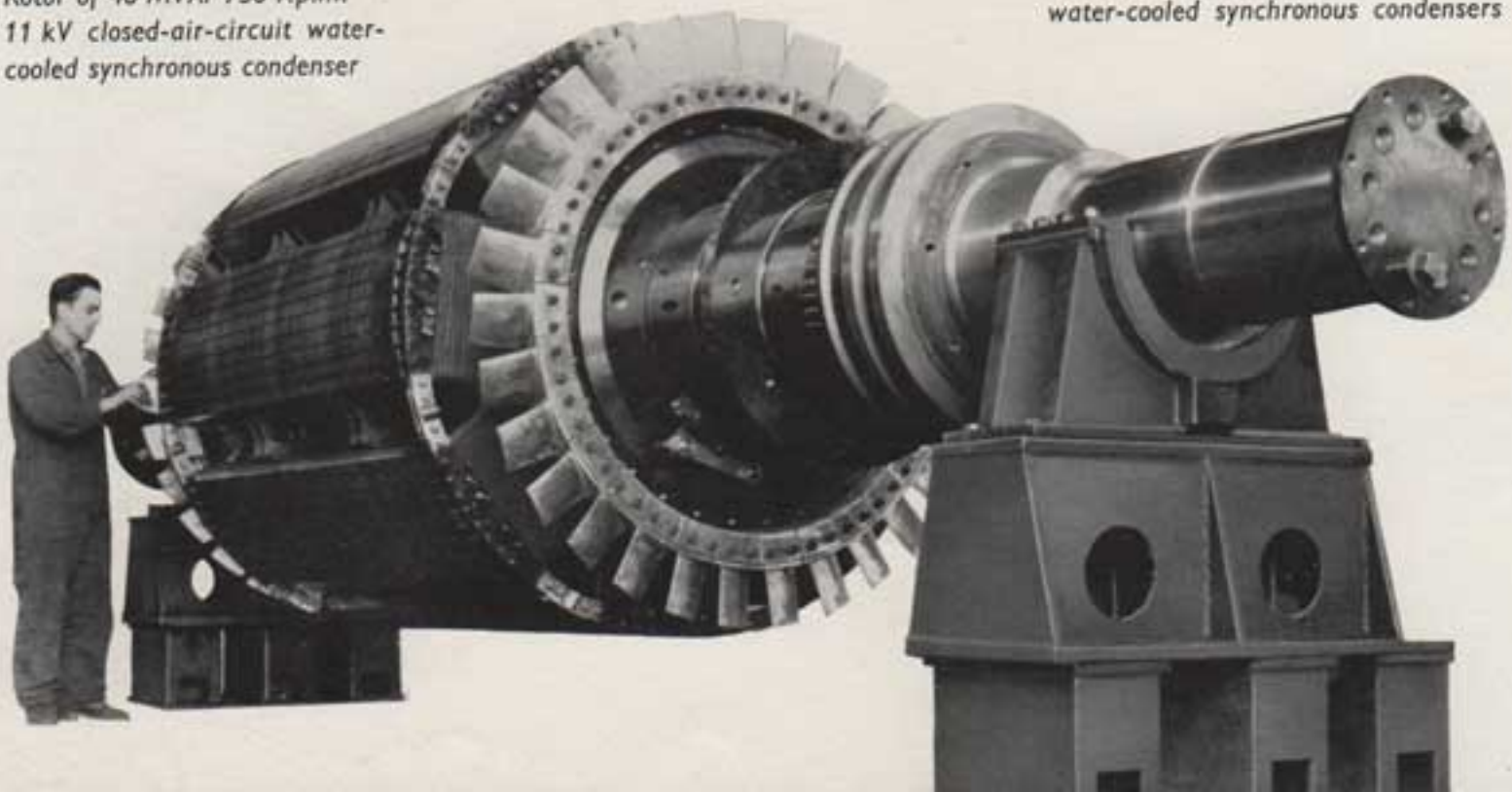
SYNCHRONOUS CONDENSERS

Synchronous condensers are normally employed to regulate system voltage or to improve system stability by generating or absorbing inductive ("magnetising") reactive power. They usually resemble the larger and higher-speed salient-pole a.c. generators both electrically and mechanically, although detail differences may be necessary because of the need to start the condenser as a salient-pole synchronous motor. Our recent activities in this field include the manufacture of three 16·4 MVAr 750 r.p.m. closed-air-circuit water-cooled machines for the Electricity Trust of South Australia, the installation of a 40 MVAr 750 r.p.m. machine for our own Transformer Testing Department, a contract for two 60 MVAr 1000 r.p.m. outdoor-type closed-hydrogen-circuit water-cooled condensers for the C.E.G.B., and smaller units of 500 to 1500 kVAr for industrial power factor correction.

Stator of 60 MVAr 1000 r.p.m. 13 kV closed-hydrogen-circuit water-cooled synchronous condenser

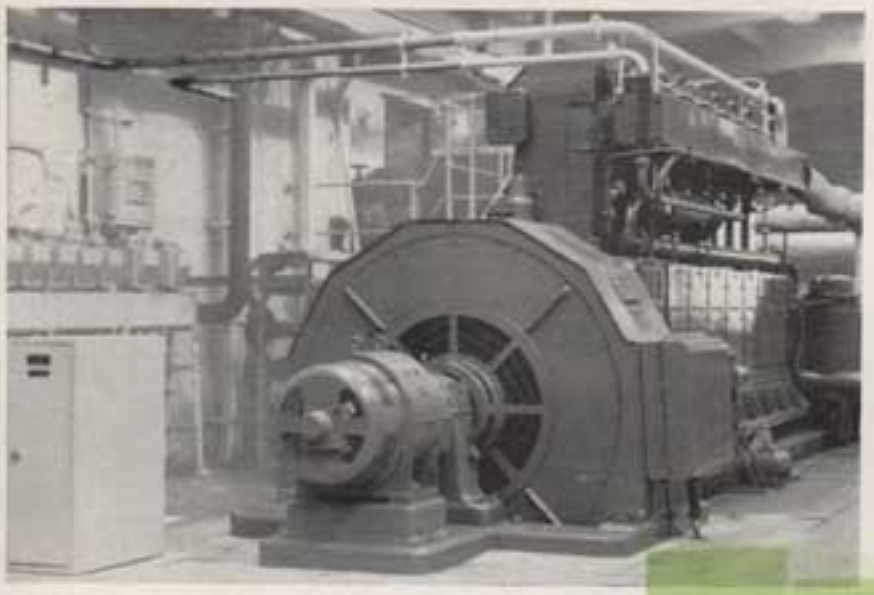
16·4 MVAr 750 r.p.m. 12 kV closed-air-circuit water-cooled synchronous condensers

Rotor of 40 MVAr 750 r.p.m. 11 kV closed-air-circuit water-cooled synchronous condenser



A.C. GENERATORS

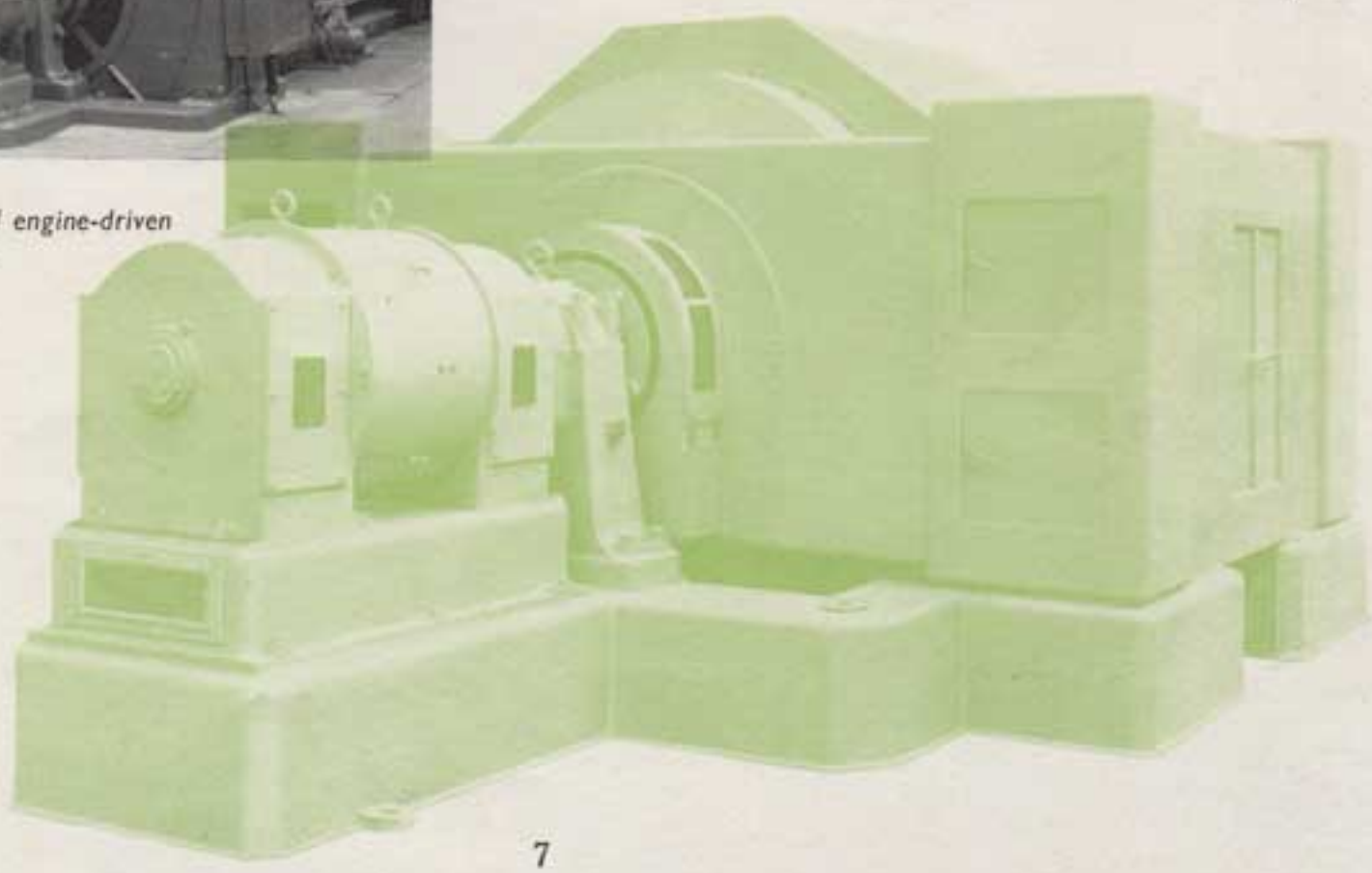
900 kW 1500 r.p.m. 2·4 kV geared gas turbine-driven filter-ventilated a.c. generators



580 kW 300 r.p.m. 3·3 kV diesel engine-driven screen-protected a.c. generator

Increases in the capacities of public supply systems have of late very much restricted the circumstances in which private generation is economic. In certain industries, however—and especially in paper mills, chemical and gas works, oil refineries, textile manufacturing and processing, beet sugar factories, and breweries—the economics of process energy recovery are such that private generation of at least part of the required power supply is justified; in such circumstances a geared turbo-alternator running at 1500 or 1800 r.p.m. (for a 50 c/s or 60 c/s supply) is usually adopted. A complete range of four-pole alternators of this type with outputs of up to about 10 MW at voltages of up to 11 kV is available, and any of the usual types of enclosure (e.g. screen-protected, filter- or duct-ventilated, closed-air-circuit water-cooled) can be supplied. Slow-speed engine-driven alternators of up to about 5 MW are also available, and these are frequently specified as stand-by for emergency use or for installation in isolated situations. All these alternators are of the rotating-field salient-pole type, and they are normally supplied on a bedplate with a single pedestal bearing and with a directly-coupled self-contained exciter.

3 MW 1500 r.p.m. 11 kV steam turbine-driven closed-air-circuit water-cooled a.c. generator



A.C. MOTORS

There are very few industrial applications for which a Bruce Peebles motor cannot be supplied, and there are very few industries to whose progress and efficiency we have not contributed at some time. It is impossible here to illustrate more than a few of the many kinds of a.c. motor available, but the following list will give some idea of the nature and extent of our manufacturing range.

Squirrel-cage induction, slipring induction, salient-pole synchronous, synchronous induction, salient-pole synchronous induction, multi-speed squirrel-cage induction, variable-speed Kramer. Screen-protected, drip-proof, pipe-ventilated, duct-ventilated, filter-ventilated, weatherproof, weather-protected, plain totally-enclosed, totally-enclosed fan-cooled, closed-air-circuit air-cooled, closed-air-circuit water-cooled, flameproof (both totally-enclosed fan-cooled and closed-air-circuit air-cooled).

Horizontal or vertical; self-contained or with bedplate and pedestal bearings; high speed or low speed; high-voltage or low-voltage; high-torque or low-starting-current.

Motors to British Standards, American Standards, Canadian Standards; standard motors and special motors; motors to drive mine fans, sinter fans, air-conditioning fans and blowers; motors for boiler feed pumps, circulating water pumps, mine pumps, dock pumps; motors for axial compressors and reciprocating compressors; motors for frequency changers and motor-generator sets; motors for

4000 h.p. 1500 r.p.m. 11 kV filter-ventilated salient-pole synchronous motor driving a centrifugal compressor at an oxygen plant

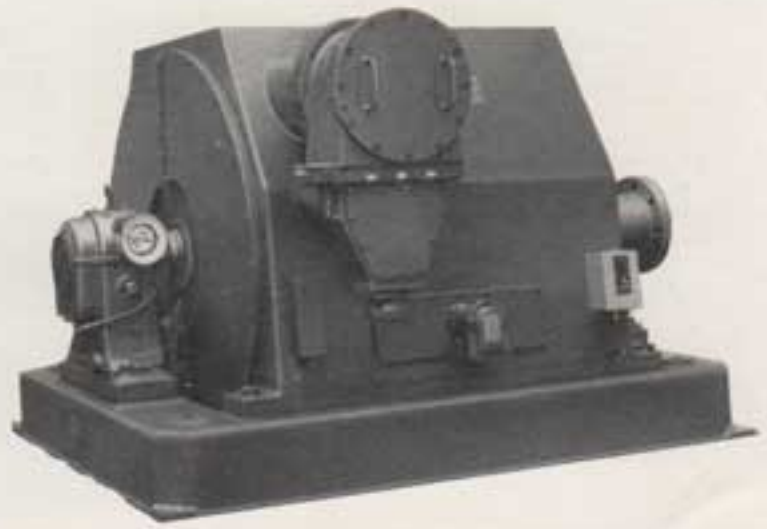
5900 h.p. 250 r.p.m. 11 kV screen-protected salient-pole synchronous motors driving reciprocating compressors at an ammonia plant

420 h.p. 1480 r.p.m. 3·3 kV weatherproof closed-air-circuit air-cooled squirrel-cage induction motor fitted with short-circuit-tested terminal assembly for a system fault level of 150 MVA

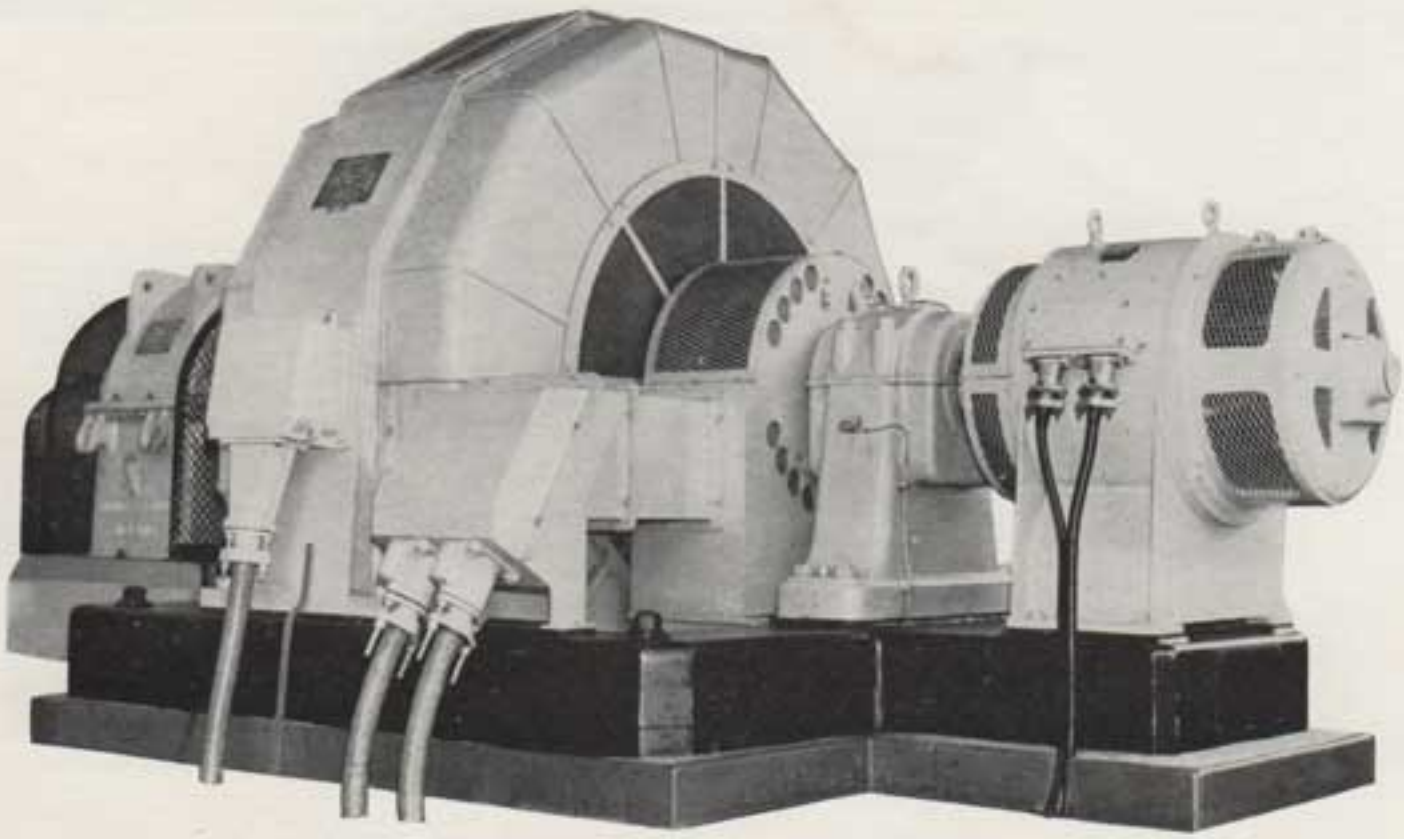
375 h.p. 735 r.p.m. 415 V drip-proof squirrel-cage induction motor

60 h.p. 2960 r.p.m. 415 V totally-enclosed fan-cooled squirrel-cage induction motor to the standard fixing dimensions of BS 2960

steelworks auxiliary drives; for cement mills and coal crushers, for the oil and chemical industries, for coal mining machinery—all these are available in an almost infinite variety of combinations and variations, and on this page and on pages 8 and 10 are just a very few examples of the kind of motor whose reputation for reliability has written the name of Bruce Peebles into so many specifications. And although a wide range of standard motors is available we are always pleased to look into any special drive requirements with a view to the provision of a motor with exactly the right characteristics.



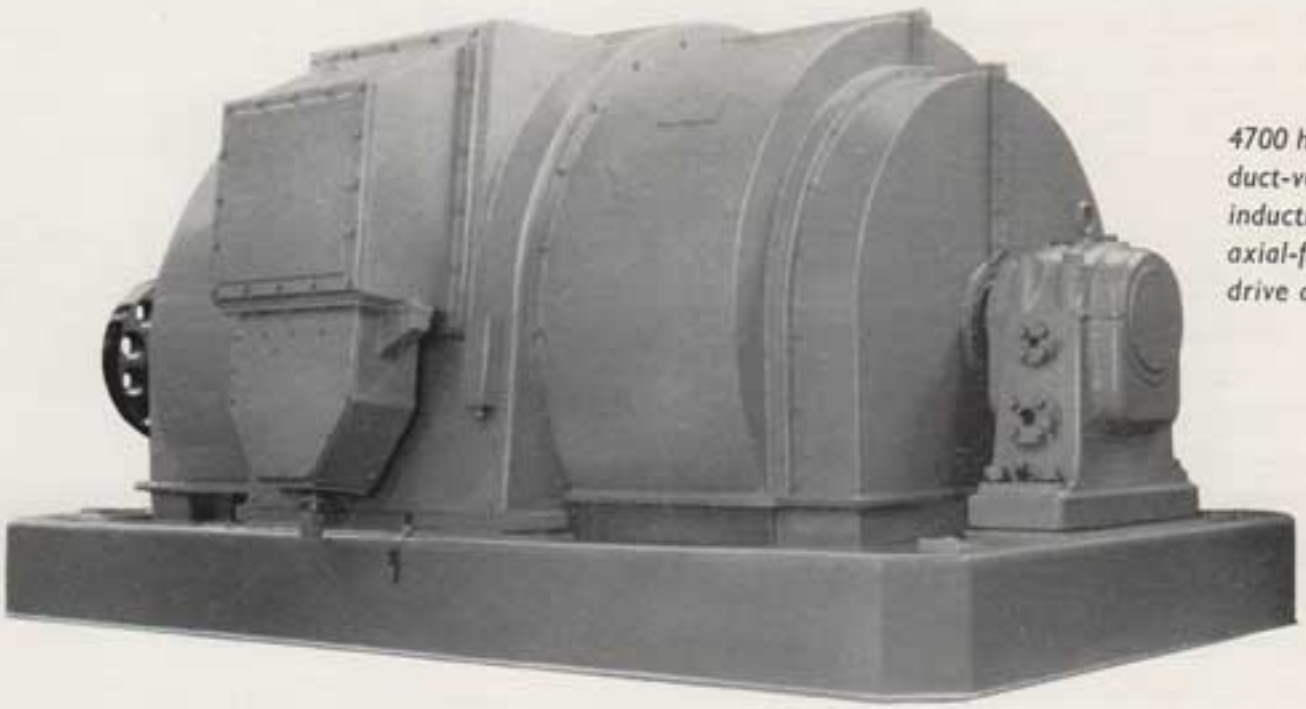
700 h.p. 493 r.p.m. 3·3 kV duct-ventilated squirrel-cage induction motor fitted with short-circuit-tested terminal assembly for a system fault level of 150 MVA



900 h.p. 300 r.p.m. 3·3 kV synchronous induction motor driving a mine ventilating fan

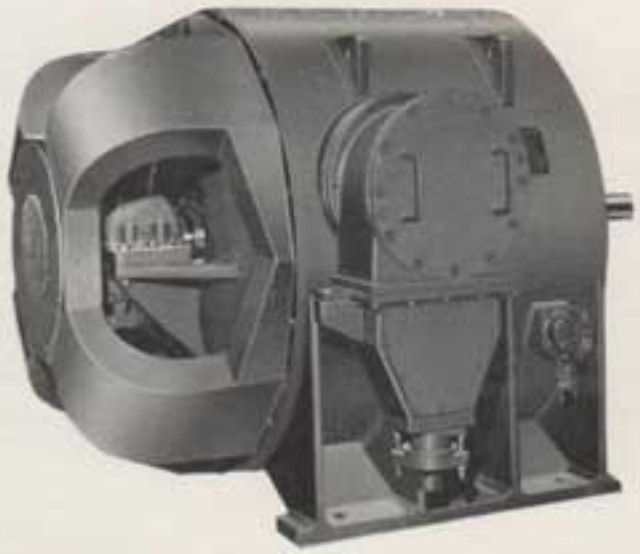
250 h.p. 2960 r.p.m. 415 V squirrel-cage induction motor, weather-protected (Type II) to NEMA standards

130 h.p. 585 r.p.m. 3·3 kV totally-enclosed fan-cooled flameproof squirrel-cage induction motor fitted with short-circuit-tested flameproof terminal assembly for a system fault level of 75 MVA



4700 h.p. 1485 r.p.m. 11 kV duct-ventilated squirrel-cage induction motor for a geared axial-flow turbo-compressor drive at a chemical plant

1025 h.p. 295 r.p.m. 6·6 kV drip-proof squirrel-cage induction motors driving circulating water pumps at a generating station

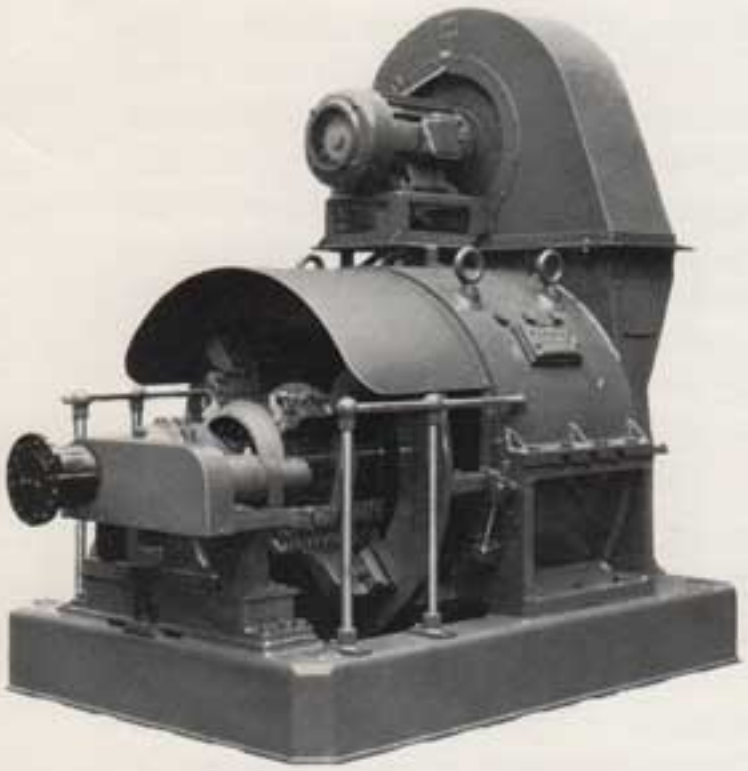


350 h.p. 1480 r.p.m. 3·3 kV closed-air-circuit air-cooled flameproof squirrel-cage induction motor fitted with short-circuit-tested flameproof terminal assembly for a system fault level of 150 MVA

D.C. MACHINES

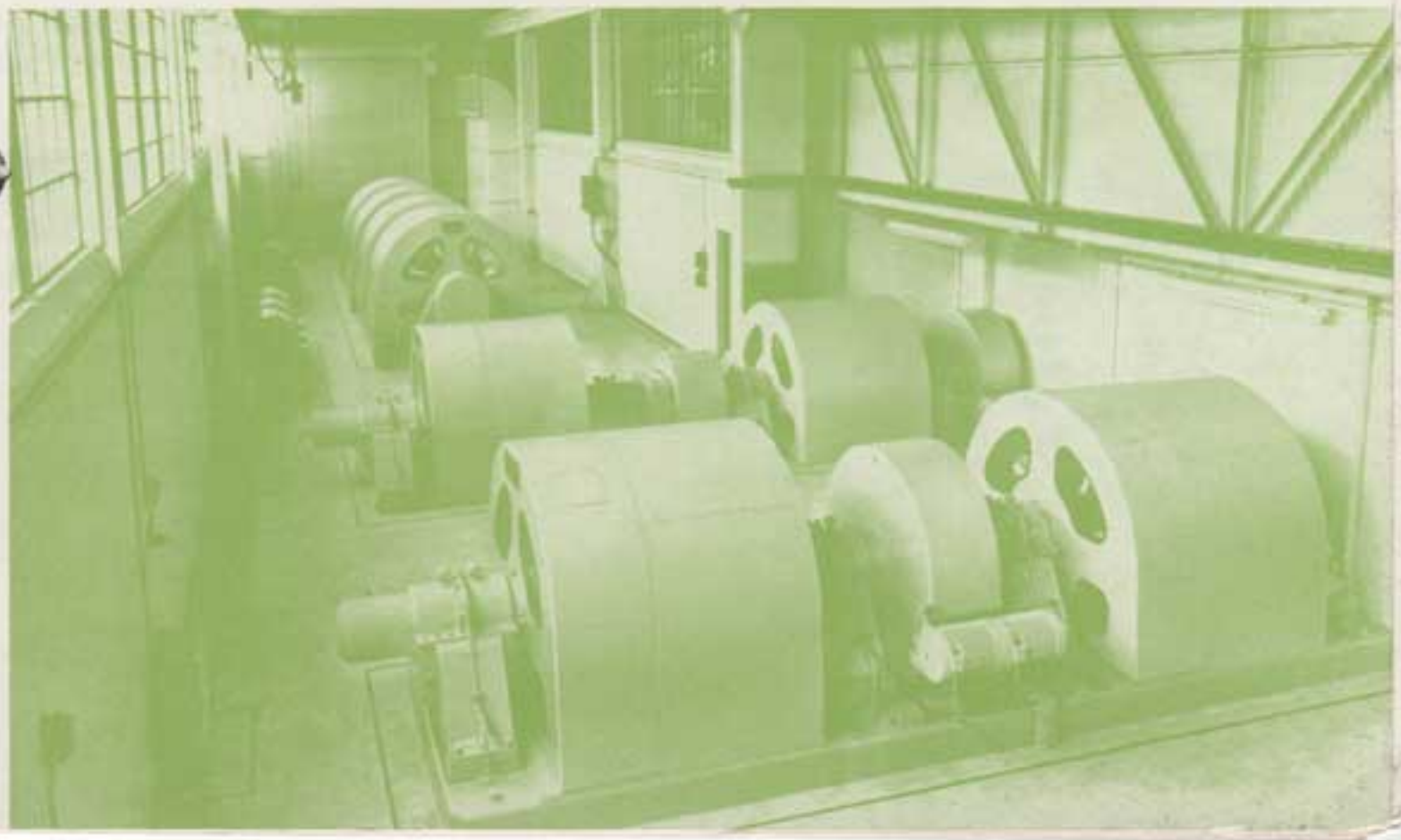
In modern industry alternating current reigns supreme, and in general there can be no denying its utility and economy. There are still applications, however, where the characteristics of the direct current motor make it especially suitable, and none more so than wherever variable speed is essential. For wide speed ranges, and especially at large output powers and where the drive demands a constant-torque characteristic, the speed control of a d.c. motor by armature voltage variation is preferred by many industrial users. In particular, and in spite of the need for either a motor-generator set or a grid-controlled rectifier, the d.c. motor is still the almost universal choice of the steel-works engineer for his main rolling mill drives.

Other equally specialised applications for which d.c. machines have recently been supplied include dynamometers for the testing of small diesel engines, and a rectifier-controlled variable-speed motor for the testing of hydraulic transmission equipment. In both these applications the flexibility of operation of the d.c. machine, and its ready response to armature voltage and field current changes, make it especially suitable for incorporation into automatic control systems designed to facilitate the work of the testing engineers.



1500-580 h.p. 1550-600 r.p.m. 700 V pipe-ventilated forced-draught d.c. motor for the full-power testing of hydraulic transmission units

0-235 h.p. 0-900 r.p.m. saturable reactor/rectifier-fed d.c. motor

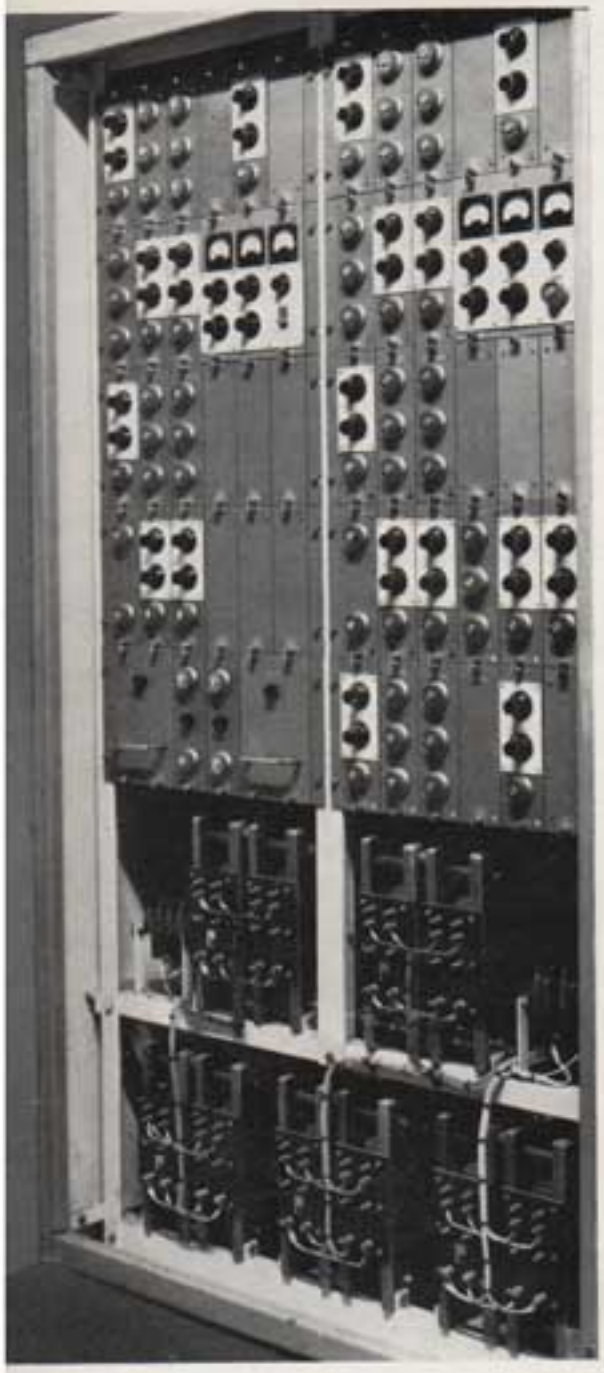


Motor room of modern steel strip mill showing two 715 h.p. mill motors, two 625 h.p. reel motors, and (background) a 3000 h.p. motor generator set

CONTROL SYSTEMS

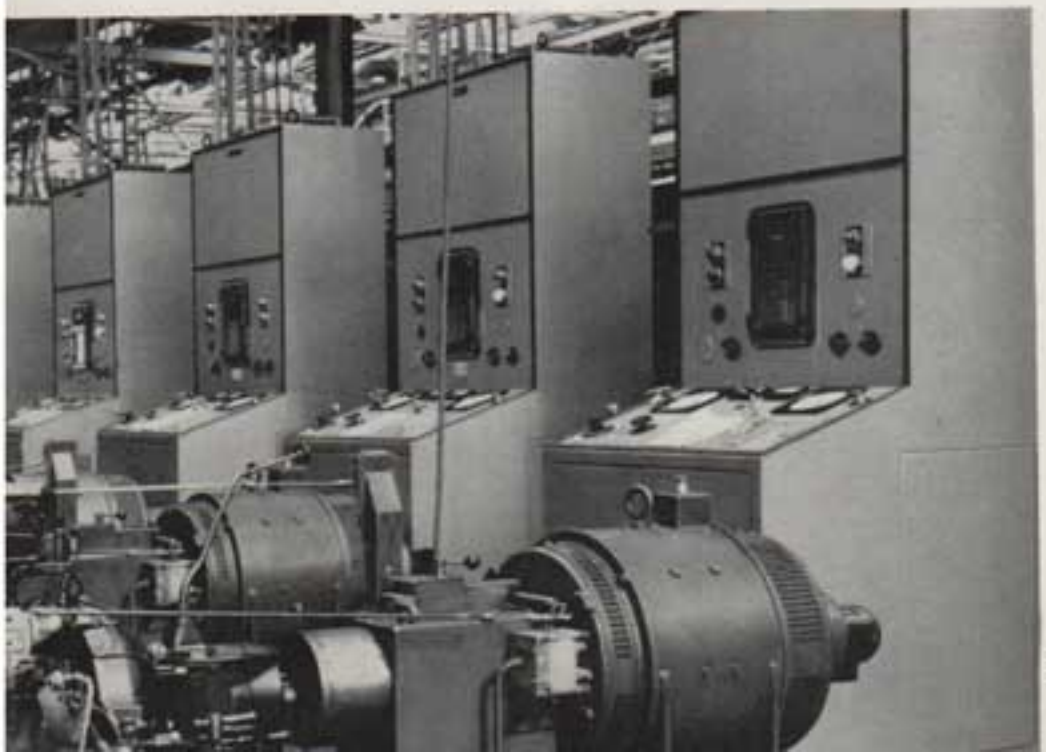
The problems associated with the control and protection of the Company's rotating plant and transformers are the responsibility of our Control Systems Division, an entirely separate engineering section staffed by qualified and experienced engineers, and supported by specialised drawing office and production facilities. One of the most important of the Division's many activities is the design and execution of variable speed drives for a wide variety of industrial applications, and among the systems already commissioned or currently in hand are : the speed-control of a 950-165 h.p. variable-speed modified-Kramer combination for a steel-works fan drive : rolling mill drives with automatic speed and tension control ; the automatic speed control of the 1500-580 h.p. d.c. motor shown on page 11 ; drives for speed-matched plastics calenders ; automatically controlled and programmed d.c. dynamometer engine-testing sets ; and magnetic amplifier-fed d.c. motors for a variety of lower-powered applications.

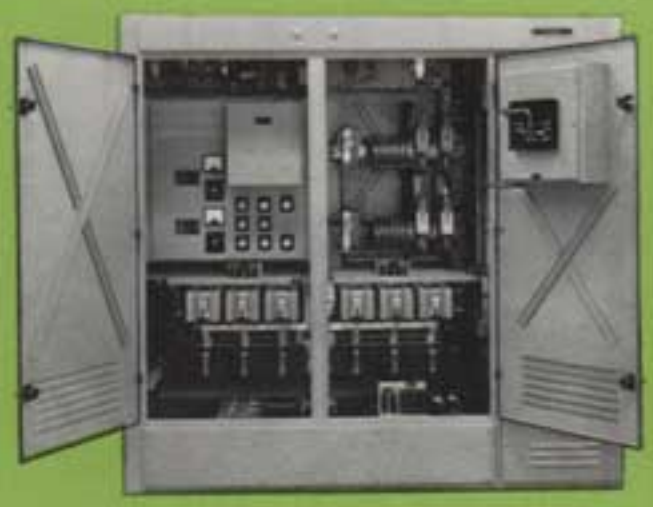
The Division is also engaged in the design of other more specialised forms of control equipment. Many of these have been developed to meet particular applications in the steel industry, and products in this category include : equipments for detecting the presence of pinholes or weld pilot holes in rapidly moving strip ; a system for the automatic temperature control of a battery of electrically-heated furnaces by means of magnetic-amplifier-controlled series transductors ; and a system employing thyristors and solid-state circuits for the automatic switching of electro-magnetic overhead conveyors on steel strip cut-up and classification lines.



Left
Control cubicle for a four-motor automatically-speed-matched plastics calender drive

Below
Part of a diesel-engine-testing dynamometer installation





Control cubicle for the 235 h.p. variable-speed motor illustrated on page 11

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