

# THE STORY OF BRUCE PEEBLES

1866-1954

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Booklet No. 104

Presented by
BRUCE PEEBLES & CO, LTD.
on the occasion of the 88th Amiversary
of the establishment of D. Bruce Peebles & Co.
in 1866

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published 1955

TO

ALL THOSE MEN AND WOMEN
WHO, THROUGH THE YEARS SINCE 1866,
BY THEIR DEVOTION TO THE COMPANY
HAVE MADE THE STORY POSSIBLE
AND

TO BUSINESS FRIENDS
EVERYWHERE, FOR WHOSE SUPPORT
AND APPRECIATION OF SOUND ENGINEERING
WE ARE TRULY GRATEFUL.

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"Fast streams from little fountains flow Tall oaks from little acorns grow."



Sunset over Carlingford Lough, N. Ireland

Photograph by J. W. Rodger

Nature's laws are unchanging and unchangeable. Night follows day, season succeeds season. The cycle is unending. But man advances. The brilliance of the evening sky tinged with gold heralds a dawn of promise, with a resurgence of energy which inspires man, contemplating in wonder the divine beauty of the skiec, to dream of what the new day may bring.

Perceiving the miracle of it all, how can man refrain from dreaming about the future—dreams borne on wings of imagination above the solid foundation of past achievement, yet having that foundation to support their undeniable probability.

In opening this history with a picture of the sky filled with light we seek to suggest something of the vistas of opportunity in all fields of activity.

# **PREFACE**

Histories of industrial concerns showing the lines along which they have been developed are not uncommon, but the form of this one is rather unusual and may call for a word of explanation of the principles and arrangement of material.

In any history the first requirement, when one comes to write it, is to choose a stance from which to view the whole pattern, weaving the accounts of the various events into a continuous narrative. Here we found ourselves at once in difficulties. After a considerable array of facts had been gathered and sifted, we had a memorandum covering the vital development in the history of the Company with a list of events which, by their nature, could not easily be dealt with in strictly chronological order. Accordingly, when we came to lay out the plan for this booklet, we decided to deal with each field of development at dates appropriate to each of the main departments, thus giving the reader a "close-up" picture of connected topics. To take one example, the foundation of the Company in 1866 and its early development at Tay Works gain coherence and effect by being concentrated in one chapter. Similarly, it seemed expedient to deal with the subject-matter covering East Pilton Works in four sections starting with the Rotating Electrical Machinery Department, now in its fiftieth year, and following with the Transformer, Rectifier and Welding Departments in turn. We have written the story taking the facts as we found them, seeking neither to gild nor to magnify, and have endeavoured to show how far beyond the shores of these islands the marriage of enterprise and vision with craftsmanship and progressive production methods can carry Scottish goods and Scottish industrial prestige.

Finally, we hope and trust that this little book may serve to strengthen the ties of friendship which have been such a pleasant and treasured feature of our business connections all over the world.



View of Edinburgh from Princes Street in 1866, when BRUCE PEEBLES was founded.

## PART I. THE EARLY DAYS

1866 — 1903

We do not exist to restore a past, but to create a future which embodies the greatness of the past. STEPHEN SPENDER.



THE FOUNDER
OF THE COMPANY
The late Mr David Bruce Peebles,
F.R.S.E., 1826-1899.



THE FIRST ELECTRICAL SHOP—1898 Tay Works, Bonnington, Leith.

Meeting of the Incorporated Municipal Electrical Engineers at Tay Works, 20th June 1901. President (from ross, smelfth from left) the late Mr W. A. Chamen, Glasgow Corporation.



# THE

# EARLY DAYS

1866 ---- 1903

This is the story of how as idea and an ideal grew into an industry. One hundred and twenty-spirity pars ago Daville Brace Pecbles, the man who founded Brace Pecbles, was born in Dundee. His working life started with an apprentischip with Umpherston & Kerr, General Engineers, Dundee, and later he entered the service of the Great Western Railway at Swindon Locomotive Works. Subsequently he spent some time at the locomotive works at Amiens in France, and returned to England to join John Fairburn & Co., Leeds.

Mr Peebles entered the Gas Industry in 1857 as a partner in the firm of Fullerton & Co., gas meter manufacturers, Edinburgh, and in 1866, when he was forty years old, he started a small business in a workshop at Fountain-bridge, Edinburgh, and founded the firm of D. Bruce Peebles & Co. for the manufacture of gas appeliances.

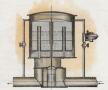
#### TAY WORKS

Ten years after the foundation, the Company had to move to larger ground, and in 1876 peruhased some land on "the once arable estate of Hill-house Field, Bonnington, now laid out in streets and forming a suburb of North Leith," where new works were built and named Tay Works in Dundonian nostalgia.

Under Mr. Peebles the Company had begun an era of experiments on gas appliances which represented great developments not only in wet and dry meters and gas governors of various kinds for station and district application, but also for indoor and street lighting. Outstanding was a main governor operated by a pilot governor. This was fair in advance of its day, but is now widely used, especially where high outlet pressures are required.



Street agating has undergone a great many changes since 1880 when Mr D. Bruce Peebles invented the needle governor gas burner, which became well-known in many parts of the world. Electric lighting was then just an



This pressure-loaded gas governor, patented in 1875, was considered to be far in advance of its day.

In the early 'nineties the Company started to manufacture gas engines. Among many improvements incorporated in the design was one consisting of a heated porcelain cone for ignition of the charge when a valve operated by the cam shaft exposed the compressed mixture to it. This was before electrical ignition was found possible. The manufacture of electrical machines followed in 1898. First came direct current dynamos and motors. Next, with the growing realisation of the advantages of alternating current for power generation, distribution and application, came alternating current generators and motors. Research and development have resulted in our present-day huge generators, transformers, and other power equipments which play such a vital part in this modern age.





The Company played an active part in the development of arc lamps, the main source of street lighting in the carly 'nimeties. Pictured is one designed to obviste "painful flickering and to give a post occupied to the public of the public of

One of the most successful inventions was the medial progression burned in faith manifolds and the successful and 500. The difficulty to be overcome for boose lighting at that time was to get a nodeoleck burner for inform use which would give a "seastly, bright light with a soft, white manifolds with the successful and the successful and the hydrocarbons, cannot coal enrichment being growly in use." The invention, which courted the "line" and was welcomed as a hereon-sent boost to householders, became with famous. A quaint passage from an early boddet on "Bote to Burn Gas" throws a slidight on domestic on "Bote to Burn Gas" throws a slidight on domestic than the exercision. It reads "Notice to eversum—When



A pioneer totally-enclosed weather-proof motor. Built in 1898, it was one of the first of its type to be made in Britain.

there is an escape of gas, do not strike a match, or search for the escape with a light, but open the windows and call master or mistress."

The manifecture of single acting as engines in the list indicates surable an important sage in the development of the Company. While the origin of the gas engine surfaces manufacture at Ty Works by some years, the Company introduced important novel features which were an improvement or pervison practice. One of these was a heard perceion cone for ignition of the charge when a sent perceion cone for ignition of the charge when a valve operated by the can shaft ergoard the empirese mixture to it. This was before exercised ignition was the contraction of the co

## ELECTRICAL DEPARTMENT STARTED

David Bruce Peebles foresaw the many uses for his gas engines and had the idea that to obtain the highest efficiency from the use of power gas, energy should be converted to electrical power, which was just beginning to make its impact felt on the lives of our grandparents, and that the manufacture of dynamos should be started. In tracing the history of the Company at this time it appears that a widely-held belief insisted that electricity would never replace gas for light and power. The truth was not quite so romantic as that. As long as he lived, Mr Peebles never lost the courage of his convictions that the gas and electrical industries would grow and advance hand-inhand which, in some respects, has proved to be the case. In 1808 an electrical department was started, an existing brick building, which would be considered fantastically small to-day, being taken over for a workshop, with an old unused house for an office

It was a more leisurely world them. A world without motor cars, without aeroplanes or submarines; also, it was without cinemas, wireless or television. The two-wheeled hansom cab and four-wheeler "growlers" could be seen in Princes Street. Electricity was still an infant in the cradle.



A "highly ventilated" 140 kW gas engine driven direct current generating set supplied to a steel works in 1902. In the early days it was common practice to use very ample dimensions and plenty of concer.



Industrial electrification was an early activity. In 1903 the Linwood Paper Mill, Renfrewshire, was electrified with 1,750 B.H.P. of plant and was reputed to be the largest paper mill installation at that time.



EARLY DAYS

This picture, taken at Tay Works, Bonnington, in 1902, shows senior officials of the Company with employees. Seated in the front row are:—(1) Mr G. D. Susherland, Chief Estimator; (3) Mr G. K. Griere, Manager, Gas Department; (3) Mr Arbur C. Peebles, Director; (4) Mr J. Hart, Assistant Works Manager; (5) Mr W. Gramicael Peebles, Director; (6) Mr M. T. Pickstone, Chief Designer; (1) Mr John R. Peebles, Secretary; (8) Mr Arthur Hart, Werks Manager; (9) Mr John H. Burting, Sales Manager; (3) Mr Arthur Hart,

The first dynamos were large in physical dimensions for their output, well-ventilated, with plenty of copper and other materials and slow in speed. Trained workers were few in number, and secrecy in design was the order of the day. For a start the Company carried out the complete electrification of quarries near Ecclefechan, Dumfriesshire, comprising two 90 kW dynamos and a number of weatherproof totally enclosed motors, believed to be among the first of their type in Britain. Many pioneer electric lighting and power installations were undertaken, as the following extract from Company records of the late 'nineties shows "Over so,000 electrical horsepower of dynamos are at the present moment running in the various lighting and tramway power stations in the United Kingdom and the Colonies." Electric arc lamps were developed and supplied in large numbers for street lighting.

So great did the pressure of available space become that a building across the street from the Works was taken over, and here a band of armature winders carried on their mysterious twisting and bending of conductors. The completed armatures were trundled on bogies to the main shop for testing, this operation being attended by many of the schoolboys in the district.

From this small and optimistic beginning at Tay Works the large organisation at East Pilton has been built up. Few of the pioneers could have foreseen the development of their small dynamos into the huge electrical plant now being manufactured.

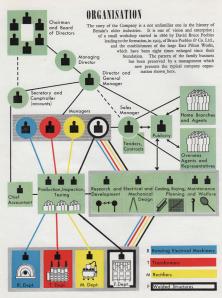
When Mr Peebles died in 1899 at the age of seventy-three years, he had laid the foundation of the organisation that to-day carries his name to every quarter of the world.

## PART II. EAST PILTON WORKS

1904 -- 1954

Therefore, as we build, let us think that we build foreur. Let it not be for present delight, or for present us clone; let it be such work as our descendants will thank us for; and let us think as we ley streen or stone, that a time is to come when these stones will be hold sacred because our hands have when these stones will be hold sacred because our hands have when these stones will be hold sacred because our hands have when these stones will be hold sacred because our hands have labour and turningly tubestance of them: "See! This our fathers did for us 1"

JOHN RUSKIN.



# A TRIBUTE

Grateful tribute is paid to all those who, by their labours and enlightened judgment, have brought the Company to its present dominant position. A few names are recorded here—prominent in the history of Bruce Petoles issue 1598—but they are seen standing among many others, the men in the shops and in the technical and commercial branches who, over the long span of years, have contributed greatly to the success of the Company.

C. McEUEN.

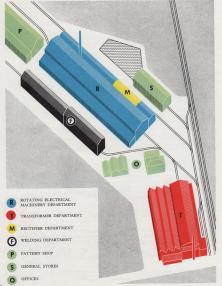
1908 - 1912

# DIRECTORS PAST. M. B. MOUNTAIN, 1908 - 1909

A MACKENZIE

	C. J. Shiels,	1908 - 1938	A.	W. 7	AIT,			1908	- 10
	A. B. ANDERSON,	1910 - 1914	L	EE MI	TRRAT			1913	
	SIR JOHN COWAN,	1916 - 1929	S.	E. Ba	STON	v.		1920	
	DR. JAMES WATT.			R TH			LOP	1923	
	A. C. EBORALL,			L. K				1934	
	G. M. COWAN, 1934 - 1952			W. H. MORTON.				1943	
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CHIEF	EXECUTIV	DC							
UHILLI	DARUUITY	DO.							
PAST.	R. W. GAUNTLETT,	Don	CL	. n .					
	J. W. SAALER, Man		M. D. Roer, Chief Designer. W. OLIVER, Chief Contract Engine						
	PAUL LA COUR, C		L. F. Donney, Chief Contract Engine						
	C. J. HUNT, Chief I	,	J. E. Dobson, Chief Contract Eng. G. G. L. Preece, Sales Manager.						
	G. Brookhouse, C.			J. U.	L. P	GEECE,	Sales	man	uger.
PRESENT.	V. P. MACKAY, 1	F.A.M.E.M.E., M.I	.E.S., A.	LE.E.,	Ma	nager,	Rota	ting	
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	SECRETARY, WI								

## LAYOUT OF EAST PILTON WORKS



## PRINCIPAL PRODUCTS

General Purpose A.C. and D.C. Motors

Flameproof Motors for Oil Refineries and Mines, etc. Heavy Duty Motors for Cranes, etc.

Totally Enclosed Fan-Cooled Motors for dusty situations

High Torque Motors for starting against

heavy loads Steel-Clad Motors for severe service

Beater-Roll Motors for Paper Mills

Synchronous Induction Motors

Marine Type A.C. and D.C. Motors

Engine Type Generators Geared Steam Turbine-driven Generators

Hydro-Electric Generators Induction Generators

Belt-driven Type Generators Synchronous Condensers

Frequency Changers Balancers and Boosters Induction Motor Generators

Synchronous Motor Generators Synchronous Induction Motor Generators

Motor Converters

Rotary Converters Power Transformers

Distribution Transformer

Auto-Transformers Voltage Regulating Transformers

Mining Type Transformers

Furnace Transformers

Welding Transformers Reactors

Extinction Coils

Mercury Arc Rectifiers—Steel Cylinder and

Glass Bulb Types Fabricated Steel Structures of all classes of

major and minor construction

Electromagnetic Apparatus



General view of East Pilton Works and Offices. Firth of Forth and Fifeshire Hills in background.



East Pilton Works and Offices in 1908.

Part view of Bast Pilton Works to-day showing Rotating Electrical Machinery Department with Welding Department in background and General Offices at left. Firth of Forth and Fifeshire hills in background.





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# ROTATING ELECTRICAL MACHINERY DEPARTMENT

1904-1954



One of three 1,500 kW 11,000 volt 150 r.p.m. a.c. generators installed in 1904 in the Upper Boat Power Station of the South Wales Electric Power Distribution Company. Driven by

The death of Mr D. Bruce Peebles in 1899 closed a chapter in the history of the Company, and during the next few years the business was carried on by his Trustees. Changing times brought also the need for change in organisation, and in 1902 the old concern which had carried an honourable record for thirty years gave way to the Limited Liability Company formed under the present name of the firm. Ten acres of land were purchased at East Pilton where the East Pilton Works were erected and equipped at a cost of over £93,000, and completed in July 1904. The first Board of Directors included W. Carmichael Peebles, Arthur C. Peebles, R. S. Portheim and M. T. Pickstone, and with characteristic forthrightness they adopted as their trade mark " PPP" The gas department continued at Tay Works and separated in 1908 under the name of Peebles & Co. Ltd., and is a flourishing concern to-day.

reputed to be the first machines in the country to generate at 11,000 volts.

It was said at the time that the building of the East Pilton Worst excited much public curiosity because of the apparent suddenness of their coming into existence, the large area they contained, and the beauty of their construction. It was also pointed out that there was a large overhead travelling crane driven by electricity and large machine tools including a huge boring mill will "all worthy of inspection." To-day, many cranes are employed and many large precision machine tools installed which, if they do not excite the curiosity of the visitor, are indeed symbolic of the development of the Works during the past fifty years.

#### PIONEERS

But it is necessary to pick up the threads of the story. The first real venture of the Company into the field of large rotating electrical machines was through a trading arrangement made with Ganz & Co. of Budapest for the use of their designs in connection with Ilgner fly-wheel motor generators, traction motors, large generators and motors. At the beginning German labour was imported, but it was not long before the growing industry began to attract local labour, and also men from universities and public schools who came as premium apprentices and many of whom attained positions of eminence in the electricity supply industry in later years. Soon there came what a Scotsman was bound to regard as a reversal of the natural order of thingsyoung men crossed the Border, and came from overseas, to learn in Edinburgh.

The years that followed were years of rapid progress-first among the developments and certainly the most dramatic work which caught men's imagination at the time was the invention in 1904 of the Peebles-La Cour Motor Converter. The first order came from West Ham Corporation, London, for 500 kW and 250 kW machines. This wonderful machine played a great part in the fortunes of the Company for a quarter of a century, during which time nearly a million kW were supplied for service all over the world. This invention was quickly followed by the development of compound alternators in which a small rotary converter took the place of the usual exciter. The a.c. side was connected to the alternator terminals through a transformer and chokes, and the d.c. side was connected to the alternator field windings and functioned to give a flat or rising voltage characteristic.



1905. First electric winder with Ilgner control installed in Britain. Tarbrax Oil Co. Ltd



1906. Shepherd's Bush Sub-Station, Great Western Railway, showing some of the first motor converters ever built.

Some of the contracts for gover staticos, railway and transvey systems assumed, for those days, gigantic proportions, no proposition being to the proposition being to the proposition being to the proposition being to the proposition being the proposition of the South Wells Electric Power Distribution Company, Driven Proposition were required to be the first marking the proposition were required to be the first marking the proposition were required to be the first marking the proposition were required to be the first marking the proposition were required to be the first marking the proposition which is the proposition which is the proposition which is the proposition of the proposition which is the proposition of the proposition which is the proposition of the proposition of the proposition which is the proposition of the prop

About the same time electrification schemes were carried out at many collieries including the complete electrical equipment of the Durham Collieries power station, with a capacity of 10,000 hp. of turbo-alternators. The first large hydro-electric power scheme for public supply in Britain—the Snowdon scheme—was completed in 1006. The whole of the work from tunnelling to transmission lines was undertaken by the Company.

Other achievements of those momentous years included the electrification of tramways at Shanghai, Athens, Delhi, Sunderland, Llandudno, Colwyn Bay, Falkirk, Wemyss and elsewhere. Ten electric locomotives were built for the Portmadoc-Beddgelert and South Snowdon narrow gauge railway. The abandonment of the railwayn in 1908 because of the high cost of cutting the track through dense rock formations resulted the track through dense rock formations resulted the Common ext. at that time.

A NEW CHAPTER OPENS

In 1908 a comprehensive re-organisation took place, and if the period 1904-1908 was one of pioneering and development economic influences and increasing competition now made the protective urge the more dominant, and the mood during the years leading up to the 1914-1918 War



1911. 650 kW and 350 kW 3,000 r.p.m. turbo-generators installed at the power station of Swansea Harbour



1918. 1,000 kW d.c. generators in the Power Station of the Partington Steel & Iron Co. Ltd., Irlam, near



1904. The first large hydro-electric power scheme for public supply in Britain. 1,500 kW 10,000 volt generators in Cym Dyli Power Station, North Wales Power & Traction Co. The plant is still operating.



1925. 7,500 kW hydro-electric generators in the Lake Coleridge Power Station, New Zealand. Four 1,500 kW generators were supplied in 1916 for this scheme. The whole of the plant is still operating.



Main bay of Rotating Electrical Machinery Shop showing the diversity of the work undertaken. Flow of materials is undirectional, each process leading to the next. Components and sub-assemblies are dealt with in side bays and galleries.

The demand for the motor converter continued to grow, and important contracts were understaken grow, and important contracts were understaken for high-speed turtho-alternators and for industrial electrifications chemes. New designs were introduced, but generally speaking the Company was content with a range of standard products, progressing amoodhy and without any special to the Works\* "went on munitions", making high-explosive shells, hydro-phones for the detection of submarines, just mountings and aeroplane parts. With the Armistice the Company once electrical balant. energies to the manufacture of electrical balant.

The story of the Rotating Electrical Machinery Department between the wars compares with that of other heavy industries in this country. There were two distinct phases, the first reaching is culmination in the post-war boom period when record orders were undertaken in which 20,000 kW of motor converters including eight 2,000 kW, 1,500-volt, 50 cycle single commutator converters.

the first ever made in the world, automatic moter converter sub-rations, and 7,00 kW hydroelectric generators for New Zealand stand out; the second when the trade slump came in the late 'twenties. The Company passed through a trying period, but when the contraction of trade reached its lowest ebb there began a new chapter in the annals of the Company, and an era of expansion of both manufacturing facilities and technical development began

#### EXPANSION

In 1932 there began a scheme of modernisation designed to make the Department one of the most up-to-date in the country. Considerable additions of modern equipment for manufacture were made, and the work of reorganising continued until the outbreak of World War II in 1939. Completely new ranges of a.c. motors were designed, and the development of a.c. generators with alternative methods of cooling increased their field of application. During the war the preductive

resources of the Department were utilised to the full. The highly responsible work undertaken is referred to on pages 28 and 29 of this

It is against a background of ambitious hydroelectric schemes at home and abroad and the trend of modern industry to use large capacity motors of special construction that the great technical progress made since the war is to be set. Manufacturing processes have been augmented by new equipment, leading to advanced techniques in manufacture and systematic research in large rotating machine design. Extensive testing equipment has been made available for dealing with high output machines. This has resulted in far-reaching changes in the general pattern of the Rotating Electrical Machinery Department's activities, and many contracts for power plants up to 30,000 b.h.p. are being undertaken for wellknown hydro-electric schemes at home and abroad. It is significant that the first schemes of the North of Scotland Hydro-Electric Boardthe Morar and Lochalsh Schemes-initiated in 1948, are equipped with Bruce Peebles generators. For power station major auxiliary drives such as boiler feed pumps, high-speed squirrel cage motors of over 2,000 b.h.p. are being produced for direct starting, production of these large motors being matched by others of 8 000 b.h.p. for compressor drives and other applications. An entirely new design of large flameproof motors is inproduction for oil refineries and oil pipeline locations. All this in addition to equipments for general industrial use.

The outstanding technical progress made and the remarkable expansion in development that has taken place in modern times has been inspiring, and seldom in the long history of the Ronting Plant Department has there been a greater development in a story of continued progress. The contribution made by Mr. W. B. Läng, now a Director and General Manager, has carned in full measure the Company's entitled.

As these lines are being written this Department celebrates in filtrich brithday at East Pilton, but it goes still further back, having been been at Tay Works in 1985. The contribution to be the training been been at Tay which is the properties of the properties of the training the present principles and bold progressive applications of dearned technique. The end of the in which increased knowledge should facilitate the work to which the Company has dedicated the Rotating Electrical Machinery Department, making profit-side use of the great reperience than been plus desired to the properties of the p



Main Testing Department showing (left to right):—10,000 kW hydro-electric generator for New Zealand; 1,900 B.H.P. a.c. motor for South Africa; 2,500 kW geared generator for Australia; 15,000 kVA synchronous condenser for New Zealand.

# Tycars of Progress & Achieveneut

Progress in rotating electrical power plant to-day differs from that of the past, not so much in differs from that of the past, not so much in deciging, improvements in windings, and in fundamental materials such as insulation, steel, one, copper and its alloys. Not so long ago interiorated construction was bolded upon as a few part of the control o

The evolution of the electric motor has been marked by continuous improvements in electrical and mechanical design, and developments in this branch of manufacture mande during the past decade are clearly reflected in the successful production of individual motors of very large honespower for special industrial applications. The examples shown on this and the following page are an infinible measure of edigin, progress and manufacturing infinible measure of edigin, progress and manufacturing techniques to meet the expanding demands for special type of motors for unusual operating conditions.

- IIO B.H.P. Totally Enclosed Fan-cooled Squirrel Cage Motor designed to give maximum area to heat radiating surface and uniform air flow over the cooling fins.
- 450 B.H.P. Totally Enclosed Tube-cooled Squirrel Cage Motor fitted with oil lubricated ball and roller bearings and constant level oilers. Heated air circulates through tubes on outer periphery of stator. An external fan moves cooling air over tubes.
- 3. 450 B.H.P. Flameproof Squirrel Cage Motor for oil refineries and situations where explosive gases or vapours are present. Tubes surround the stator. Internal fans circulate air within the motor to transfer heat to the tubes. External fan moves air through the tubes to remove heat quickly.



The years following the Second World War must be regarded as the most progressive period in the long history of the Company in ac, motor manufacture, Individual motors of record size have been built, some of which on the represent the absolute limit of what can be achieved. Development records many achievements. There will be more in the wears abend.



(Abow). 850 B.H.P. Steel Clad Slip-ring Motor for driving a crude oil pump at an oil depot. Of fabricated all-steel construction this type of motor is ideal for

(At ldf). 2,050 B.H.P. 3,000 t.p.m. Squirrel Cage Motor for boiler feed pump service. Designed for starting directon-the-line, the motor can run up the pump to full speed in 10 seconds. Self-contained air filters are provided, and the bearings are pressure lubricated from a pump located in the bedplate, gear-driven from the motor shaft. Built in 10,00.

(Below). Five 1,900 B.H.P. slow speed Synchronous Induction Motors driving gas compressors at a fertiliser works. Important economies can be effected by installing these motors for power applica-





7,700 B.H.P. Duct Ventilated Slip-ring Motor for driving an air compressor for use in a supersonic wind tunnel. Pressure lubrication is provided. The design is basically similar to that adopted for many stable leavements are machines. Built in 1742.









(Above) is a 3,750 kW Totally Enclosed geared Turbo-Generator with self-contained coolers and (at left) are 2,000 kW Enclosed Ventilated Generators with self-contained air filters in an industrial power station.

The pioneering achievements of the Company are important as part of a valuable fifty years of experience in generator manufacture which is reflected to-day in the highly developed designs shown here.



(At right), 4,200 kW of Diesel Engine driven Generators installed in the Lerwick Power Station of the North of Scotland Hydro-Electric Board.



Grudie Bridge Hydro-Electric Power Station (see facing page) and River Bran

## HYDRO-ELECTRIC GENERATORS

In 1906 Brace Peebles engineered the Snowdean Hydro-Electric Scheme, the first large project for public supply in Britain. The original Cym Dyil Britain State of the State of

a 1,000 kW generator for Dalgarrog.
Almont half a century has elapsed such as for a construction of the construction of construction for well-known schemes wide-spread geographically. Mostly, individual generators of construction for well-known schemes wide-spread geographically. Mostly, individual generators into the construction of the constr

each of the Local Pannich and Glascarnoch

175 kW Induction Generator using the flow
of compensation water. 4,000 kW slow speed
Vertical Induction Generators are on order for

Schemes of the same Authority, all of which carry full responsibility for the complete power station machinery on the hydraulic and electrical sides. In recent years the stope of manufacture, not only in scale but also in research and development, has widened enormously, and the close lision which exists between design and manufacturing departments has been marked by the progressive collection of data on which improvements in the construction and performance of hydroelectric generator can be based.

Such is the broad picture presented in this short history, and in looking at it more closely it is seen that the progress made is not inconsiderable. On its record of achievement great credit is due to all those who have shared in a co-operative enterprise of the highest order.





(At left). A 14,000 kVA Generator built in 1953 for the Niingen Power Station of Nordland Fylkes Kraftforsyning, Norway.

(Centre). A 15 000 kVA Synchronous Condenser manufactured in 1950 for a hydro-electric scheme of the New Zealand Government.

(Below) Grudie Bridge Power Station of the North of Scotland Hydro-Electric Board. The installed capacity is 26,656 kVA in two units consisting of vertical-shaft Francis-type generating sets operating under a gross head of water of \$37 feet. Installed in 1950.

The pictures which illustrate this page have been picked at random from the many contracts for hydroelectric plant completed during the years 1950 to 1954, some of which carried full responsibility for combined generator and turbine, with switchgear and auxiliary equipear and auxiliary equipear and suxiliary equipear and suxiliary equipear.

ment.







manufactured, and weapons made at East Pilton included a multiple rocket projector and the famous P.I.A.T. mortar. So successful was this portable infantry anti-tank gun that a special department was set up for it, most of the workers being women.

song would be a second of the Company's effort came that this order for "Whale" (posttoons for Mulberty harbours). This "Top Secret" was discreetly kept, and although delivery time was incredibly short, Bruce Peebles had the "Whales" fisherizated in time for D-day, in whose aftermath they played a vital part. Emergency bridge parts too were constructed and set no correas. The convert of the property of the prop

helped to clear the routes.

Thus war supplies for sea, land and air were made at East Pilton, some of them of great intricacy, as for example gun turret hydraulic pumps with 2,000 parts precision machined to 1/10,000th of

A very gracious and much-appreciated recognition of the Company's contribution to the national effort was made when King George VI and Queen Elizabeth visited the Works in 1942 and 1944, accompanied on the second occasion by the (then) Princess Elizabeth. In 1939 the late Duke of

Kent paid a personal visit to the Works.

As the war drew to a close the lessening in output of munitions was counterbalanced by a

Generator for A.R.P.

pass Corrector Coils

speed-up in the provision of electrical plant for war - ravaged areas. Some of the equipments

supplied during the war are shown on this and

the facing





# W.

The late King George VI with Queen Elizabeth, now the Queen Mother, made two visits to East Pilton Works, the first on sth June 1944, and the second on 2 and September 1944, when they were accompanied by the Queen (then Princess Elizabeth). (Below) they are seen during the 1944 visit with Mr. J. W. Rodger; Sir William V. Darling (then Lord Provost of Edinburgh), Chairman; the late Mr. P. Butler and Mr. W. B. Laing, 10sin General Managers.

# ROYAL VISITS



Leaving the Works at the conclusion of the 1942 visit.





First (125 kVA) Transformer built in Scotland, 1925.

## Transformer Department

1925-1954



During 1923 and 1924 the Directors of the Company took the important and far-reaching decision to start a Transformer Department. They were influenced by a situation similar to that of many other engineering companies interested in electric traction, most of whom were manufacturing rotary or motor 15 for the sunply of direct current to the concluding the company of the control of the concluding the control of the control o

converters for the supply of direct current to the overhead tramway networks installed in practically every town and city in this country and in many cities abroad.

Companies engaged in this work found themselves large purchasers of the

Companies engaged in this work found themselves large purchasers of the creatively high rescanace type of power transformer used with rotary conrelatively high rescanace type of power transformers used with rotary conchange-over to the manufacturing of transformers for themselves. Bruce Perbels were in a slightly different position, as their popular converting plant could be operated from an 11,000-volt supply without a transformer, but they also had other interests, and important sections of complete contracts they also had other interests, and important sections of complete contracts

Complete control of contrasts was always in the Directors' minds and executally led to their decision to manufacture transformers also. A serious approach towards manufacturing transformers was made by the Board of Directors under the tenh Managing Directors, Mr Stephen E Bastow, who had already done much to advance the Company's affairs, with the outhad already done much to advance the Company's affairs, with the outmanufacture of the Company's affairs, which was a company to the company to the company that the compa

The positive step of providing a suitable factory and range of designs was now taken by entering into a provisional agreement with another well-



July 1925 saw the beginning of transformer manufacture in the single bay factory seen here—a factory of modest size compared with the present large plant illustrated on the next page.



Present Transformer Shop. It has been five times extended since it first started operating in 1925 and covers three times as much area as the original building. A further extension is now under way.

established manufacturer of transformers; typical factory layout and equipment were suggested, and designs planned for a comprehensive range of small and medium-sized transformers.

It soon became essential to secure the services of someone competent to evaluate these proposals and designs in relation to market requirements, to establish a really suitable factory and to get manufacturing under way quickly, overcoming the initial difficulties contingent on such a venture.

The Company succeeded in finding the kind of service desired; it was agreed that a completely new factory should be built, with room for expansion, and that the designs already obtained were not entirely suited to British specifications, which were a little more onerous in their requirements. Eventually when the start was made—at the beginning of 1925—tt was a clean, unhampered sart which led to happy results for the Company.

Work proceeded simultaneously on designs for new transformer equipment and factory layout. Towards the end of 1925 the first landmark was reached with the completion of the first transformer—a unit of 125 kVA.

## EXPANDING ACTIVITIES

January 1927 saw a rapid extension of the Department's operations in the home market, withan order for forty-two, 2,000 KV Atransformers for the then Charing Cross Electricity Supply Co. Ltd., the largest single order for transformers ever placed up till then in Britain.

Within a few years of its formation the Department in 1509 section algainst severe competition an order for 110,000 kVA of 124,000-volv water-cooled transformers for a Canadian Mydro-electric scheme, at that time one of the largest orders over placed in Britain for E.H.T. transformers. More than 500,000 kVA of transformers have since been built by Bruce Pebels For Canada. Great had been the progress made, and many orders were in Britain for Edwards of the Orders were in Britain for the Canada.

### IMPORTANT EXTENSIONS

By the end of 1929 the work already demanded more space, and a gallery was added to one end of the factory. This, however, did not suffice, and in 1930 the floor area was doubled by the erection of three new bays. Many advances in transformer design and manufacture had been along] expected lines, but research had been directed with such successful results that by 1930 the manufacture of mercury are rectifiers became practicable, thus opening up an important expansion of the Commany's business.

By 1936 a new phase of development appeared. The Department had attained appeared. The Department had attained 123,500 kVA and now added 123,500-volt transformers for the British Gridj, in units up to 15,500 kVA, the forerunners of many larger high voltage units including those recently ordered for the 275,000-volt Super Grid.

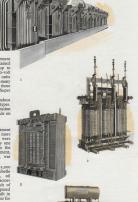
World War II brought a tremendous demand for transformers of all types. References to the Department's contribution of equipment for war potential are made on pages 28 and 29.

#### NEW DEVELOPMENTS

Peace found the products of the Department in great demand. In 1945 once again more space was needed, and the three bays were further extended, making the factory one of the largest and best equipped in the country. A new Coil Winding Department, a model of layout and cleanliness, was brought into commission.

Progress continued, and in 1949 two 75,000 kWA generator transformers for Portobello Power Station and also 3-phase, oil immersed, magnetically shielded reactors capable of dealing with a power fault of 450,000 kWA were built, the latter reputed to be the largest of their type ever built in Britain. There followed in 1933 an order for

- 1. 1927. Largest single order for Transformers ever placed in Britain up to that date.
- 1928. 2,000 kVA Transformer fitted with externally operated "off load" plug type tapping switch.
- 1930. 110,000 kVA of 124,000-volt Transformers supplied for a Canadian hydroelectric scheme.
- 1931. "On-load" voltage control equipment introduced. Picture shows a 10,000 kVA Transformer with "on-load" gear for Canada.







The Transformer Shop has been many times enlarged to cope with increasing demands, and a further extension to the main bay is now in progress. The most modern manufacturing and testing facilities are provided for building high voltage transformers in largest capacities.

two 120,000 kVA units for the 275,000-volt Super Grid. Between 1926 and 1926 annual orders rose to 350,000 kVA; by 1946 the figure had been trebled; by 1954 it resched 2,000,000 kVA. Since its inception the Department has dealt with orders reaching the impressive total of 20,000,000 kVA. The factory, further extended in 1954 by a new bay, now covers three times its original area, and another extension is under way, making six in all since 1924.

Notwithstanding achievements in meeting demands for units of ever increasing capacity and voltage, research never ceases, and a high voltage testing plant in the form of a 1,800,000-volt impulse generator is used for studying lightning disturbances, insulation and other problems. Many personalities assisted in this brilliant development, men with enthusiasm and bellef in the fiture, pionering spirit, inventiveness and an ideal in keeping with the Company's long artificion of quality, men who carried the Department to success and met the stringent requirement to success and met the stringent requirement to success and met the stringent requireted by the success of the success of the success feet and the success of the success of the Mr P. Butler joined the Department in 1926. His wide knowledge and experience were great assets, and his achievements are lasting momenassets, and his achievements are lasting momented than the success of the success of the success of the became a Director and loint Great Ma 1929.

The urge to progress is as strong to-day as during the past twenty-nine years. The Department aims to lead in all its fields of activity and so uphold the traditional high quality of Scottish manufacture.



This impressive line of transformers nearing completion shows (right to left) 20,000 kVA Generator Transformer for the North of Scotland Hydro-Ellectric Board; 13,000 kVA unit for the British Ellectricity Authority; and a 4,575 kVA Mercury Are Rectifier Transformer for South African Railways.



In the Transformer Coil Winding Department, considered to be amongst the largest and most extensively equipped in Britain.

# 2 Gears of PROGRESS & ACHIEVENEYS

Is in necessity that the development of the Transformer Department as been identified with the entally attaces in the dean of algae high-relating the control of the contro

One of the prime factors in developing the Transformer Department to the high degree it has now reached has now reached has now reached has been the resized work undertaken to meet probable future requirement. Chiefly this was in connection with armospheric over-voltage phenomena. Design data to consume the satisfactory operation of extra high voltages of the control of the produced by lightning and other facts that of the produced by lightning and other disturbances were obtained from investigations carried out greatly in excess of the normal occuration voltage.

High voluge research and the study of insulation trength problems on transformers are paint on with increasing proposed in the 1,000 consistent of the



The 1,800,000-volt Impulse Generator here illustrated is extensively used for research work on transformers, and in specified instances the impulse testing of completed transformers. The valuable information resulting from high voltage research work has contributed greatly to the high surge strength of Bruce Peebles transformers. (Beige) High-speed Cathode Ray





This 3-phase 33,000-volt Oll-Immersed Magnetically Shielded Reactor, one of four built in 1948 for Portobello Power Station, is believed to be the largest of its type to be built in Britain up to that time. It is designed to limit the short circuit current to 45,000 kVA.

During short-circuit testing at the British Short Circuit Testing Station at Hebburn-on-Tyne the Reactor successfully withstood ten successive full short circuits without any sign of distress.



A 130-ton 75,000 kVA Generator Transformer, one of two built in 1949 for Portobello Power Station.



This 30,000 kVA 132,000-volt Transformer is typical of many supplied for the National Grid during the past twenty years.

It is a far ery from the small transformer built in 1935 to the 120,000 kVA units of to-day. The trend of modern destrictive supply practice is towards the transmission of bulk power at ever-increasing voltages, and for real properties of the control of the con



## RECTIFIER DEPARTMENT





By the middle 'twentise the use of rotating machines as a means of converting alternating current into direct as a means of converting alternating current into direct as a mean of converting alternative were becoming available, so that when the Company took up the manufacture of mercury are rectifiers it toud hardly be considered a new development, but rather the introduction of a new product. Nevertheless it opened up a new and unexplored field, because no British manufacturer had at the time produced a steel (vinder at the time produced a steel (vinder and the time produced as teel (vinder and

recitific for use on large power conversion systems. There is no doubt that the tradition established by the enter in the property of the control of the control of the enter in the fidd of electrical conversion was one of the dear the control of the control of the control of the lader, overing the sole manufacturing and selling rights in this control wise clylinder recitlers. In the anium property of the control of the control of the Switzerland to study technical developments, and following that a new department for the manufacture of graph of the control of the control of the graph of the control of the control of the meaning development manufacture of Glass Hall Recettlers usered in 1911 under knew form Société describes usered in 1911 under knew form Société to the control of the control of the property of the control of the control of the first control of the control of the property of the control of the property of the control of the property of prope

The first steel cylinder rectifier to be supplied and installed in Great Britain was put into operation by the Company in 1930 in the Dewar Place sub-station of Edinburgh Corporation. The record of the Rectifier Department in establishing the technique and manufacturing methods necessary for the production of power rectifiers has been very graftlying. Since its inception the department has dealt with well over 400,000 kW of rectifiers for various public and industrial services, the major output being absorbed in main line rallway electrification.

By 1932 the Company had already won prominence as one of the nation's foremost manufacturers of rectifiers and gained outstanding recognition by the award of four successive orders between 1932 and 1939 from the then Southern Railway Company for a total of 115-2,500 kW remote supervisory con-

A typical 2,500 kW water-cooled Steel Cylinder





(At left). This general view of the Rectifier Department, taken in 1951, shows mercury are rectifiers in various stages of construction. Most of them are for railway traction service.

(Below). From 1947 to 1954 the Company was busily engaged with the manufacture, supply and erection of nineteen 2,500 kW 1,500-volt rectifier sub-station equipments for the Manchester - Sheffield - Wash electrification scheme of British Railways, one of the most important railway electrification schemes of modern times. Ficture shows a group of rectifier undergone preliminary tests, and automatic control preliminary tests, and automatic control

trolled rectifier sub-station equipments for the London-Brighton and South Coast main line lectrification schemes. The total of 287,000 kW supplied represented at the time the greatest agerate capacity of rectifiers in the world for a single customer and the four orders into which the aggregate was divided were each in turn the largest single order ever placed for rectifiers in and for Great

Forefront of the 1947-1954 railway electrification picture is the completion of what has been termed one of the most important railway-engineering schievements of modern times—the Manchester-Sheffleld - Wath electrification scheme of British Railways, which marks the first apolication in

Britain of 1,500 volti d.c. to main line railway work. Bruce Petels rectifier ub-strain equipments are used exclusively for the conversion of for delivery to the overhead conductor system. Nineteen equipments were supplied, each constitute of a 1,500 km grid-controlled used cylindar capacity and automatic switchages for remote supervisory control. Some of the sub-stations are additionally equipped with electronically-corner cover from [concentives while braking on steep recover from [concentives while braking on steep



gradients when such power is not absorbed by trains moving uphill.

Still another field for the use of a.c./d.c. rectification exists in the mechanisation of mines where selenium rectifiers can be used with advantage as a means of providing power through the batteries of underground electric locomotives.

The history of the Rectifier Department records many achievements not only in the sense of design but also in the development of existing techniques and in the introduction of new ones.

# 2 Gears of Progress & Achievenery

In the preceding pages an attempt has been made in the short space available to outline some of the outstanding achievements of the Rectifier Department during the past twenty-five years. The rate at which new developments in rectifier engineering are demanded by the first rectifier was supplied in 1930. Research and practical pioneering go on all the time towards further development. Whale the pace is growing faster the Company's policy ternains the same—to meet and, if the pace is growing faster the Company's policy remains the same—to meet and, if the pace is growing faster the Company's policy remains the same—to meet and, if the pace is growing faster the Company's policy remains the same—to meet and, if it is not the pace in the pace is growing faster the Company's policy requirements in tall broader fields.



The demand for glass bulb rectifiers continues to expand for equipments of ever-increasing capacity. Here is an 875 kW unit supplied in 1948 for a Scottish steel works.

From 1932 to 1939 the Company played an important part in the electrification of the Southern Region of British Railways and supplied nearly 300,000 kW of rectifier substation equipments. Picture shows a 2,500 kW sub-station at Plumpton.





Air cooled steel cylinder mercury are rectifiers were first developed in 1946, and many have been supplied for railway traction service as instanced by the 2,500 kW 1,500-w/ot sub-station equipment pictured at left undergoing Works tests. Bull in 1952, it is one of several air-cooled equipments for British Railways.



## WELDING DEPARTMENT

1929-1954





The Company was a pioneer in the technique of fabricating large steel structures. Picture shows a tank for a 3,000 kVA transformer made in 1932.

Even as recently as 1926, the discarding of drill, rivet, both and nut, as a means of bonding plate with plate or part with part, in favour of fusion was viewed with considerable misgiving by many of the older school, but such prejudices were short-lived in the light of convincing partical demonstration, and as is well known to everyone partical demonstration, and as its well known to everyone arms as one of the greatest aids to rapid and economical production in engineering circles—Heavy or Light.

With experience in application it quickly became obvious to the Company that full exploitation of welding technique would be a boon in the case of all their principal products, and time has proved that conclusion well founded.

In 1933 and following the relatively severe trade depressions of the late 'twenties, one of the Company's heavy engineering shops, primarily erected for-and for some years engaged on-the production of heavy machinery for steel works, was made available with little change in the disposition or type of the plant installed, and that happily and at once provided a most suitable centre for the expansion of the Company's rapidly growing activities in the production of a wide range of welded structures. In the early stage work in the main was directed towards the production of welded structures required by other Departments. For the Rotating Plant Department: Stator Frameworks, Bed Plates, Bearing Pedestals, Rotor Spiders, etc.; for the Transformer Department: Transformer Tanks, with all the steel structural parts required in the manufacture of the transformers; and eventually for the Rectifier Department the hermetically sealed steel vessels used in the construction of large power mercury arc rectifiers, and it naturally came about that many

structures, formerly built up by castings, were discarded and the more desirable steel welded frame substituted, leading to flexibility in design, elimination of pattern manufacture, and many important conomies in the application of welding instead of casting for work of a non-repetitive order.

The Department made rapid headway, and as its meant on work became much more diversified. Steadily increasing demand for the products of the new Welding Shop made it orbins that faced. In 1937 the decision was taken to double the manufacturing space protosity available, and at the same time provide all the increased facilities—multi-operated Welding Machines, large Profiling Machines, Twice Bending Machines, provide provides all the manufacturing of the manufacturing of the manufacturing which was not as a support of the manufacturing of the new products.

Welding operations on components actually started in the late 1920's, but in 1931 the new bay seen here was added to the transformer shop and devoted entirely to the production of fabricated steel structure.





General view of Welding Department

Whereas in the earlier years referred to effort were concentrated on the numariserur of composens for other concentrated on the numariserur of composens for other integration of the control of the cont

More recently tanks were built for transformers as large as 75,000 kW, and states and roter frameworks fabricated for relatively large, slow-speed hydro-electric generators with deviable sations, where externes exceed on a first importance. Bearing brackets, designed to carry a vertical bad of 85 tons, were also made. Here, too, precutions had to be taken during welding to avoid locked-up stresses by adopting and contractions. Such that the contract of the c

During the Second World War the possibilities of fibricated construction were tested to the utmost, and the Department operated to the very limit of its physical causacity under the stress of immediate demands for many hand of strange and new products for the fighting services. Some of those products for the fighting services, Some of those products from the first product and products for the fighting services. Some of these products are producted from the first product and the product and the first p

for 120,000 kWA transformers to-day, as well as fabrications for 25,000 kWA generators. From an annual usage in 1929 of 4,000,000 feet of electrode to 2,000,000 feet and 2,500 tons of steel to-day. Some disappointments and many triumphs stans triumphs and the standard out as milestones in its history. The Deptit of the future for the future future future future future future for the future future

Throughout all the years from conception to maturity, through all the trials and tribulations of such a venture, Mr Gilbert Anderson, with his able staff, has set a

standard and a pace and created a tradition which he, as Manager of the Welding Department, may well regard with great satisfaction and pride.





## 2 Fears of

### PROGRESS & ACHIEVEMENT

The past twenty-five years have witnessed striking advances in welding techniques and construction brought about by the phenomenal increase in the size and weight of individual fabrications, and in meeting new and constanty-changing conditions the Welding Department has played a conspicuous and highly successful part. Having completed the first quarter-century satisfactority, it turns with interested alactivity to the next one.



Built in 1949, this tank for a 75,000 kVA transformer is typical of the large structures which can be successfully fabricated.

Lower illustrations on opposite page show a fabricated stator frame for a 16,380 kVA Synchronous Condenser, and operations in progress on a tube cutting machine.

The years following World War II were the lass years for steel plate supplies, and the successful fabrication of massive structures from the limited variety of plates then available showed, by the accurate matching and mainty by the accurate matching and mainty of parts, the adaptability of the art of steel the supplies of the suppl



## THE SOCIAL SIDE



The Welfare of the employees is given the closest attention. In a large dining hall first-class meals are provided at a cost within

While social life is to a large extent built around domestic life, the Company realises that many social activities can spring from the comradeship of work and can bring greater unity to the lives of the employees and their families. Social activities are therefore encouraged and strongly supported.

An interesting feature of the organisation is the encouragement given to employees to offer suggestions for improvements in amenities, design and production. Through a Joint Production Committee, which functions in matters as diverse as safety, welfare and production, all suggestions are carefully examined, and awards granted where merited. Employees participate in a Production Booms Scheme.

Social and recreational interests are catered for by the Social and Sports Club. Another useful and appreciated amenity is the provision of a Works Library which contains a wide selection of technical, general interest, fiction and reference books.

An Apprentice Training Scheme is in operation, and a comprehensive Welfare Service is provided for both sexes under the direction of Personnel and Welfare Departments. A Medical Service looks after the needs of employees, and there is a branch of the St. Andrew's Ambulance Corps. Modern Canteen Services are provided. The spiritual welfare of employees is cared for by a visitura Industrial Chaplain.

The Company has always encouraged its employes by promotion, and in this way has created a fine spirit of co-operation and enterprise. The present of co-operation and enterprise. The present of the Chief Executives began as B.P. apprentices. The care of the aged has not been overlooked. In 1950 the Wardie Men's Club for retired employees was formed by Mr. W. M. McKenzie,

This picture, taken in 1945, of a group of workers whose combined service totals well over 2,000 years, indicates the good relations existing between the Company and its workpoole. present Company Secretary, in collaboration with the Rev. James Rennie, the Company's Industrial Chaplain.

Finally, B.P. News is the title of the Company's own Magazine. Published quarterly, it serves as a valuable link between individuals, departments, branches, and agents and representatives of the Company at home and overseas.



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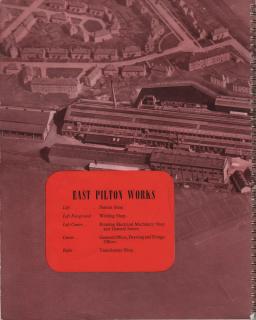
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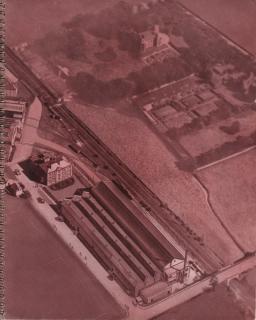
Even as the years pass, taking so much for granted as they go, experience has taught under the year to reto-morrow may disclose some new method, or a better way of doing things, that will give even greater excellence to our products. Past efforts, and even spectacular events and developments are, therefore, but transient achievements serving to inspire us to still greater endeavour.

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### AN INVITATION

Many of you who have read this book will have visited Eart Pilion Works and will know of our activities. We hope that its pages have recalled pleasant memories and that our friends will come again to see us. To those who have not yet had the opportunity of visiting us, we hope the book will have been found interesting. To everyone we extend a very warm invisition to visit our Works where examples of modern electrical machinery practice may be examined in pleasant surroundings.





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