

# ELECTRICAL REVIEW

FOUNDED  
1872

Vol. CXXXIV. No. 3465

APRIL 21, 1944

9d. WEEKLY



## THEY HAVE TO BE GOOD

A high proportion of L.S.E. D.C. motors are used for applications such as this (a ship's circulating pump) where any trouble would be highly inconvenient, to say the least.

Marine engineers are not alone in proving from experience that L.S.E. make motors, for a wide range of uses, that fit the job exactly, need very little attention, and keep on turning round until the driven machine is scrapped.

**LAURENCE, SCOTT  
& ELECTROMOTORS LTD.**

*Specialist Makers of Electric Motors since 1883*



NORWICH • MANCHESTER • LONDON AND BRANCHES



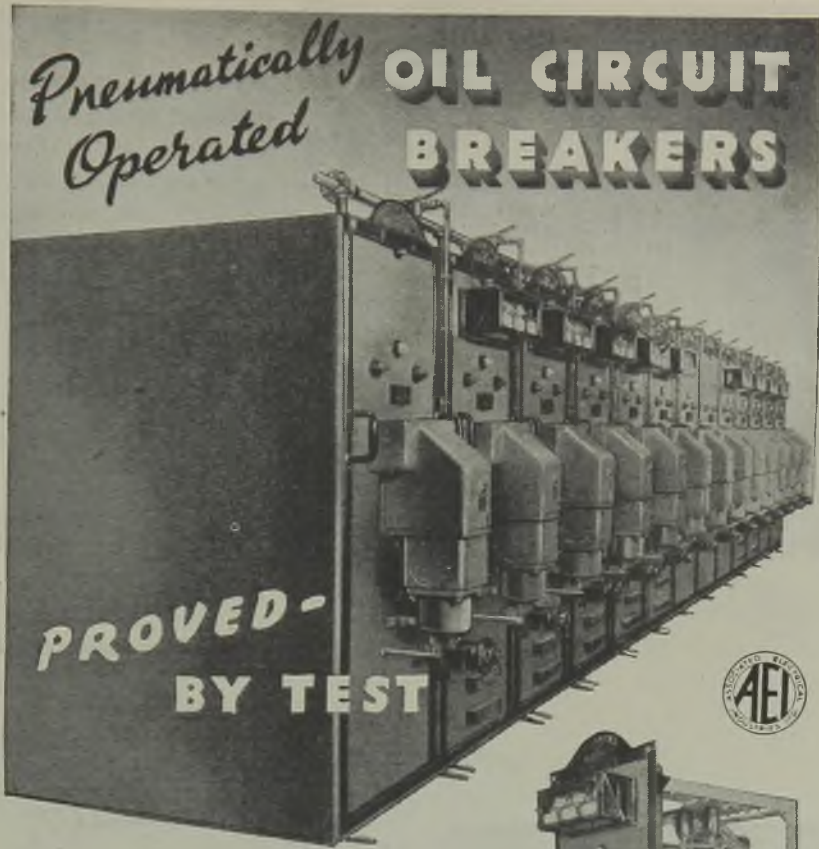


## Throwing a new light on accidents

Although accidents *will* happen, many of them needn't. Lighting—poor lighting is frequently to blame. Investigation and research prove it, prove also that a scientifically planned lighting system, as created by Siemens, does reduce accidents—a vital consideration in these days of man-power shortage and increased demands on production.



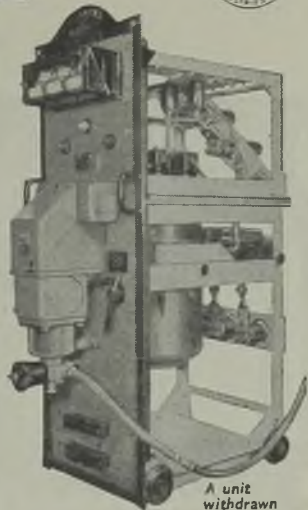
PLANNED Lighting with Siemens Lamps can be the solution to the many production problems resulting from inadequate lighting. Our expert lighting engineers are ready to advise—and without obligation.



The above photograph illustrates a truck type switchboard recently supplied for the control of important plant in India.

Pneumatic closing mechanisms are fitted, ensuring smooth and rapid operation, the full closing power being maintained right up to the end of the stroke.

Pneumatic operating mechanisms are available for all sizes of circuit breakers, irrespective of the type of switchgear employed.



A unit withdrawn

**FERGUSON, PAILIN LIMITED**  
**M A N C H E S T E R 11. E N G L A N D**



**'EFESCA'**  
Wiring Accessories

**'HITEST'**  
Cable & Flexible Cords

Regd Trade Mark.

**EFESCA**

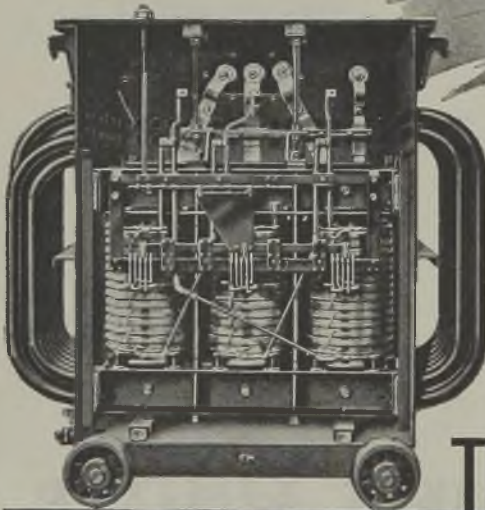
The comprehensive range of "Efesca" lighting Accessories and Fittings and "Hitest" Cables and Conduits are produced in our own several Works. At present, priority orders must receive first consideration but, within the limits imposed, we give, as always, the utmost service.

★

**FALK, STADELMANN  
& COMPANY LIMITED**  
89-93 FARRINGTON ROAD,  
LONDON, E.C.1 & BRANCHES

⊗ 89-19B

## Inside - Information



Outwardly one transformer looks very much like another. It's the unit inside the tank—the nerve centre—upon which real performance must be judged. The picture tells the discerning engineer just what he wants to know and shows how reliability is built into

**PEEBLES**

# TRANSFORMERS

**BRUCE PEEBLES & CO. LTD., ENGINEERS, EDINBURGH.**



# ELECTRICAL CONTROL GEAR for all types of installations

"BILL" REWRIBABLE  
ARC DAMPING TYPE  
FUSES or  
ENGLISH ELECTRIC  
H.R.C. CARTRIDGES.



LONDON: A W ZELLEY  
75, GREAT PETER ST.  
WESTMINSTER, SW1

**BILL SWITCHGEAR LTD**  
BIRMINGHAM 20

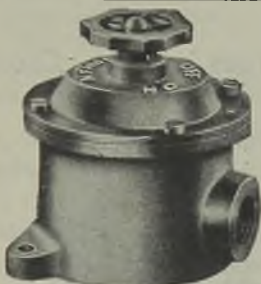
MANCHESTER - GLASGOW -  
BELFAST - BURTON-ON-TRENT  
EXETER - SOUTHAMPTON

BIRCHFIELDS - 5011 (4 LINES)

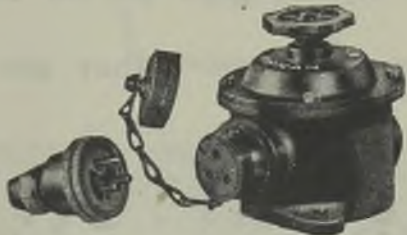
"BILSWITCH" BIRMINGHAM



## WEATHERPROOF SWITCHES



N 900. 5-amp 250-volt C.I. Switch  
screwed  $\frac{3}{4}$ " conduit.



N 910. 5-amp 250-volt C.I. Switch complete with  
3-pole earthed-type plug. N 660 A.

**SIMMONDS & STOKES LTD.**  
Victoria House, Southampton Row, London, W.C.1. Holborn 8637 & 2163



## THE EYES HAVE IT.

The eyes have fair play when the lighting is correctly planned with the correct lamps for the job. To make sure of this, draw on the resources of the Crompton Lighting Service. They are at your disposal . . .

# CROMPTON LAMPS

FOR **CORRECT** LIGHTING  
TUNGSTEN . . . FLUORESCENT . . . DISCHARGE . . .

CROMPTON PARKINSON LTD • ELECTRA HOUSE, LONDON, W.C.2

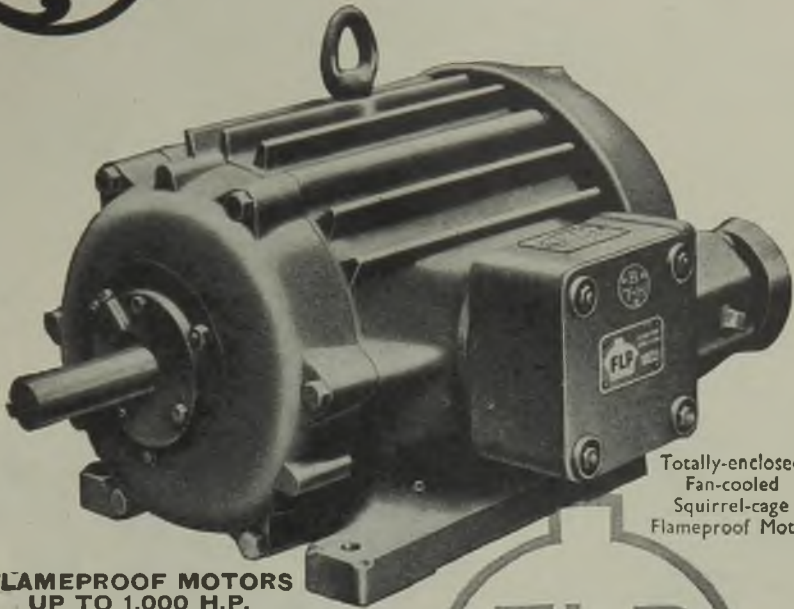
Telephone: Temple Bar 5911

Telegrams: Crombark, Estrand, Landa





# FLAMEPROOF MOTORS



Totally-enclosed  
Fan-cooled  
Squirrel-cage  
Flameproof Motor

**FLAMEPROOF MOTORS  
UP TO 1,000 H.P.**  
(Squirrel-cage from  $\frac{1}{2}$  H.P.)  
(Slip-ring from 5 H.P.)  
and

**AN EXTENSIVE RANGE OF  
FLAMEPROOF CONTROL GEAR**

For use in collieries, oil refineries, paint and varnish works, spray booths, and any situation where inflammable gases or liquids may be present.



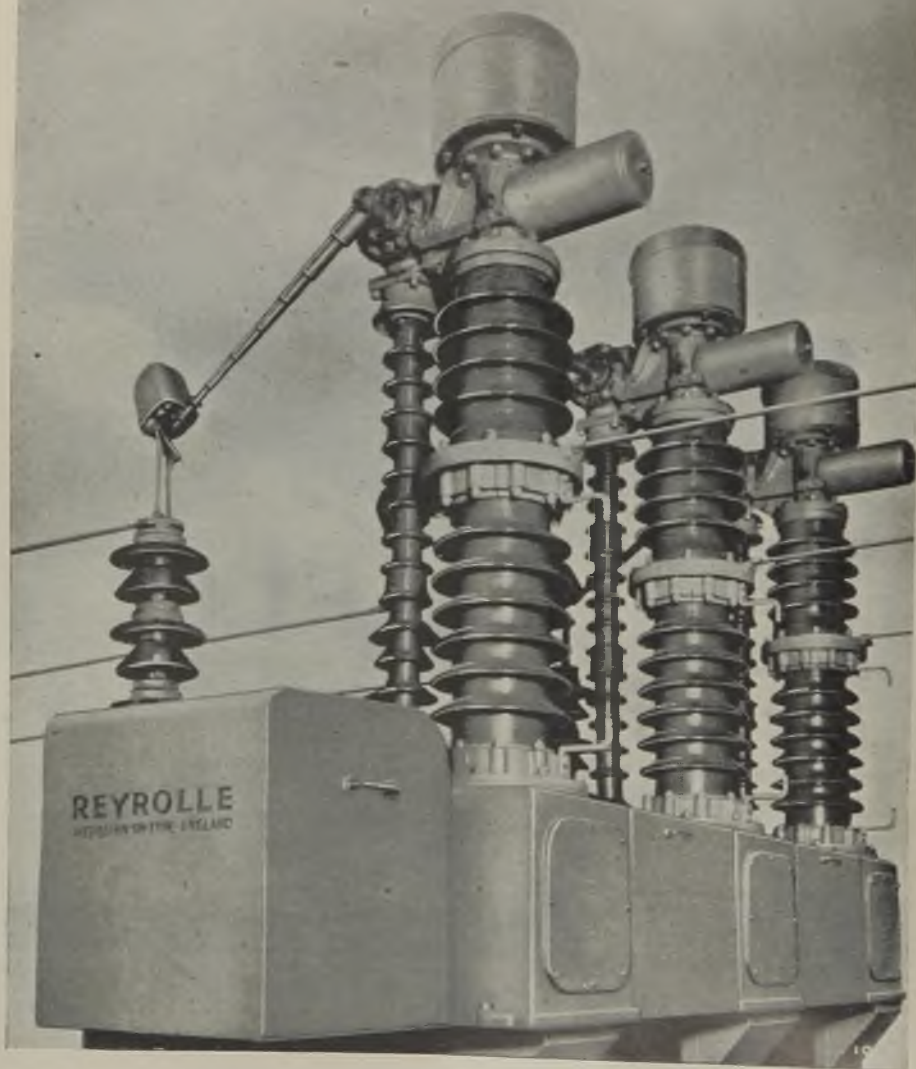
*All-steel cylindrical frame motors and gate-end control gear are available for underground conveyor drives, etc.*

# BTH

THE BRITISH THOMSON-HOUSTON CO., LTD.  
CROWN HOUSE, ALDWYCH, LONDON, W.C.2.



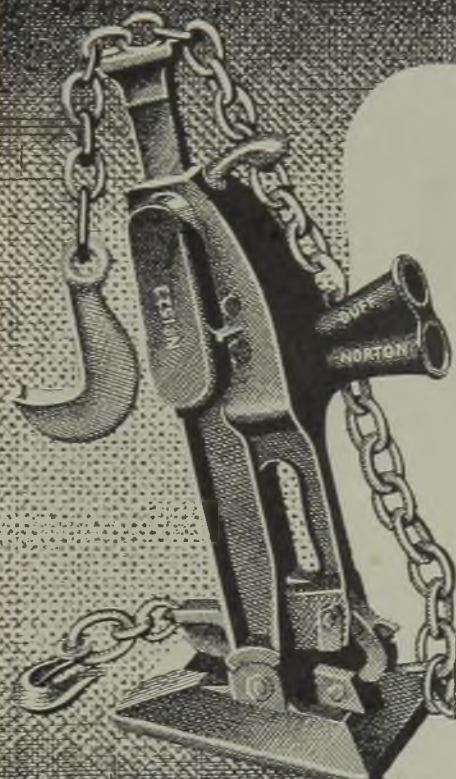
A3243

**REYROLLE****AIR-BLAST****SWITCHGEAR**



*Let mechanical muscles multiply man-power*  
**for EVERY PROBLEM OF LIFTING - LOWERING - PUSHING - PULLING**

# DUFF-NORTON JACKS



The best of original design, the best of materials, the finest of precision machinery would be insufficient to make Jacks of outstanding quality, if skilled craftsmen were not putting their very best into every stage of their manufacture. Duff-Norton are proud of men who make the Duff-Norton Jack.

The illustration is of a Duff-Norton Genuine Barrett GENERAL PURPOSE JACK (FourWay). This is the jack for rough and ready service. It is convenient to handle and spot... can be operated by one man and, having a pivotal base which gives operation at any angle, it can be used for pushing.

The working parts (of utmost simplicity) are fully enclosed... there are no machine screws or parts to come loose... the self-contained spring mechanism can be removed bodily... there are no loose pieces, bolts or nuts to require adjustment.

The steel chain which fits into slots on top of the jack, can be used as a sling. The double socket lever aids effective operation under cramped conditions.

DN 4

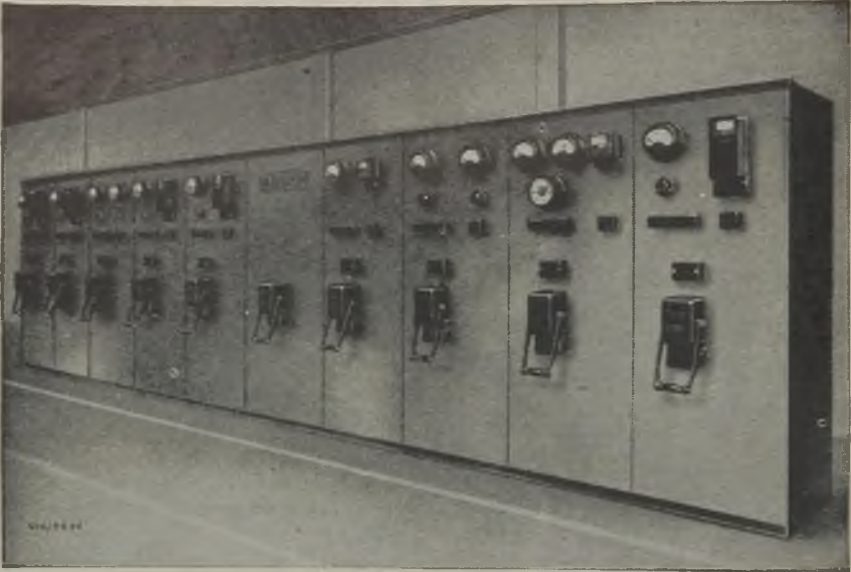


**CONSOLIDATED PNEUMATIC**  
**TOOL CO. LTD.**  
 232 DAWES ROAD LONDON S.W.6

**AIR COMPRESSORS · PNEUMATIC TOOLS · ELECTRIC TOOLS · DIESEL ENGINES · VACUUM PUMPS**  
**CONTRACTORS' EQUIPMENT · ROCK DRILLS · DIAMOND DRILLS · OIL WELL TOOLS**



*Stationary*  
**CUBICLE TYPE**  
**SWITCHGEAR**



**TYPE S.C.R.**  
**REAR ACCESS.**

**RATINGS**

up to  
**2,500 AMPERES**  
**660 VOLTS**

**T**HIS type of equipment is designed for use chiefly in industrial substations to control incoming bulk supplies and feeders to heavy plant and distribution gear.

- NEAT and EFFICIENT DESIGN and LAYOUT
- ROBUST CONSTRUCTION
- UNRESTRICTED ACCESS
- SAFE OPERATION



*Taylor Tunnicliff Porcelain*

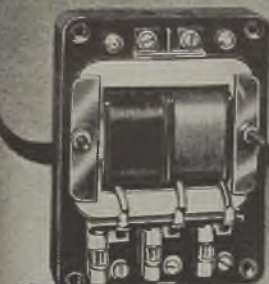
Head Office: Eastwood, Hanley, Staffs. London: 85, Streatham Hill, S.W. 2. Phones: Tulse Hill 5255-6 & Stoke-on-Trent 5272-4

TAB/TT.40



# G.E.C. INDICATORS

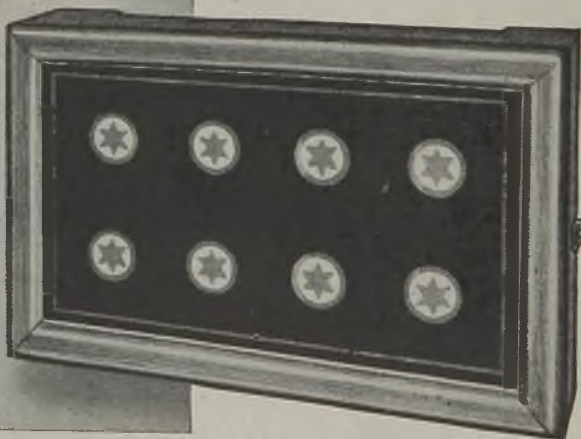
## BAKELITE BELLS-PUSHES AND TRANSFORMERS



Note the three fuses in the transformer, one to each pole on the secondary side, thus complying fully with I.E.E. Regulations No. 210.



**Get into touch  
with your nearest  
G.E.C. Branch for  
all requirements  
in Bell installation  
material.**



**G.E.C. quality is being rigorously maintained**

# IMPORTANT TO DEALERS

TELEGRAMS:  
 FERRANTI MANCHESTER  
 TELEPHONE  
 FAIRFORTH 2271  
 (WEEKLY BRANCH SERVICE)  
 TELEX  
 FAIRFORTH TELEX 2220

**FERRANTI LTD**  
 ELECTRICAL & GENERAL ENGINEERS  
 MOSTON  
 MANCHESTER, 10

LONDON OFFICE:  
 KERN HOUSE,  
 36 KINGSWAY, W.C.2  
 TELEGRAMS:  
 FERRANTI, WESTCENT,  
 LONDON  
 TELEPHONE:  
 TEMPLE BAR 6666  
 REGISTERED OFFICE:  
 BULLINGWOOD, LANC'S

Your Ref  
 Our Ref **FF293/2**

Dear Sir, PEACE --- THEN PROGRESS.

It is pleasant to indulge in dreams of universal prosperity after the war. But Progress is a child of slow growth; of experiment certainly, but all the time nourished by its predecessors.

Time-tested Ferranti Radiant Electric Fires will therefore be available to Dealers as fast as we can produce them --- because the world of electricity consumers will want to live comfortably during the months of development and reconstruction.

Our plan No.1, therefore, is --- the best of pre-war models quickly, to keep Dealers happily and profitably employed meeting the demands of old and new householders. Improved models will follow --- for we have never lacked the progressive spirit.

Yours faithfully,

*A. Galloway*

Manager,  
 Domestic Appliance  
 Sales Department.



WHERE QUALITY  
IS SPECIFIED...

*fit*  
**'METALLIC'**

LOOK FOR THE  
A.S.C.M. MARK



ON EVERY  
LENGTH..

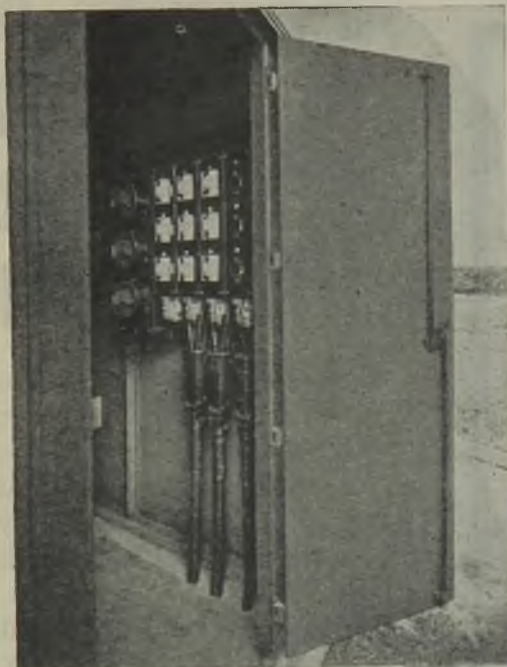
**METALLIC SEAMLESS**  
TUBE COMPANY LIMITED  
LUDGATE HILL BIRMINGHAM  
PHONE GEN 7167 GRAMS "FLASK" BIRMINGHAM

Sales Depots:

LONDON	88 Goswell Road, E.C.1
NEWCASTLE-ON-TYNE	St. John Street
LEEDS	5 York Place
SWANSEA	1 Grove Place
GLASGOW	137a, St. Vincent Street



# DISTRIBUTION PILLARS & PANELS for all purposes



In addition to standard ranges of Henley Distribution Pillars and Panels, we can arrange for special assemblies to meet customers particular requirements. The Henley unit type construction is exceedingly flexible and by mounting meters, instrument panels, etc., on the same framework as the units themselves, space is saved and a neat layout is obtained.

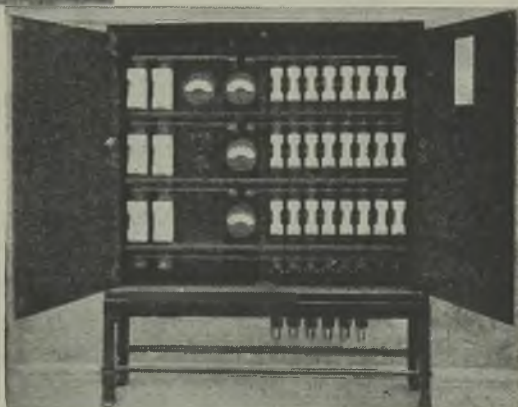
On Left: A small substation panel fitted with bakelite shields and incorporating a meter panel. The units are of the HENLEY Dwarf Type.

Below: A pillar assembly including two 500 amp. feeder units and eight 150 amp. distributor units, direct connected ammeter on each phase and voltmeter with selective switch for reading voltage on each phase.

## HENLEY

UNIT TYPE  
DISTRIBUTION  
PILLARS &  
PANELS

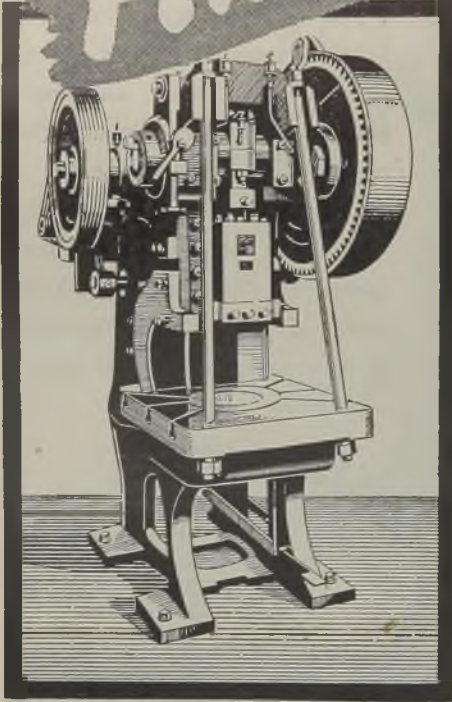
TRADE  MARK



**W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.**  
MILTON COURT • WESTCOTT • DORKING • SURREY

PHONE: DORKING 3241 (10 LINES)  
TELEGRAMS: HENLETEL, DORKING

# Fixing?



## HERE'S A SOLUTION TO YOUR PROBLEM

Each Rawlplug Technical Specialist has spent many years studying fixing problems and is therefore well able to advise you on the subject. He is backed by works technicians and the research facilities of our own laboratories. An appointment can be arranged with one of our specialists by writing to the address below.

If your problem does not require the special attention of a Representative, make sure you have at hand a copy of our 24-page brochure "Fixing Devices that grip the World." And if you are further interested in fixing problems you can obtain free, a copy of our 216-page Technical Handbook "Modern Fixing Practice" by applying on a trade letter heading.



B.259

**THE RAWLPLUG CO. LTD., RAWLPLUG HOUSE, CROMWELL RD., LONDON, S.W.7**

# FUSEGEAR

*Specify  
'English Electric'*



## 'ENGLISH ELECTRIC' TYPE 'J'

**CARTRIDGE-FUSE LINKS** have for more than a decade — given unequalled performance under service conditions in Underground Disconnecting Boxes, Feeder Pillars and Service Cut-outs



**STANDARD**



**SLOTTED**

FIXING CENTRES	CURRENT RATINGS	LIST No. PREFIX LETTERS
<b>STANDARD</b>		
3"	20A to 200A	J H
3 1/4"	20A to 400A	J P
3 5/8"	20A to 600A	J S
<b>SLOTTED</b>		
3"	20A to 200A	96 T Y
3 1/4"	20A to 200A	95 T Y
	250A & 300A	95 T J
	350A & 400A	171 T N
3 5/8"	20A to 300A	385 T J
	350A & 400A	386 T N
	450A to 600A	387 T W

DELIVERY AS ALWAYS—EX STOCK

*Every genuine cartridge-fuse link manufactured by our Company bears the name 'English Electric'*

**THE ENGLISH ELECTRIC COMPANY LTD.**  
— STAFFORD —





# CANNING

## EQUIPMENT FOR HARD CHROME DEPOSITION

For reclaiming and building up  
Engineering products.

Cams, crankpins, crankshafts, gears,  
bearings, piston rods, cylinders for  
internal combustion engines, gauges,  
dies, moulds, etc.

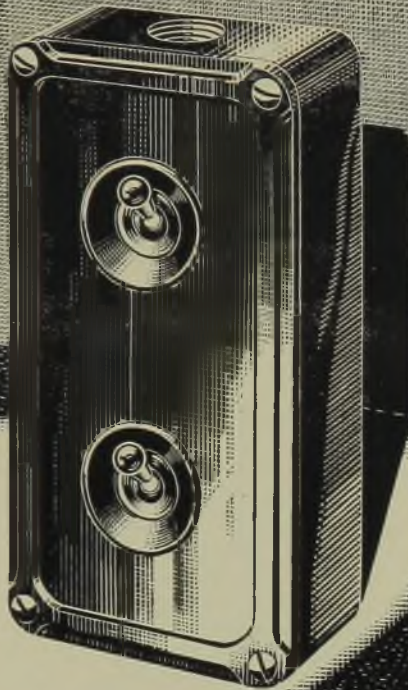
Let us help you with your reclamation  
problems.

W **CANNING** & CO LTD

**GREAT HAMPTON STREET, BIRMINGHAM 18**

# Industrial

## IRONCLAD SWITCH UNITS



"BRITMAC" Ironclad Industrial Switch units have earned the utmost confidence of Architects, Consultants, Electrical Contractors and their clients for many years. The switch unit illustrated, catalogue No. P.1542, with flat lid, is one of the comprehensive range available. May we send you full details of the "BRITMAC" Ironclad Range ?



ELECTRICAL  
ACCESSORIES  
FOR ALL WAR-TIME  
INSTALLATIONS

POINTS OF PERFECTION

**C • H • P A R S O N S • L T D**

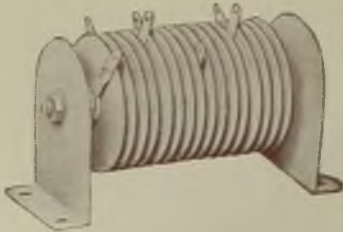
Telephone:  
ACOCKS GREEN  
1642 LINES

Britannia Works  
Wharfdale Rd. Tyseley  
**BIRMINGHAM 11**

Telegrams:  
HECTOMAR  
BIRMINGHAM



## Serving with the SIGNALLERS



**U**RGENT . . . that's the tag on nine out of ten messages: accuracy, too, is imperative. Signalling under war-time conditions is a secret service. STC Selenium Rectifiers are silent in operation; moreover, they keep fit for long periods without maintenance and are free from moving parts. Where direct current is required from an A.C. source they ensure sustained and satisfactory service. For Service use they are given a protective finish which withstands the most severe atmospheric conditions.



# Selenium Rectifiers

Rectifier Sales Department :  
STANDARD TELEPHONES AND CABLES LIMITED, NEW SOUTHGATE, N.11

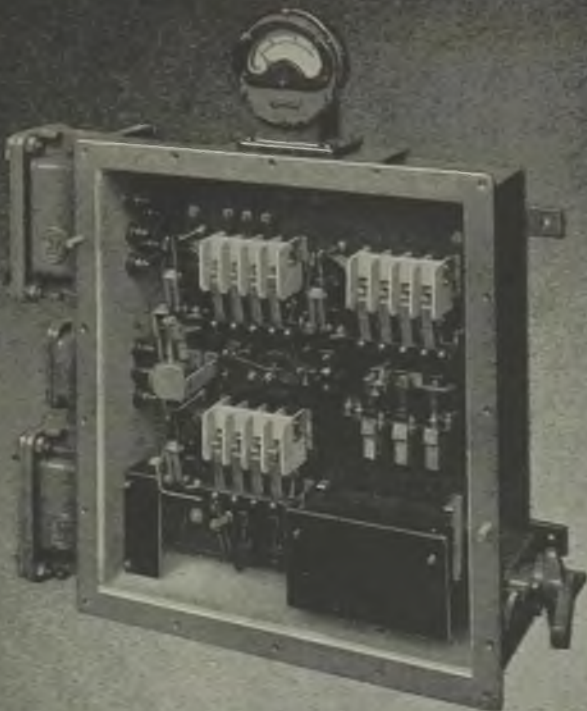


**FLP**

*Flameproof*

STRAIGHT-ON • STAR-DELTA • STATOR-ROTOR

# CONTACTOR STARTERS



CERTIFIED FOR USE IN COLLIERIES OR OTHER INDUSTRIAL SITUATIONS WHERE INFLAMMABLE ATMOSPHERES MAY EXIST.

MANUFACTURED IN STANDARD SIZES UP TO 300 H.P.

*Send for Descriptive Catalogue No. 100.*



**M. & C. SWITCHGEAR LTD.**

KELVINSIDE WORKS, KIRKINTILLOCH, GLASGOW

SALES & SERVICE : OLIVE GROVE RD. SHEFFIELD, 2.

LONDON OFFICE : 36 VICTORIA ST., S.W.1



RECTANGLES

BARS

RODS

COMMUTATOR  
BARS

COPPER  
SECTIONS

**ANACOS**  
REGD.

BUSBARS

SPECIAL  
SECTIONS

The  
House of  
Copper Conductors  
for over  
60 years

TELEPHONE  
BLACKFRIARS  
8701 (8 lines)

**FREDERICK SMITH & COMPANY**  
INCORPORATED IN THE LONDON ELECTRIC WIRE COMPANY & OTHERS LIMITED  
ANACONDA WORKS, SALFORD, 3, LANC'S

TELEGRAMS  
ANACONDA  
MANCHESTER

# IN SUPPORT OF THE MINISTRY OF FOOD HERE IS ANOTHER RECIPE FOR YOUR DEMONSTRATIONS:

## Beetroot Pie

### Ingredients

4 parboiled potatoes, 2 cooked beet-roots, 1 chopped onion, 1 table-spoonful of grated cheese, ½ pint of white sauce (made with household milk or milk and water), salt, pepper and mustard.

### Method

Slice vegetables and arrange in layers in a dish, seasoning to taste. Pour sauce over, sprinkle with cheese and a few breadcrumbs and brown in the oven or under the grill.



# The Jackson

COOKING CABINET



Cat. No. 192j.

# The Jackson

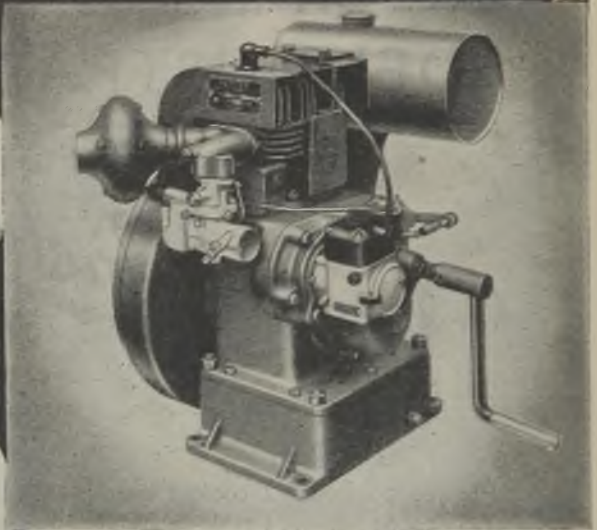
## ELECTRIC STOVE Co. Ltd.

143 SLOANE STREET, LONDON, S.W.1





## AIR COOLED ENGINES



### TO MEET ALL SMALL POWER REQUIREMENTS

Petter Engines are renowned for their dependability in service, and the Air-Cooled 4-stroke Engine illustrated, which is made in a range of sizes of  $1\frac{1}{2}$ , 2 and 3 B.H.P., is suited for the driving of all classes of Stationary and Portable machines, within the power limits given.

It is robustly constructed — needs only the minimum of attention when in operation and all working parts are easily accessible.

For full information on this unit, or on Petter Engines generally, built in a range of sizes up to 540 B.H.P., write to :—

**PETTERS LTD**  
LOUGHBOROUGH, ENGLAND



## 10 out of 10, Mr. Canton!

John Canton was a London schoolteacher in the eighteenth century. Perhaps as a relief from giving daily instruction in the 3 R's, he himself turned scholar and learned all he could out of school hours about the then obscure subject of electricity. With few resources, he eventually made the first pith ball electrometer, and read a paper before the Royal Society on his method of producing artificial magnets. For this he was elected a Fellow and awarded the Copley medal.

We think that John Canton would have given Distrene (Regd.) 10 out of 10 for its outstanding insulating and electrical properties. The brief data below can be checked against working samples; may we send them? Distrene is made in sheets, rods and tubes, and also as a moulding powder for injection machines. You get more mouldings per pound of Distrene than with any other plastic because of its low density and faster moulding rate.

### BX DISTRENE (Regd.)

COMPRESSION STRENGTH . . . . .	7 tons per sq. in.
SPECIFIC GRAVITY . . . . .	1.06
WATER ABSORPTION . . . . .	Nil
COEFFICIENT OF LINEAR EXPANSION . . . . .	.0001
SURFACE RESISTIVITY (24 hours in water) . . . . .	$3 \times 10^6$ megohms.
DIELECTRIC CONSTANT 60—10 <sup>6</sup> CYCLES . . . . .	2.60—2.70
POWER FACTOR UP TO 100 MEGACYCLES . . . . .	.0002—.0003

---

BX PLASTICS LTD, LARKSWOOD WORKS, LONDON E.4

---



### **What is it?**

It is a mixture of solder or pure tin and flux combined in the form of paint or cream. It does not separate and no stirring is required before or during use.

### **What is it for?**

It can replace normal methods of soldering *i.e.* the use of stick solder and flux or hot dip tinning. It is particularly suitable for pre-tinning or sweat soldering.

### **How is it applied?**

By brush or pad. Soldering or tinning is effected by blow-flame, soldering iron, hot plate or by stoving.

### **Is any special skill required to use it?**

No. Satisfactory tinning or soldering can be done by unskilled labour. It is only necessary to apply the paint or cream and to heat. The method lends itself to mechanisation and mass production.

### **Will it do all soldering jobs?**

No, but it offers a very wide field of application and can often successfully replace the ordinary methods of soldering. Our technical department will give further advice.

### **Can we get a sample?**

Certainly, if you apply to us.

**FRY'S**

METAL FOUNDRIES LTD., TANDEM WORKS, MERTON ABBEY, S.W.19 Mitcham 4023

AND AT MANCHESTER, BRISTOL, GLASGOW AND DUBLIN

Birmingham Representative: 20 Stanway Road, Shirley, Birmingham. Telephone: Shirley 1666



# NEW PROVINCIAL BUILDING · CAPE TOWN



Consulting Engineers :

Fitzion & Kester, Cape Town

## *Installed with* **CRABTREE ACCESSORIES**

In this fine new building, simplicity of line and a minimum of ornamentation are admirably combined in a fabric which is expressive of all that is best in modern building practice.

In selecting the equipment of so modern a structure, it is logical that only products of enduring quality should be chosen for service and it is therefore not surprising that in the New Provincial Building, as in so many of South Africa's other splendid buildings, Crabtree electrical accessories have again been installed.

*This advertisement does not imply that Crabtree products are necessarily available either in the United Kingdom or for export to any country overseas*

# CRABTREE

A · NAME · SYNONYMOUS · WITH · PROGRESS · IN · ACCESSORIES · AND · SWITCHGEAR

"Crabtree" (Registered)

C.577/225. Advt. of J. A. Crabtree & Co. Ltd., Walsall, England

Pronounced  
**PROGRESS**  
 in the Insulator world



Another step forward in the intricate business of producing insulators of large dimensions and exceptional capacity. These porcelains for Oil Filled Bushings were supplied to a recent order. To indicate their size we have shown them in correct relation to a 10 H.P. Hillman Mix. Reaching 80 inches in height, they stand out as a definite advance in insulator manufacture. This represents a big job, for which the Bullers organisation and resources are well adapted—but we are also producing insulators of small and intricate design. So—whatever your requirements in insulators and ironwork, make sure by specifying Bullers

# Bullers

## INSULATORS

### AND IRONWORK



BULLERS, LTD., THE HALL, OATLANDS DRIVE, WEYBRIDGE, SURREY  
 Telephone : Walton-on-Thames 2451. Manchester Office : 196, Deansgate, Manchester

*Look at it  
in this light!*

*-SAYS THE WORKS MANAGER . . .*



"I buy Philips Lamps for these reasons. First, they appeal to me as an engineer, because they transform electricity into abundant light with the utmost economy in current. Next, I can rely on Philips Lamps because they are backed by 52 years experience in lamp manufacture. Finally, the Philips organisation gives me a first-class service—and that is important in a busy works."

*Made by Engineers for Engineers*

**PHILIPS** 

THE LAMP FOR PERFECT LIGHT





## Something **NEW** in Switchgear!

**Sordoviso produce a new Plug-in Contactor**

Here's some news! Sordoviso Engineers have produced a new design in Switchgear featuring plugged-in relays and contactors which allow immediate accessibility to the mercury switch itself *without the need of detaching a single screw.*

The coil unit (supplied with fuse and spare fuse) is *immediately accessible and interchangeable.*

The main contact is in an entirely separate compartment from the coil contact, so that the *highest possible degree of insulation between the two is obtained, together with a most compact unit.*

Every part of this newly-designed instrument is, in fact, immediately accessible and can be dismantled and rebuilt *in a few seconds!* Available in three different ratings of 5, 10 and 15 amps, with a wide range of voltages up to 500 volts A.C.

(British & Foreign Patents). For full information write:

# SORDOVISO

**SORDOVISO SWITCHGEAR LTD.**

220 The Vale, Golders Green, N.W. 11. 'Phone: Gladstone 6611-2  
Contractors to Air Ministry, Ministry of Aircraft Production,  
Ministry of Supply, Admiralty, War Office, Department  
of Petroleum Warfare, G.P.O., I.C.I.—All Departments.

MINISTRY OF PRODUCTION

## PRODUCTION CHANGES

**Output of new and still more effective weapons of war must be increased**

**T**O release the labour and provide the capacity, production of less urgent war materials must be reduced.

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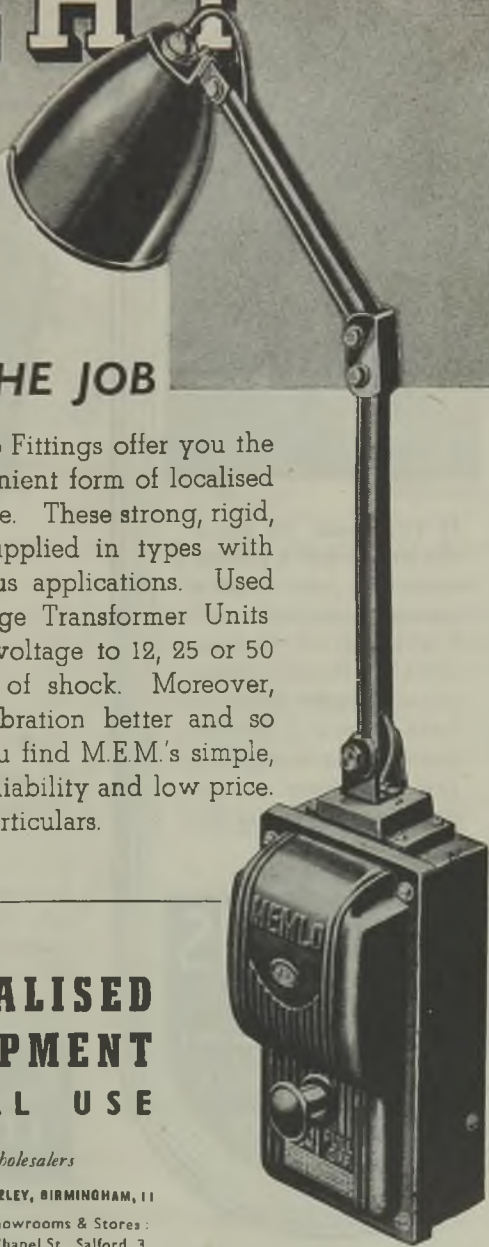
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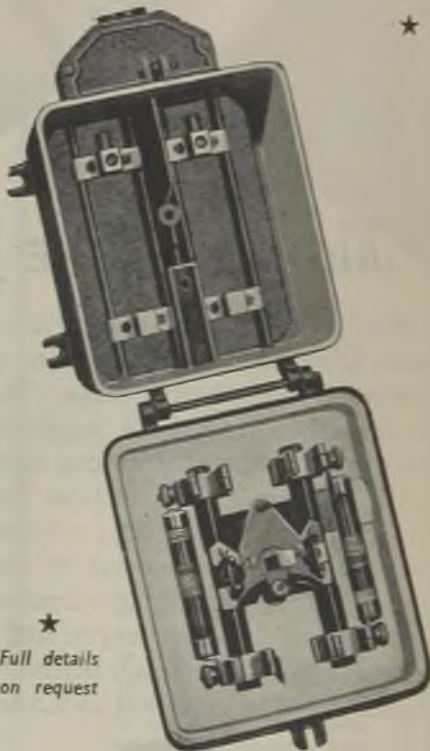
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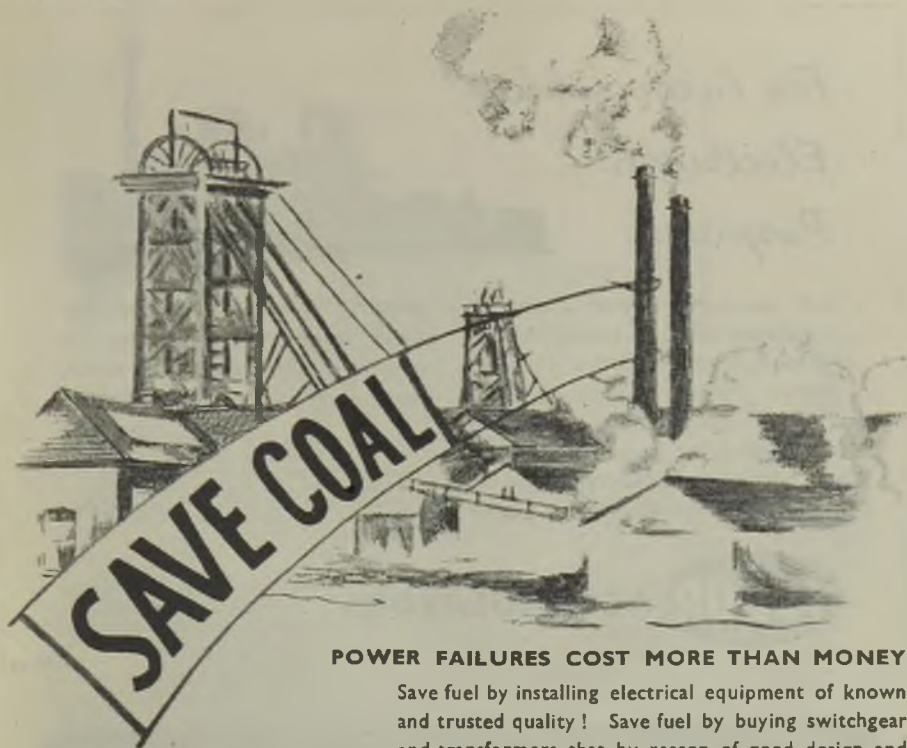
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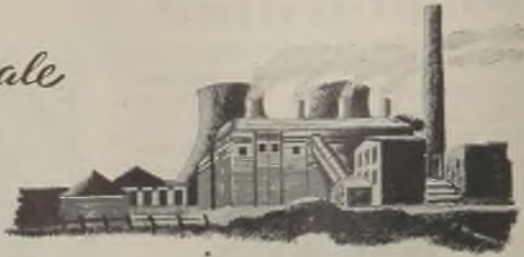
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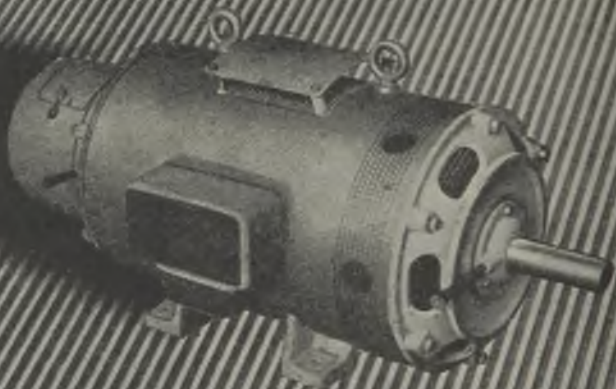
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# ELECTRICAL REVIEW

April 21, 1944

Managing Editor  
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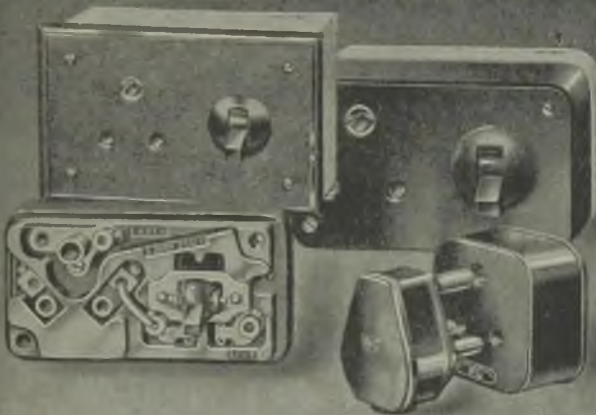
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**EDITORIAL, ADVERTISING & PUBLISHING OFFICES:** Dorset House, Stamford St., London, S.E.1  
Telegraphic Address : "Ageekay, Sedist, London." Code : ABC. Telephone No. : Waterloo 3333 (35 lines).  
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# ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIV. No. 3465.

APRIL 21, 1944

9d. WEEKLY

## Trends on the Farm

### *The Meaning of Electrical Service*

**L**ESS than in almost any other industry has mechanisation in farming meant electrification—at least in regard to the heavier and more typical processes. The limitations at present are technical, as they are, for instance, in long-distance road transport. For this reason or for others, more recondit than technical, a popular misconception has arisen regarding the extent to which electricity is available to and, indeed, is now being used by the farmer. On that account criticisms have been levied at the ability or willingness of electricity supply undertakings to meet the needs of agriculture.

#### **Unmerited Criticism**

Such criticisms, as Sir Cyril Hurcomb (Chairman of the Electricity Commissioners) has recently said, are in general very far from the truth—a conclusion that received strong support from a paper presented on April 13th before the I.E.E. Installations Section and reported in our last issue. The author, Mr. A. Cameron Brown, in carrying out extensive investigations for the Electrical Research Association, has found that, apart from a few State-subsidised schemes abroad, Great Britain now occupies the leading position.

So much needs to be said to get the perspective right. There is, of course, no room for complacency. Interstices, Sir Cyril has pointed out, have still to be filled. That they will be is not to be doubted if Mr. Cameron Brown's experience is general and—it was borne out by the tone of the discussion of his paper—

electrical engineers, whether research, manufacturing or supply, have the single-minded purpose to do what is in them to aid the farmer. No less welcome was the acceptance at face value of the sincerity of their intentions by the farming interests represented at the meeting.

Of especial significance was the evidence that agriculturalists now regard value of electric service as of greater importance than price per unit or even cost of installation. Regarding the latter, however, attention may be drawn to the necessity for hire-purchase arrangements for reasons given in the recent Report of the I.E.E. Post-War Planning Committee.

No doubt the maintenance of the present receptivity towards the electrical idea will depend to some extent on a continuance of prosperity after the war and of wages that are high enough to discourage the use of much avoidable labour.

#### **Advice and Assistance**

Even if the present high levels are not fully retained, the impetus that has been given to electrification ought to be enough to ensure its steady advance, particularly in the ways referred to in the paper, provided electrical engineers display the requisite initiative in devising and bringing to the farmer's notice the means for performing his tasks.

Further essentials are that all undertakings should interpret their obligations in the liberal spirit to be found among the more advanced of them, without too meticulous a regard for the economics of

each individual connection and with an avoidance of legal-seeming formalities. They should, moreover, be ready to give advice on all matters relating to installation and maintenance. Experience has shown that much depends upon the staff responsible for developing this class of load. The men selected should be more than good practical engineers; they should also have an ingrained knowledge of and a real feeling for farming and should keep themselves up to date through close contact with agricultural institutions and associated electrical research. It is by such means, as well as by taking full account of the favourable diversity factor of farm motors in quoting tariffs, that consumption can be made to grow more rapidly than aggregate maximum demand, thus increasing the return on the heavier expenditure, as compared with urban conditions, that is likely to be incurred in supplying the vast majority of farms in the country.

SIR LYNDEN MACASSEY,

**Education and Employment** writing to *The Times*, stresses the need for finding suitable employment

for technically trained graduates and students from universities and technical colleges. Those schemes which have been described by the contributors to our "Engineers of the Future" series naturally aim at training men primarily for the works of the sponsors, although, of course, the training equips them for positions elsewhere. It would seem, therefore, that there is hardly likely to be much scope for entrants from outside into companies which have their own schemes. But some of these provide post-graduate courses whereby young men from the universities and schools are given practical training and presumably find employment afterwards with the same companies. Apart from these, however, there are still many concerns which have no training schemes of their own. These should welcome men with a thorough technological education and be prepared to pay them accordingly.

**Plant Disposal** IN his letter Sir Lynden Macassey recalls a suggestion which he made last year that surplus electrical equipment remaining in the Government's hands at the end of the war might be presented to technical institutions to bring their equip-

ment up to date. This proposal may be welcomed on another count. The B.E.A.M.A. refers in its 1943 report, reviewed in this issue, to the need for avoiding the disastrous effects of throwing this equipment on the market in an unorganised fashion. Discussions on the subject have taken place with the Board of Trade, and, the report says, it is confidently hoped that satisfactory arrangements will be made in this matter. No doubt Sir Lynden's proposal will be given due weight in the formulation of these arrangements.

#### **A Difficult Period**

THE B.E.A.M.A. report contains a reminder that the nebulous term "post-war" is likely to be made even more difficult of definition by the conditions which will exist when the European conflict is ended while the Pacific war continues. The report mentions the export position particularly but that is only one aspect of the complicated problem. How far can we go towards restoration of our peacetime economy while helping to rehabilitate devastated Europe and to subdue Japan?

**Street Lighting** IN one direction at least we may legitimately proceed with the work of restoration when the war in Europe ends—public lighting. The removal of the present restrictions will do as much as anything to help us recuperate from war's effects. The annual report of the Electric Light Fittings Association says that in conjunction with the Association of Public Lighting Engineers a questionnaire on the subject of immediate post-war street lighting has been sent to local authorities and much useful information and assistance has resulted. It is to be hoped that material and labour for this admirable purpose will be made rapidly available.

**Conductor Developments** THE difficulty of reconciling a necessary brevity of title with an accurate indication of the contents of the text to which it relates was illustrated in the paper on copper conductors for overhead lines which Mr. G. W. Preston and Dr. H. W. Taylor presented before the I.E.E. Transmission Section last week. If the words "some recent developments in" could have been inserted before that title without making it unduly cumbersome, some

misapprehension would have been avoided. The amount of attention paid, for instance, to steel-cored copper conductors would not then have been regarded by some taking part in the discussion as a tacit advocacy of the use of this form of construction in the vast majority of cases in which plain copper has hitherto proved most advantageous.

**Copper** THERE is, as the paper showed, much that can still be said about ordinary copper. Although voltage drop will no doubt continue to determine the maximum normal loading of conductors, the investigation into the current that overhead lines can carry without injurious softening in the ambient temperatures and, more important, wind conditions likely to be found in this country is of considerable interest. So also is the economical design of "as-cast" compressed-sleeve joint described. The discussion indicated that the authors' apparent preference for overstressing conductors at the time of erection as compared with pre-stressing did not meet with general acceptance.

**Fuel Saving** MAJOR economies in fuel and power can be achieved by the management of industrial concerns in many directions, but the full results cannot be obtained if orders are not properly carried out. This necessitates the appointment of men or women in each works charged with the duty of ensuring that the management's directions are observed. But they can go much farther than this by paying attention to the hundred little ways in which waste can occur and thus secure economies which, in total, are of considerable value. Recent broadcasts by "fuel watchers" have indicated the many small points which have to be looked after—the cutting down of idle running of motors, the switching-off of unnecessary lights and heaters, etc. Quite apart from the national aspect, saving fuel means reduced expense and, most probably, increased efficiency. It is therefore good business.

**Government Aid** SEVERAL directions in which the Government could assist industry to meet the post-war needs of full employment and a flourishing export trade were mentioned by Sir Alexander Roger in his address to the shareholders

of the Automatic Telephone & Electric Co. this week. They included the earliest possible relaxation or removal of wartime restrictions; the encouragement of private enterprise to provide cheap and rapid communications of all kinds; the cultivation of friendly trade relationships within the Empire and with those countries which inclined towards us; the raising of the obsolescence allowances for taxation purposes; and the reduction or abolition of excess profits tax to enable industry to expand. There is nothing outrageous in these suggestions; they express the views of the majority of industrialists who, after all, have considerable experience of these matters.

**American Deal with Russia** It was reported last week that a group of United States manufacturers had entered into arrangements with the Soviet Government for supplying goods on credit, immediately after the war, to the value of \$2,500 million. Finance will be provided by American banks and apparently the United States Government is not involved in the deal. The exact nature of the commodities which will be provided is not known, but in a letter to the *Financial News* Mr. Evelyn Walkden, M.P., suggests that power station installations are included. Mr. Walkden recalls that proposals made last June for the formation of an Anglo-Soviet Co-operative Trading Association for such a purpose as this were "put into cold storage because of the attitude adopted by the British authorities," who preferred to wait until post-war economic conditions could be more clearly seen.

**"Trade Dispute"** THE touchiness of employees nowadays is well illustrated by a case referred to in the *March Ministry of Labour Gazette*. Electrical engineering operatives, 4,587 of them, with a firm near Newcastle-on-Tyne ceased work for a couple of days because a demand for the dismissal of a labourer who had given evidence against another employee in a theft charge was refused. They apparently had their way for the labourer was "placed on leave of absence with full pay and subsequently obtained permission to leave the firm's employment." What happened to him after that is not recorded.



# Students' Laboratory

*Technical College Demonstration Machinery with Unique Duplicate Bus-bar System of Supply*

**T**HE new machine laboratory of the Electrical Department of Rugby College of Technology and Arts, Warwickshire County Council, has been designed to accommodate an unusually large number of students reading for Ordinary and Higher National Certificates and the London University final degree, necessitating the provision of over twenty machine sets.

The supply of power to such a number of machines, each differing in type, had to be considered with reference to (a) voltage regulation, (b) protection of machines and safety of students, (c) interconnection of machines, (d) provision of means for conducting regenerative tests, (e) opportunity of providing course work illustrating electrical power and (f) simplicity, so that the scheme can be readily understood by the average student. All of this is comparable more with the conditions of power station control than

by coupling switches. Connection to the bars is made by incoming and outgoing feeder panels (Fig. 1).

The intake to the College is at 12,000 V, reduced to 400 V, three-phase, four-wire for normal lighting and power in the College by a 200-kVA B.T.H. transformer. A 30-kVA star-delta transformer fed from the main low-voltage switchboard feeds the machine room, three-wire at 230 V.

**By A. Draper,**  
B.Sc., A.M.I.E.E.

*Head of the Services Training Department and Lecturer in Electrical Engineering, College of Technology and Arts, Rugby*

Feeder panels equipped with three-phase ironclad switch-fuses connect this transformer with the AC main bus-bar and, if required, with the variable voltage bus-bar, either direct, or through an induction regulator capable of handling 75 A line current and providing a boost of 30 V per line. The latter is mounted on a trolley and it can be plugged into the panels when necessary, being otherwise available in other parts of the laboratory.

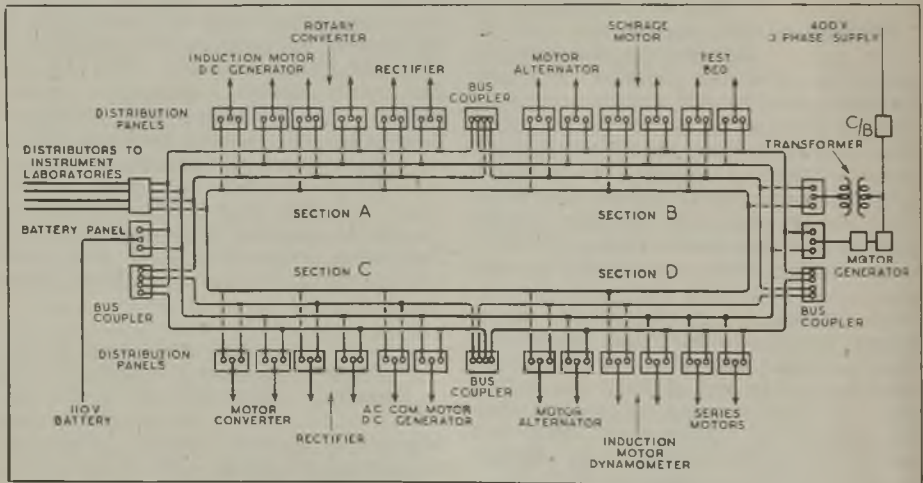


Fig. 1.—Line diagram of four ring mains encircling machine laboratory

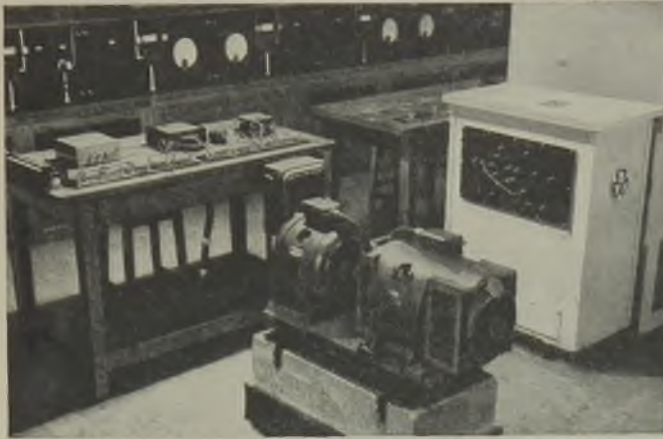
of distribution from a consumer's substation. In consequence, a duplicate system for both AC and DC was developed with twelve bus-bars of  $\frac{1}{2}$ -in. diameter copper encircling the machine room, forming four ring mains. The fixed voltage bus-bars are continuous rings, but the variable voltage bars are further divided into four sections, which can be coupled together to form complete rings

The DC intake to the fixed voltage bus-bar is at approximately 110 V and is obtained from either a service motor-generator set or a battery.

The main service set consists of a 30-kVA self-synchronising motor with overhung exciter driving a 16.5-kW DC generator with auto-transformer starter. Its control gear is in a steel cubicle with ammeter and

power-factor meter. An additional meter in the same cubicle shows the power factor of the whole College supply, and the set corrects the power factor of the whole system.

The DC generator is at present shunt con-



Motor-generator test set

nected, but at a later date electronic voltage stabilisation is to be added. It is connected to the bars by 150-A contactors housed in a cubicle with field regulator, ammeter, and voltmeter.

The alternative source of supply is a battery of 60 197-Ah "Exide" cells in a separate room some distance away. A remote-controlled end-cell switch enables the voltage to be varied. The feeder panel connecting the battery to the bars is equipped with ammeter, voltmeter, charge and discharge Ah-meters. The battery is normally charged through the variable voltage bus-bar by a mercury-arc rectifier in the laboratory through a mercury cup cut-out on the battery panel.

In front of the bus-bar cubicles around the laboratory are the outgoing feeder panels to the machines from the bars. The connections are made by contactors mounted on panels below the bus-bars, controlled by switches on the feeder panels. Each is a two-way switch enabling its associated machine to be connected either to the fixed or variable voltage bus-bar.

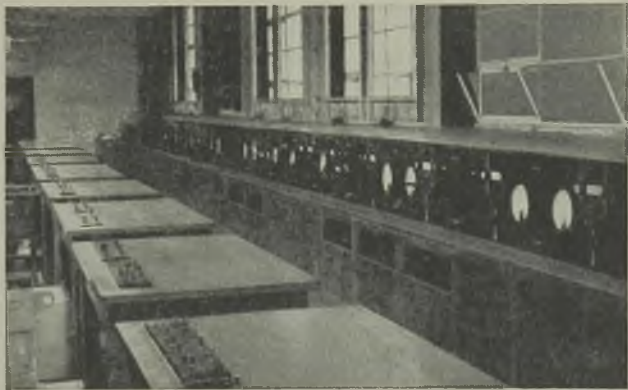
Lines painted on the surfaces of the control panels represent the connections to the bus-

bars, with the control switch mounted so as to complete the diagram, thus indicating the connection that has been made. Pilot lamps are also energised by the control switch to indicate the circuit which has been completed.

The machine laboratory (Fig. 2) is laid out in two lines. Students' tables are arranged adjacent to each machine set, each of which has a "Sindanyo" strip on the edge of its top, on which are mounted terminals leading to the contactor panels of the distribution system and also to the windings of the machines.

Starters and field regulators are mounted on the front of the tables. Wiring between machine and table, and between table and bus-bars, is carried under the floor in stoneware pipes.

Meters used by the students for their tests are of a portable pattern and the student completes the connections between the main terminals, his apparatus, and the machine. The disposition of the terminals allows the wiring to be done comparatively neatly by an intelligent student working from first principles without producing the maze of tangled cables so often to be seen in a temporary "hook up." At the same time the connections are not over simplified by the



Students' tables and distribution panels in front of bus-bar cubicles

use of links, thereby avoiding reducing the student's effort to rule-of-thumb connections.

For certain tests that need constant voltage a machine can be switched to the constant-

voltage bus. The duplicate bus-bar is to be used for the interconnection of machines for loading purposes, or for the provision of variable voltage for short-circuit tests on

rectifier can be energised from the AC fixed-voltage bus, with their DC sides switched to the variable DC bus; once again the motor-alternator set can be used for loading.

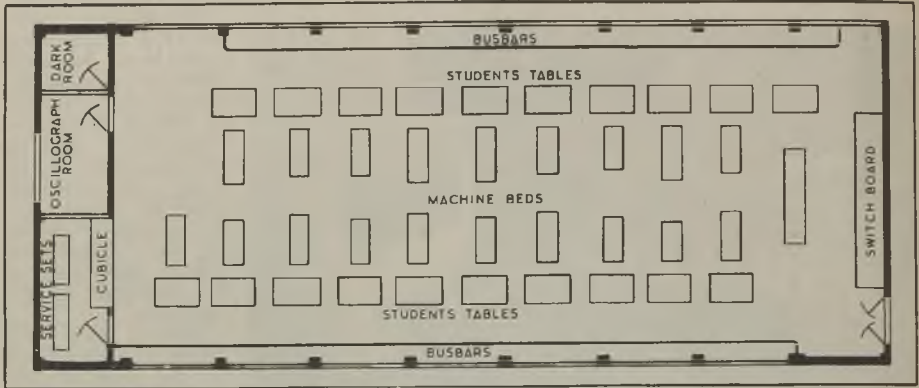


Fig. 2.—Plan of the machine laboratory

transformers and locked rotor tests of induction motors (Fig. 3) from an adjacent motor-alternator set. The latter's motor is switched to the DC main and the set controlled from that side. Its alternator is switched to the AC variable bus-bar supplying the induction motor which is also switched to that bar.

For a load test on an induction motor (Fig. 4) when using the same set, it is now

A synchroscope is mounted at one end of the machine room, its rotor and stator being connected to sockets on the distribution panels of all synchronous machines in the laboratory. The usual pair of synchronising plugs ("incoming" and "on load") prevent more than one machine being connected to the instrument at the same time.

Sustained overloads are unlikely in a College machine laboratory, but the possibilities of wrong connections and even double short-circuits due to faulty synchronising must be allowed for. In consequence, the usual form of thermal overload trip with which modern starters for small power machines are equipped are not suitable for our purpose. Instantaneous overload trips are therefore provided in all the

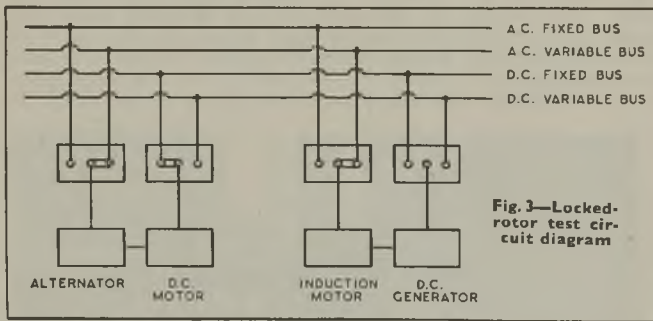


Fig. 3.—Locked-rotor test circuit diagram

required to run the induction motor from the fixed voltage AC mains driving its generator while using the other set for loading the generator. This is accomplished using the DC variable bus to energise the motor, and synchronising the alternator to the AC fixed main.

For a more complicated test (Fig. 5), a motor-generator and

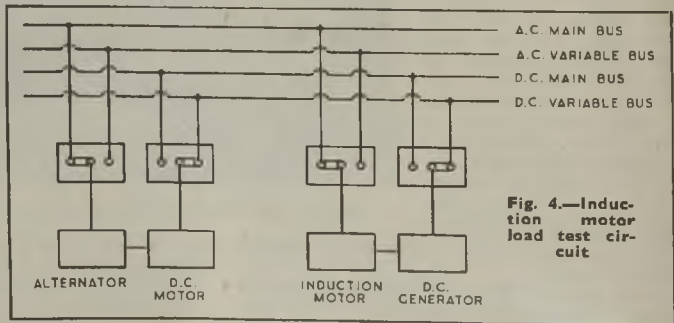


Fig. 4.—Induction motor load test circuit



contactor circuits between the students' tables and the bars and also in the main generator and battery circuits.

The contactors on the AC ring mains are AC operated and the DC contactors are DC operated, with the exception of the main service set and the battery circuit-breakers. The latter DC contactors are AC operated and hence if the main AC circuit-breaker on the laboratory transformer is tripped they, together with all AC contactors, will be imme-

diately opened, all other DC contactors following with the removal of voltage. Push-buttons at suitable points in the laboratory acting as emergency stop buttons are arranged in the trip circuit of the main AC circuit-breaker, thus providing for the emergency shut-down of all power.

Wartime circumstances have held up the delivery of machines, so that the laboratory is at present operating with only half the number of sets planned. The final scheme will group the machines into four sections corresponding to the sectionalisation of the transfer bus-bars.

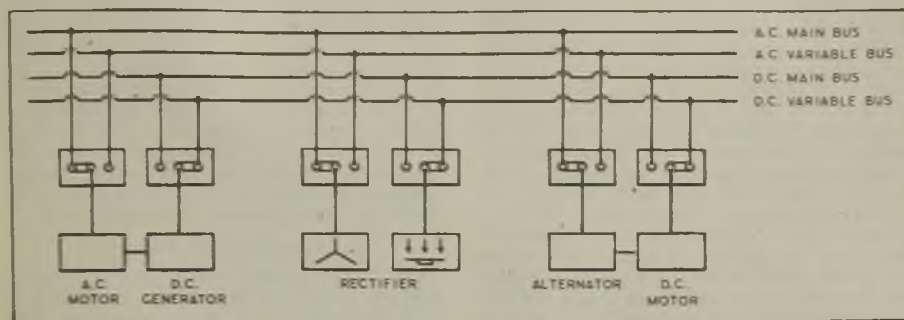


Fig. 5.—Parallel operation of rectifier and motor-generator sets

diately opened, all other DC contactors following with the removal of voltage. Push-buttons at suitable points in the laboratory acting as emergency stop buttons are arranged in the trip circuit of the main AC circuit-breaker, thus providing for the emergency shut-down of all power.

Wartime circumstances have held up the delivery of machines, so that the laboratory is at present operating with only half the number of sets planned. The final scheme will group the machines into four sections corresponding to the sectionalisation of the transfer bus-bars.

#### Advantages of the Scheme

It is not possible to use the variable-voltage bus-bar for two different purposes simultaneously, but it might be used for two experiments simultaneously which require a constant voltage differing from that of the fixed-voltage main.

This limitation is not severe, however, since there are four sections of each variable bus, DC and AC. Consequently a maximum of eight experiments, whose complexity requires the use of the transfer bus, can operate simultaneously in the laboratory, together with a further twelve experiments of a simpler character running from the fixed-voltage mains.

Although the laboratory is not yet complete and the scheme has not been operating to full capacity, the results so far obtained indicate that students soon appreciate the bus-bar arrangements, and can readily trace back

sultation with the Board of Education inspectors and the British Thomson-Houston Co., Ltd., the directors of which presented the complete equipment to the College.

## Structure of Alloys

### X-ray Crystal Analysis

IN addition to metallurgical papers presented on the occasion of the annual general meeting in London of the Institute of Metals, a special lecture was delivered by Dr. W. Hume-Rothery who outlined modern views on alloys and their possible applications.

The lecturer explained how X-ray crystal analysis permitted the positions of atoms in different crystal structures to be determined, being the first great step forward towards an understanding of the structures of metals and alloys. The study of the X-ray data and the equilibrium diagrams of alloys enabled a number of factors controlling alloy formation to be discovered empirically. At the same time mathematical physicists were encouraged to examine the behaviour of electrons in the periodic field of the crystal lattices of metals, and the results obtained were found to have an immediate bearing on the properties and structures of metals and alloys.

As a result of this work, said Dr. Hume-Rothery, we were enabled to look beyond the mere crystal structure, and could begin to understand some of the factors which determined the structure and properties of alloys. In a limited way, from knowledge of atomic structures, it was already possible to produce alloys possessing the desired structures and properties, and if this work could be extended, its possibilities would be very great.

# Circuit-Breaker Design

## Swiss Contributions to Development

THE development of circuit-breakers in Switzerland is outlined in a paper by MR. G. A. MEIER which has been submitted to the Association of Supervising Electrical Engineers in London.

The historical introduction dates several types of switch, including the plunger-in-tube contact, oil-immersed, water quenching, pot-type and low oil content, air-blast and vacuum designs, products of Brown, Boveri, the Oerlikon Co. and Sprecher & Schuh being mentioned. Charles Brown, one of the founders of the Swiss Brown, Boveri concern, is said to have suggested the use of oil in switches about 1890 when he first introduced it for insulating transformers. Ferranti utilised oil in a breaker built in England in 1895, but the design strangely allowed the arc to be partly in air. The first oil switch was built in Switzerland in 1897 and the first three-phase model was placed in service in the Paderno power station in 1898; it was capable of breaking 70 A per phase at 15,000 V.

The undesirability of constructing water quenching breakers for more than 30 kV led to the development of the low-oil-content design for higher voltages, with arcing chambers isolated from earth on supporting insulators exactly like the water-filled chambers for from 11 to 24 kV. The quantity of oil required may be as little as one per cent. of that needed for the conventional switch and the breaker grows in height only with increasing voltage whereas the old "dead" tank must be enlarged in all three dimensions.

The paper then proceeds to describe the air-blast breaker, pointing out the importance of short operating time and considering the influences of recovery voltage and of the natural circuit frequency; the effect of the last-mentioned factor is said to have been first noticed by Dr. Kopeliowitch.

Large air volume increases breaker dimensions and therefore involves costly design. For these reasons dual arc extinction was introduced with the aid of built-in resistances paralleling the main arc gap so as to damp oscillation and retard the building-up of recovery voltage.

### Air-Blast Gear

A number of air-blast circuit-breakers were commissioned in this country at the beginning of the war and have so far had an excellent operating record. Several hundred outdoor breakers for up to 220 kV are successfully in operation and designs have been developed for up to 500 kV for trans-continental power transmission.

Instead of simple enlargement of the single-

nozzle design for higher voltages it is more economical to connect arcing chambers in series. To achieve even distribution of voltage between them, condensers are connected in parallel with the breaks; relatively small capacitance is sufficient, the condensers being stressed only during the short opening time. They are of the bakelised paper type, similar to bushings, and are surrounded by dry air at a pressure slightly above atmosphere for excluding humidity. This multiple-break design is economical because it lends itself to a "unit" system of building up breakers for increasing voltages from a few more or less standard elements, which simplify testing by obviating large capacity "proving" plant.

### High-speed Re-closing

For maintaining continuity of supply air-blast circuit-breakers of the rapid (0.2 to 1 second) re-closing type, operating with specially designed high-speed relays, have been developed for the whole range from 6 to 220 kV. For a demonstration staged in Switzerland last year a stuffed bird was "flown" on to a high-voltage overhead power line energising, through a transformer, some lamps and motors driving a machine tool and pumps. Thus a short-circuit was produced, causing the breaker to trip and re-close itself immediately. The motors continued to run and the interruption of light was hardly noticeable.

The paper concludes with brief references to the air-compressing plant associated with switchgear. Its introduction to power and substations has caused air to be utilised for such other purposes as pneumatic tools, blowing-out operations, spraying, etc. Isolators have been adapted for pneumatic actuation and in one power station the windows, which are not easily accessible, are pneumatically operated under push-button control. To render switchgear completely oil-less, potential transformers containing compressed air instead of being filled with oil have been successfully placed on the market. Some of them have been in service in this country since the outbreak of war.

### Industrial Management

A COURSE of six University Extension Lectures on "An Introduction to Industrial Management," by Mr. T. G. Rose, is to be held at the Institution of Electrical Engineers, Savoy Place, W.C.2, commencing on Friday, April 28th, at 5.30 p.m. The fee for the course is 5s. (single lectures 1s. 6d.) and tickets may be obtained from the Accountant, University of London, Senate House, Bloomsbury, W.C.1, or in the Lecture Hall before the meetings.

# Grading Relays

Securing Reliable Operation of the Inverse-Time Overload Type

**RELAY** current settings are governed by the normal full load at

By **D. T. Evans, A.M.I.E.E.** For example, let T.M.S. equal time multiplier setting and T

the several points involved and by the ratios of the current transformers there. When selecting the time-setting for relays, it is customary to allow a grading of 0.5 sec. between successive relays at the short-circuit current. Discrimination should be maintained throughout the whole range of fault currents. It is particularly important that the time-lag should agree closely with

the actual time of operation required and let the maximum short-circuit current be twenty times full load. From curve,  $T_m = 2.2$  sec. Minimum time setting =  $2.2 \times 0.05 = 0.11$  sec.

T.M.S. =  $\frac{T}{2.2}$ . Then  $0.11 +$  four intervals of  $0.5 = 2.11$  sec. Under these conditions five relays may be graded as indicated in Fig. 2. Relay No. 5 (minimum setting), T.M.S. =  $\frac{0.11}{2.2} = 0.05$ ; relay No. 4,

T.M.S. =  $\frac{\text{Min. setting} + \text{interval}}{2.2} = \frac{0.11 + 0.5}{2.2} = 0.27$ ; relay No. 3, T.M.S. =

$\frac{0.61 + \text{interval}}{2.2} = \frac{1.1}{2.2} = 0.5$ ; relay No. 2,

T.M.S. =  $\frac{1.11 + \text{interval}}{2.2} = \frac{1.61}{2.2} = 0.73$ ;

relay No. 1, T.M.S. =  $\frac{1.61 + \text{interval}}{2.2} = \frac{2.11}{2.2} = 0.96$ .

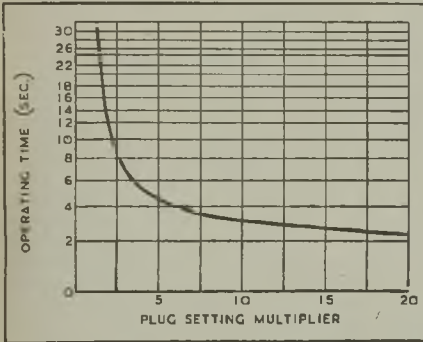


Fig. 1.—Characteristic curve for an inverse-time overload relay having a definite minimum time of 2.2 sec.

the setting at the short-circuit current. Divergencies from the curve at lower currents are relatively unimportant. The last relay in a circuit has the shortest time delay, which is dependent on the minimum value of the time multiplier possible. Theoretically this is zero, but is actually about 0.05 sec. to allow proper operation of the contacts.

In calculating graded-time settings the maximum short-circuit current attainable should be worked out, and the time corresponding to this current, in terms of relay setting, determined from the curve. Let this time be  $T_m$ , then the minimum time delay will be  $0.05 \times T_m$ .

The value of  $T_m$  for maximum fault current can be obtained from Fig. 1. Plug setting multiplier (P.S.M.) =  $\frac{\text{Calculated maximum fault current}}{\text{Current (Primary) corresponding to relay setting}}$

Current (Primary) corresponding to relay setting  $T_m$  for the value of P.S.M. thus obtained may then be read directly from the curve.

Where fewer than five relays are to be graded, the maximum time may be reduced or the intervals between relays increased. Where more than five relays are necessary, relays having a definite minimum time variable between 0 and 4 sec. are generally used. It follows that the number of relays which may be graded is governed by the short-circuit current, the number increasing as the short-circuit current decreases and *vice versa*. More than five two-second relays cannot be graded with a short-circuit current of twenty times normal load or greater, as the relays would be working in a saturated condition. When the fault current exceeds the saturated value of the relay, the relay will be operating in its minimum time; the

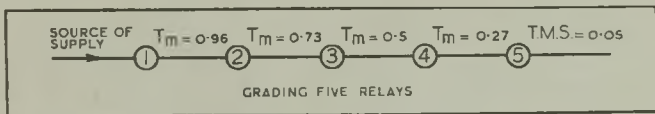


Fig. 2.—Diagrammatic scheme of grading for five relays

operating times are then controlled by the time-setting multiplier only.

The following example gives grading of relays when the short-circuit value is ten times full load.  $T_m$  from curve = 2.9 sec.



Minimum time delay =  $2.9 \times 0.05 = 0.145$  sec. and maximum time delay =  $0.145 + 5 \times 0.5 = 2.645$  sec. Six relays can be graded, giving a maximum time delay of 2.645 sec. To ensure stability at full-load current these relays must not start or creep at a current equal to the setting, but must operate with certainty at some current not exceeding 130 per cent. of it. The action of the inverse-time overload relay depends upon the magnitude of the fault current. Thus to calculate the time of operation of a relay, the following information is necessary:—Time/P.S.M. curve, current plug setting, time setting, fault current and current-transformer ratio. Overload relays should not be graded on the assumption that the fault current will exceed the saturation value of the relay. For proper discrimination the fault current must be determined.

It is sometimes possible to reduce the P.S.M. by careful selection of the plug setting. Consider the example of two substations D and E (in a series A to E) having fault values of 100 and 50 MVA and current-transformer ratios of 100/5 and 50/5 respectively. The current transformers are assumed to be graded by the saturation method. The T.M.S. of relays D and E would be 0.3 approx. and 0.15. The operating times would be 0.61 sec. and 0.11 sec., with a fault occurring at E and plug current settings of 100 per cent. in each case. If the plug current setting of D is altered to 200 per cent. the P.S.M. would be  $\frac{2620}{200} = 13.1$ . Reference to the curve gives an operating

time of 2.6 sec. With a time setting multiplier of 0.25 an operating time of  $2.6 \times 0.25 = 0.65$  sec. is obtained. For a fault at D, the short-circuit current is 5250 A, giving a P.S.M. of  $\frac{5250}{200} = 26.25$ . Relay D will therefore operate in  $2.2 \times 0.25 = 0.55$  sec., thus reducing time of operation by  $0.66 - 0.55 = 0.11$  sec. as compared with the saturation method. It follows that by careful selection of plug and T.M.S. settings a considerable reduction in tripping time can be obtained.

Unless certain precautions are taken in selecting current plug settings, incorrect operation may occur at low values of current. When the relays have been graded, the result should show consecutively decreasing or equal P.S.M.'s toward the supply. If it does not, there will be improper discrimination. The following example is given to illustrate this point:—Suppose both relays are given a time setting of unity and relay 1 has a plug setting of 75 per cent. and relay 2 a plug setting of 100 per cent. If the fault current is twice full load, then P.S.M. of relay 2 would be 2, and P.S.M. of relay 1 would be 2.66. Operating time of relay 2 would be 10.2 sec., and that of relay 1 would be 7 sec. Relays would therefore not operate in correct sequence. If in this example the relays were at saturation value, then both relays would operate in 2.2 sec. By reducing the T.M.S. of relay 2, discrimination would be obtained. To ensure correct operation of relays, it is necessary to exercise care in the selection of current plug settings and time multiplier settings.

## Progress in Brisbane

**A** MARKED improvement in their operations during 1942-43 is reported by the Departments of Electricity and Transport of the Brisbane City Council. This increased activity in both cases resulted in substantially greater demands on the New Farm power house, which is operated as a sub-department of the transport undertaking. Its total output for the year was 144 million kWh, 15.2 per cent. more than in 1941-42. Of this amount 104 million kWh was supplied to the Department of Electricity, 37 million to the Department of Transport, and approximately 3 million to the City Electric Light Co. under an interchange agreement. The heavy demand meant that the boiler-house plant had to be operated near to its limit of effective capacity. In the face of rising costs there was a small but gratifying reduction in the cost per kWh generated from 0.369d. to 0.361d. Overhead costs fell from 0.202d. to 0.176d. per kWh, the lowest figure yet reached.

Coal supplies have caused concern on three counts—cost, quality and shortage. Representations have been made to the Minister of Mines in the matter of the high pithead price (21s. 9d. per ton compared with 14s. 10d. in 1934) and the poorer quality. The cost of coal delivered to the power house last year was

£1 10s. per ton against £1 9s. 1d. in 1941-42.

Following a temporary reduction in the electricity undertaking's sales in 1941-42 the rate of expansion last year (13 per cent.) reached its highest point since the beginning of the war. The 93 million kWh sold represents an average of 1,368 kWh per consumer, 142 kWh more than in the previous year. New consumers connected numbered 1,854, making altogether 67,768. In spite of restrictions on the sale of electrical appliances 241 ranges, 224 hot-water systems and 5,675 miscellaneous appliances were added during the year.

Financially, the undertaking also did well, the net profit of £36,141 comparing with £11,537 in the previous year. Total income rose by £46,745 to £525,404, while the increase in expenditure was less than half as much—£22,140—with a total of £489,263. Per kWh sold revenue averaged 1.35d. a decrease of 0.04d. due to greater domestic consumption (the average price to commercial and industrial consumers was slightly higher than in 1941-42). Expenditure per kWh fell by 0.10d. to 1.26d.

It is stated that the undertaking's radio station again rendered good service, over 15,000 messages being transmitted, including those for other departments.

Engineers of the Future—VI

# Fundamentals of Training

*How they are Developed in the Brush Scheme*

**B**y the time an engineer is fully qualified he has passed through a number of stages of progressive specialising. This usually begins with a general notion during boyhood that he wants to become an engineer. Subsequently he makes the choice as between civil, mechanical and electrical engineering, eventually selecting some particular product such as switchgear or transformers on which to make himself an expert.

**By D. B. Hoseason,**  
M.I.E.E., M.I.Mech.E.  
*Director in Charge of Education and Training, Brush Electrical Engineering Co., Ltd.*

inherited tendencies and habits which are so deeply ingrained by the time an engineer reaches industry that we can do very little to alter them.

It is customary to say that in the craftsman class manual dexterity is the essential characteristic. This, however, is one of those sweeping assertions which is quite inadequate. It is essential that a machinist should have first-class eyesight and that his brain should react in a particular way to what his eyes see. He should be able to tell from the way a "turning" leaves the parent metal whether his cutting tool is as it should be and the colour and light reflections from the machined surface should tell a continuous story to him as to whether his machining operation is progressing satisfactorily. He must have that keenness of eyesight enabling him to read micrometers and verniers and get the correct answer.

On the other hand an armature winder requires no such keenness of eyesight, but highly developed finger and thumb muscles which will enable him to fit the coils into the slots, to bend conductors and generally carry out all the appropriate operations with steady pressure and without having to use mallets or any violent force which would damage insulation.

Although both the machinist and the armature winder require to have that manual dexterity mentioned initially, the particular forms are so different that we can almost say that machinists and armature winders are born and not made.

In the case of the professional engineer a



Woodworking section, Craft Selection School

In addition to this specialising by products, however, the young man, whether he be craftsman or professional engineer, goes through a process of specialising functionally. If he is in the craftsman class, he may, for example, choose to be a machinist, fitter, pattern maker or welder, while in the professional engineering group his functional specialising may lead to design, selling, workshop administration, operation or education.

In choosing his product the young engineer should select a class which attracts him, but should also take care that it is not equipment which is in process of being superseded; if these points are watched he cannot go far wrong. Functional specialising is, however, of far greater importance, since success functionally is associated with

successful career again depends on the right choice of functional occupation. While there are many other desirable characteristics which produce the successful workshop



College and student apprentices at a lecture on advanced engine design

administrator, it is possible to lay down that fundamental tidiness of mind is essential. If a works manager or a shop superintendent is untidy, he is not likely to make a success, no matter how good an engineer or a disciplinarian he is, as his stores control and his system of progressing work through the factory will probably get out of hand.

It is sometimes said that a successful sales engineer must be a "good mixer" and able to talk well. While these attributes may be helpful, they

are by no means the fundamental characteristics. The essential feature of the sales engineer is an inborn interest in his fellow men. He must have a genuine interest in what the colliery engineer has to do from day to day; he must want to see his existing equipment and want to help him in every way possible regardless of whether the assistance has anything to do with the product he is selling.

The self-centred or the ascetic types are never likely to make a success of the sales side, although they may be successful on design or operation.

A well organised apprentice training programme will always be of very great value to the company operating it and the much wider development of these programmes is essential for the strengthening of the British engineering industry. To get the utmost value from these schemes, however, close consideration must be given to the inherent aptitudes of the young men entering, and a scientific approach made to the principle of functional specialising. This subject has been taken as a fundamental part of the programme of training of the Brush Electrical Engineering Co.

#### Craftsmen

The recruits for the company's craftsmen are provided by the trade apprentice programme. Young boys of fourteen and fifteen enter the works from elementary and central schools and their functional aptitude is determined by giving them six months in the Craft Selection School.\* In this school each boy spends several weeks on the principal trades in the factory, *i.e.*, machining, fitting, carpentry, welding, armature winding, etc. A report book is written up weekly by each boy and the instructors record the progress made.

At the end of the six months it is usually

apparent for which trade a boy has any special aptitude, and, perhaps more important, the trade for which he is quite unsuitable. In every batch there are always several boys who prove to be generally unsuitable for the engineering industry and these are given a short time in which to find other work. The Craft Selection School has now been in operation long enough to have passed the experimental stage, and its value in the correct placing of trade apprentices is such that the



Machinists' section, Craft Selection School

company would not contemplate any reversion to the former methods.

On completion of their period in the Craft Selection School, boys are allotted to those departments for which it is evident that they have an aptitude and during the next six months, while attending the Works School for the equivalent of one day a week, are given a series of lectures on the products of the company. These lectures do not attempt to teach the boys how a transformer, a turbine or an engine works, but with components and lantern slides endeavour to show the youths what is the type of work being done in various departments. At the end of this period of six months, *i.e.*, after a youth has been with the company for approximately twelve months, the boys' inclinations as regards product and trade are known and they are indentured. The main trade apprentice programme of training then begins.

#### Technical Engineers

Under this heading are designers, sales engineers, process engineers and all those young men intending to join one of the chartered institutions. Although in the Brush Company a number of the technical engineering positions may be filled from the trade apprentice ranks, the principal source is the student and college apprentices. The former are youths who have joined the company for a four-year apprenticeship direct from the grammar and public schools. The college apprentices, who serve a two-year apprentice-

\* See *Electrical Review*, October 22nd, 1943.



ship, are degree men and may join the company after completion of their university training, or may serve one year of their apprenticeship before proceeding to the university and complete their course with one post-graduate year.

For both the college and student apprentices the programme of training is broken down into three principal stages. In the first the apprentice is given a bird's-eye view of the company as a whole by a programme of training on widely different mechanical and electrical products. At the end of the first third of his training he is interviewed and the broad field in which he should specialise is settled. He may choose, for example, power supply, or transport, or industrial equipment. If his selection is power supply the next third of his apprenticeship is devoted to filling out his experience in those departments making equipment for the power supply field, *i.e.*, turbines, alternators, transformers, switchgear, large engines, etc. If he elects to specialise in transport he is given experience on coachwork, motors, control gear, electric traction, etc. After completing two-thirds of his apprenticeship he is again interviewed and elects to specialise in one particular product within the broad field already studied.

Although the young engineer completes his apprenticeship at a specified date, his training must continue thereafter for several years. Consequently an apprentice who

has elected to specialise in power supply and more particularly in the field of switchgear will continue in the switchgear drawing office for some eight months and may eventually proceed to switchgear design. During this period his departmental manager will pay particular attention to whether his inherent characteristics best suit him functionally for design, selling, workshop administration or operation, and at the first convenient opportunity he is then transferred either to the selling or the manufacturing side or is recommended to a customer for operation, according to the inherent characteristics he displays.

As outlined at the beginning of this article, the Brush Company lays great stress on the correct choice of functional career for both craftsmen and technical engineers. In the case of the former the choice is made before the youth starts work in the factory, as functional success in a craftsman depends to a great extent on physical characteristics such as eyesight, muscular development, etc., which are readily determined. In the case of the technical engineer the choice of functional specialising is deferred until the trainee has settled down in his product department, because success in this case depends on much more obscure human traits connected with emotions, mental reactions and characteristics which only show up after a man has been working on the same type of job for a year or more.

## Forthcoming Events

**Saturday, April 22nd.** — *Barnsley.* — Hagenbach's Café, 4.30 p.m. Association of Mining Electrical and Mechanical Engineers (Yorkshire North-West Branch). Annual general meeting and annual dinner.

**Monday, April 24th.** — *London.* — Institution of Electrical Engineers, 5.30 p.m. Informal meeting. Discussion on "Fuel and Mechanical Power," to be opened by Mr. J. F. Field, B.Sc.

**Tuesday, April 25th.** — *Leeds.* — Guildford Hotel, 7 p.m. I.E.E. North Midland Centre. Annual general meeting.

*Manchester.* — College of Technology, 7 p.m. I.E.E. North-Western Centre. Lecture commemorating the life and work of Nikola Tesla (illustrated by examples of his experimental work) by Dr. A. P. M. Fleming, C.B.E., M.Sc.

**Wednesday, April 26th.** — At Loughborough College, 2.30 p.m. I.E.E. East Midland Sub-Centre. "Survey of the Problems of Post-War Television," by Mr. B. J. Edwards.

**Thursday, April 27th.** — *London.* — Institution of Electrical Engineers, 5.30 p.m. Ordinary meeting. Thirty-fifth Kelvin Lecture on "Magnetism in Theory and Practice," by Prof. E. C. Stoner.

*London.* — 11, Upper Belgrave Street, S.W.1, 6.30 p.m. British Institution of Radio Engineers, London Section. "Development of Wired Broadcasting," by P. Adorjan.

**Friday, April 28th.** — *London.* — Institution of Mechanical Engineers, 5.30 p.m. "Application of Fabricated Construction to Machine Design," by Dipl.-Ing. F. Koenigsberger.

*Manchester.* — At Engineers' Club, 6.30 p.m. Manchester Association of Engineers. "Inspection and Maintenance of Lifting Machines and Tackle," by Mr. W. Duckworth.

**Monday, May 1st.** — *Birmingham.* — At James Watt Institute, 6 p.m. I.E.E. South Midland Centre. Annual general meeting and paper on "Standards of Performance of Generating Plant, Based on Five Years' Operating Data," by Messrs. R. W. Biles and G. W. Maxfield.

*Cambridge.* — At Cambridgeshire Technical School, 5.30 p.m. I.E.E. Cambridge and District Wireless Group. Discussion on "Training for the Radio Industry," to be opened by Messrs. C. R. Stoner, B.Sc., and R. W. Wilson.

**Tuesday, May 2nd.** — *Manchester.* — At Engineers' Club, 6.30 p.m. I.E.E. North-Western Students' Section. Annual general meeting and paper on "Resistance Temperature Coefficients of Metals and Semi-Conductors," by Messrs. F. Ashworth and E. D. Taylor.

*Coventry.* — At Electricity Showrooms. Coventry Electric Club. "Brains Trust."

**Wednesday, May 3rd.** — *London.* — I.E.E. Wireless Section. Silver Jubilee commemoration meeting (5.15 p.m.) and dinner (7.30 p.m.)

# Consumers' Complaints

## Maintaining an Undertaking's Goodwill

**F**ORTUNATELY for electricity undertakings in these times of staff shortage, the number of consumers' complaints appears to vary inversely as the income of the consumer and directly as the available spare time which each can give to nursing his grievances. Prompt and efficient pre-war service was no guarantee against a number of complaints, trivial or serious, after the electricity accounts had reached their destinations. These appeared to be due in many cases to inability to meet accounts within the specified period rather than unwillingness to trust to their accuracy.

To-day, while service is necessarily less prompt, the majority of incomes are higher and few persons have leisure, so that the number of complaints received has notably decreased. Even so, there remain many to be dealt with, and the technique involved can, in proper hands, be convincing to the consumer, satisfying to the inspector and beneficial to the undertaking's goodwill.

### Qualifications of Representative

The man chosen to deal with complaints should, apart from having a pleasing personality, preferably be married and possess an all-electric home, so that he is fully conversant with operating experience of most kinds of domestic electrical apparatus. It is very important that he should have had some experience in a meter-test and/or repair department so that he is able to converse with confidence, mostly in a non-technical manner, about the workings of every type of meter used, for it is the meter's registration which is most often suspected by the consumer.

He may have to suggest that changes in the householder's activities which occurred some time previously, now forgotten, may account for abnormal use of radiators, or that a guest may be using apparatus, probably in a bedroom at night, causing the consumption of electricity unknown to the consumer but not unheeded by the meter. His knowledge of the cold weather prevailing two months ago, recorded on a temperature chart carried by him each quarter, may also inspire confidence.

Since the more general adoption of two-part tariffs, the number of complaints has been reduced because a large increase in consumption may mean only a slight increase in the account. Where previously only lighting was used on a flat-rate tariff, a wireless set of 100-W loading may have doubled the account and caused a query,

By **S. A. Daines, A.M.I.E.E.**

resulting in a change to a two-part tariff and satisfaction thereafter. A

note of warning to the temporary meter-reading staff can often short-circuit consumers' misgivings about the abnormality of impending accounts. A casual remark of the meter reader, framed in an incorrect manner, can sow the seed of a complaint which would otherwise not have been born.

The uncompleted record card for the use of the consumer ranks high in the causes of dissatisfaction and its absence from the vicinity of the meter, generally because the latter has no suitable attachment to hold it, appears to offer some scope for a minor invention. In blocks of flats there may be a suspicion that someone else's lighting points are connected to the wrong meter: here the inspector can explain the uses of a main switch as a means of allaying further suspicion. A difficult feat is to explain the rebate of varying amounts allowed with prepayment meters collecting the fixed charge as well as the kWh payments.

Rarely does the inspector find his simplest problem—that of an over-reading by the meter reader, with its easy solution of a promise of an amended account.

### Manufacture in New Zealand

**T**O fill the gap resulting from the diminution of imports, New Zealand has widened its factory production. Among the newly made articles listed by the Department of Industries and Commerce, a number are of interest to electrical manufacturers in the United Kingdom. They include bakelite products, batteries for deaf aids, domestic refrigerators, electric fences, insulating tape, parchment lamp shades, switchboards, and washing machines.

The Department has published figures showing progress during the period of the war up to March 31st, 1942. During the twelve months ended at that date the value of the production of the electrical engineering industry was £1,100,000 compared with £500,000 in 1938-39, and of that engaged in radio equipment manufacture and assembly £600,000 against £300,000.

Canadian electrical exporters are naturally interested in this development, and Mr. C. B. Birkett, the Acting Trade Commissioner at Auckland, points out that the survival of some of the factory industries that have grown up in New Zealand during the war is by no means certain and will depend largely on the degree of tariff protection or other assistance given them when peace returns and world trade is adjusted to the new conditions that will obtain. But at the same time he foresees that when the Dominion's post-war housing programme is put into operation those industries serving it will receive a great impetus.

# PERSONAL and SOCIAL

## News of Men and Women of the Industry

**A** PUBLIC lunch-hour lecture on "Britain's Electricity Supply" will be delivered by **Professor R. O. Kapp**, Director of the Electrical Engineering Laboratories at University College, London, on Thursday, May 11th, from 1.15 to 2 p.m. The lecture, which will be given in the Anatomy Theatre of the College (entrance Gower Street, W.C.1), is open to all who are interested, without fee or ticket. Particulars of other public lunch-hour lectures may be obtained on application to the Assistant Secretary, University College, Gower Street, W.C.1; a stamped addressed envelope is requested.

**Mr. Raymond Berry** has been appointed chairman and managing director of Berry's Electric, Ltd., in succession to his brother **Mr. G. J. Berry** who was killed in a recent air raid. **Mr. R. Berry**, who has been a director of the company since 1935, has served with the Royal Engineers since the outbreak of war and has been temporarily released from the Forces. **Mr. C. A. Painton**, director and manager of Berry's Birmingham works, has been appointed vice-chairman and **Mr. J. W. Reid**, manager of the company's Wembley works, has been made a director.



Mr. Raymond Berry

**Mr. F. B. Hillier**, who has been on the technical staff of Taunton Corporation Electrical Department since 1902, was presented by his colleagues this week with a polished oak revolving bookcase on the occasion of his retirement. The presentation was made by **Mr. L. V. Turner**, the borough electrical engineer.

At the annual meeting of the Liverpool Engineering Society, the retiring president, **Mr. H. Pryce-Jones**, borough electrical engineer of Brighton, installed the new president for the coming year, **Mr. F. O. John**. Among the newly elected members welcomed to the Society by the retiring president was **Mr. J. Eccles**, the new city electrical engineer of Liverpool.

**Mr. W. H. Rogerson**, sales director of Richard Johnson & Nephew, Ltd., Manchester, and managing director of the subsidiary company, Strappings, Ltd., London, is retiring on June 30th, after 50 years' service, owing to ill-health. He was a Section Director at the Ministry of Munitions in the last war and was awarded the M.B.E. for his services.

The Telcon Works Savings Group, covering the employees of the Telegraph Construction & Maintenance Co., Ltd., and the associated concern Submarine Cables, Ltd., raised £15,418 during "Salute the Soldier Week," thus beating last year's figure of £12,806 by 20 per cent. A dance and other functions were held in the works hall, the T.C. & M. Co. bearing the

expenses, and many certificates were distributed as prizes, forty of these being given by the directors and five by the secretary, **Mr. B. H. Musgrave**. **Mr. L. J. Ransom**, the works manager, gave five certificates to be awarded for the best forecast of the total subscriptions; this was won by **Mr. J. Peters**, a winder in the High Frequency Cables Department.

**Mr. E. S. Colley**, assistant generating superintendent, and **Mr. C. E. F. Evans**, senior charge engineer, in the Battersea Borough Council Electricity Department, were both hoping to remain in the service of the Council until the end of the war, but on their doctor's advice both have had to retire. The Council has placed on record its appreciation of their services and patriotic spirit. Presentations have been made to them by the general manager and engineer (**Mr. H. F. J. Thompson**, M.I.E.E.) and their colleagues, who have joined with the Council in wishing them a speedy return to normal health.

**Mr. J. L. Rowbotham**, general manager, has been elected to the board of Switchgear & Cowans, Ltd. **Mr. Rowbotham** was associated with the Hackbridge Electric Construction Co., Ltd., until he joined Switchgear & Cowans in 1937 in London; he went to the head office and works in Manchester shortly after the outbreak of war.

**Sir Alexander Aikman** has been appointed managing director of Electric & Musical Industries, Ltd.

**Mr. A. E. Iliffe**, of Benjamin Electric, Ltd., has again been re-elected chairman of the Electric Light Fittings Association.

The General Electric Co., Ltd., announces that it has inaugurated an aeronautical department at its head office, with **Mr. F. E. Buckell** as manager. By the formation of this specialised department the company's many activities in this field will be co-ordinated. **Mr. Buckell** commenced his training as an aeronautical engineer with the Sopwith Aviation Company as an apprentice in 1915, after which he served for nearly two years with the London Scottish Regiment and R.A.F. He joined the G.E.C. in 1922 at the Osram Lamp Works and was engaged in various ways in the manufacture,



Mr. F. E. Buckell

testing and inspection of lamps and valves. In 1926 he went to Australia to be manager of the Osram Valve Department of the B.G.E.C. and while there carried out, in co-operation with the late **Sir Charles Kingsford Smith**, some useful development work for radio in aircraft. When **Miss Amy Johnson** made her flight from England to Australia **Mr. Buckell** met her on



arrival in Australia, fixed radio transmission equipment on the machine and flew with her on the remainder of the journey to Sydney, at the same time giving a running commentary on the last stages of the flight. He returned from Australia in 1932 and began to broaden his sphere of interests to embrace all electrical matters connected with aircraft. He is an associate of the Royal Aeronautical Society and a member of the American Institute of Aerial Sciences.

The Gloucester Corporation is advertising in this issue for an electrical engineer and manager to succeed Mr. F. H. Corson, who is retiring after extended service with the undertaking.

On April 5th, Major Stanley M. Mohr, managing director of the Micanite & Insulators Co., presented badges and cheques to nearly a hundred members of the Long Service Association formed last year. He complimented Mr. W. J. Richardson, who was present at the meeting, upon having completed over forty-six years' service with the company; Mr. C. Clayden, who had completed forty-four years, and Miss Harriet Fletcher more than forty years. Four others had been with the company for over forty years. Altogether sixty-four members had service records of over twenty-five years, in recognition of which each was presented with a cheque for £25.

Major Mohr stated that henceforth all hourly-paid members of the Association, *i.e.*, those with over twenty years' unbroken service, would receive full pay during absence owing to illness for two weeks and a further two weeks on half pay. They would also receive an extra week's holiday with pay.

## Obituary

**Alderman A. A. Senington.**—We regret to record the death of Alderman Alfred A. Senington who was president of the Electrical Development Association in 1941-42. Mr.



The late Alderman  
A. A. Senington

Senington was born in India and spent most of his schooldays in that country and Burma. He was prominent in Bristol public affairs for many years. In 1908 he was elected to the City Council; he was made an alderman in 1920 and served as Lord Mayor in 1923-24. He had been a member of the Electricity Committee since 1909 and was chairman from 1937 up to the time of his death.

Alderman Senington had been nominated as a Group C local authority representative for the Council of the I.M.E.A.

Col. J. F. Lister whose death was reported in our issue of April 7th, commenced his electrical career at the Bath electricity works which was at that time controlled by Mr. Massingham. Afterwards he was with Verity's, Ltd., Birmingham, for some years and then joined Spencer (Melksham), Ltd., of which he was a director and for some time London representative.

His brother, Mr. George Lister, has sent us

an illustrated booklet, dated 1908, dealing with the Southern Command Telegraph Companies, R.E., which Col. Lister raised and later commanded. The scheme was encouraged by the formation of a committee for the purpose by the Birmingham Centre of the I.E.E. of which Dr. Gisbert Kapp was chairman. Before this he had been with the London Electrical Engineers which were raised at the time of the Boer War by Col. R. E. B. Crompton.

Mr. H. W. Kefford, manager, Sheffield Branch of the English Electric Co., Ltd., whose death we reported last week, was in his sixty-first year. He was educated at the Central Technical College, and from 1904 to 1907 was a designer and later in charge of electrical testing with W. H. Allen, Sons & Co., Ltd.

From there he went to Siemens Schuckertwerke, Berlin, until 1909, when he joined Siemens Brothers Dynamo Works, Ltd., being engaged in their Supplies Department (Z Fuse Section). After service in the last war with the Royal Garrison Artillery he was lent to the consulting engineer's department of the Ministry of Food. In 1919 Mr. Kefford returned to Siemens Bros.' Supplies Department and later joined the English Electric Co., eventually being in charge of the commercial standardisation section and joint manager, Publicity Department. He was appointed manager of the English Electric Co.'s Sheffield Branch early in 1933, and from 1939 until the date of his death also served as Assistant Regional Electrical Adviser (D.I.E.E.) for the North Midland Area of the Ministry of Supply.

**Maj.-Gen. A. C. Joly de Lotbinière.**—The death occurred on April 14th, at the age of eighty-one, of Major-General Alain Chartier Joly de Lotbinière, C.B., C.S.I., C.I.E., who served in India for many years as an engineer and administrator.

He was responsible for some of the earliest hydro-electric work in India, notably the Cauvery Falls scheme of the Mysore Government which supplies power to the Kolar gold-fields and to the cities of Bangalore and Mysore. Another undertaking with which he was concerned was the harnessing of the Jhelum River.

**Mr. O. S. Nichols.**—We regret to record the death on April 12th of Mr. Oretie Stanley Nichols, A.M.I.E.E., who had been connected with the British Thomson-Houston Co. for about thirty-three years, and was manager of the company's Birmingham district office at the time of his death. Mr. Nichols was born in Brisbane, Australia, in 1892, and received his technical education at the Finsbury Technical College, London. While there he was offered a course in the B.T.H. testing department at Rugby. During the last war he served in France as a lieutenant in the R.F.A., and was awarded the M.C. In 1919 he rejoined the B.T.H. Co. at Rugby and later was manager at Middlesbrough, Liverpool and Sheffield. Early this year he succeeded Mr. Hughes-Caley as manager of the Birmingham office.



The late  
Mr. H. W. Kefford

# Farmers and Electricity

## Education and Assistance Needed

**I**N opening the discussion on the paper by MR. C. A. CAMERON BROWN (*Electrical Review*, April 14th, p. 531), before the Installations Sections of the Institution of Electrical Engineers on April 13th, Mr. J. C. LESLIE (deputy secretary, National Farmers' Union) said that there need be no doubt as to the desire of the farmer to apply electricity in the widest possible manner, providing suitable apparatus and terms were offered him. In this connection he quoted the case of a farmer who was asked to guarantee £70 per annum when he proposed to put in a steriliser. An essential feature of farm installations was standard equipment, which should be simple and cheap and easy to maintain. The National Farmers' Union was anxious to see a national scheme for the application of electricity to farming. Electricity should remove a great deal of toil on the farm just as it relieved the work of the farmer's wife in the house.

MR. H. W. GRIMMITT (Electricity Commission) said that the load factors of supply undertakings that were really rural were increasing very nicely each year, the majority now being a little over 40 per cent. which was a very good figure. There was no need to worry about the maximum demands of the individual farms and an undertaking need not write to a consumer and say it had to pay the C.E.B. £3 15s. per kVA and therefore could not put in a 20-kW steriliser unless a considerable guarantee was given because the demand came on the peak of the undertaking. The diversity of farm loads must be considered. One small undertaking had 30 sterilisers connected and supplied at less than 1d. per kWh, so the farmers were asked to arrange their sterilising so that it did not come on the peak. In that way the supply was given without the imposition of onerous terms.

### Proper Lay-out Essential

Farm mechanisation must be dealt with as a complete entity. It was unfortunately the case that a large number of farm installations had the appearance of being improvised. Now that farm labourers' wages were £3 per week, and might become higher, it would be more than ever necessary to consider the applications of electricity and to lay out the plant to the best advantage. There was great scope for small conveyors and hoists, for instance. Something like 90 per cent. of farm buildings required re-building in this country which would afford the opportunity of considering the lay-out of the installation in a methodical and economical manner.

COL. JOHNSON (President, Institution of British Agricultural Engineers) also spoke of the influence of higher farm wages on mechanisation and called attention to the absence of any mention in the paper of cultivation by the use of electricity. He felt there were possibilities for even the small farm. The method of a cable carried across a field with a steam engine on either side had practically disappeared and its place had been taken by the tractor. But there was an enormous waste of power at the tractor, anything from 50 to 60 per cent. or even more: if some electrical method of operating the plough could be devised it should be much more economical. He visualised a small motor driving a winch with the cable anchored on either side of the field and the implement being drawn backwards and forwards. This problem was worthy of attention.

### Data, Guidance and Investigation

MR. F. E. ROWLAND (G.E.C.) said that prior to the establishment of the Rural Committee of E.R.A., of which the author was secretary, agricultural investigations had been handicapped by an academic approach, with undue prominence given to the less practical applications such as ploughing and electro-culture. There had also been much comparison with Continental practice based on unfair conditions. There existed an urgent need for the co-ordination of existing data, guidance for future development and for investigations into new applications, which objects had been pursued by the E.R.A. in a most effective manner. The war had slowed down the work but several special wartime problems had been dealt with.

The improvement of load factor was of great importance. Possibly due to the first farm engines being of large power, there was a habit now of employing large power-units for a short time. By using a smaller unit for a longer period, considerable savings in first cost could be realised and running charges considerably reduced due to the lower maximum demand. Another application ripe for investigation on similar lines was threshing, while there appeared no reason why the same practice should not be used for food mixing and other processes. The ultimate goal should be to proceed on such lines that the majority of farms could be completely electrified with a maximum demand of the order of 10 kVA. An important issue was an improvement in the lay-out of farm buildings which might be associated with much more up-to-date methods of handling produce.



Non-technical users frequently assessed the performance of steam raisers by the pressure, whereas evaporative capacity in lb. or gallons per hour might be of greater moment. With electricity, evaporation was constant, and farmers and milking machine manufacturers were completely satisfied with electrical steam raisers working at a few lb. per sq. inch, whereas with fuel firing, 60 lb. was often specified for sterilising.

Mr. J. A. SUMNER (Norwich) said that in his area of about 700 square miles, about half was supplied and just about paid for itself. If the so-called unremunerative parts of rural areas were to be supplied, it would be necessary to get every consumer to take about double his existing supplies and it was the duty of supply authorities to take steps to see that the average consumption per consumer was doubled in the next four or five years. He had been trying for some years to arouse some enthusiasm in the industry for development work in connection with an electrical machine to take the place of the tractor, and he had gone so far as to suggest that his Council should contribute £500 towards the necessary research and development work, but he had not been able to get very far. Some electrical ploughing had been done in his area in a rough and ready but not too crude a manner, and the farmer was satisfied.

He believed the industry would be forced to get the ploughing load. Again, he did not see why there should be uneasiness on the part of supply authorities, as the author suggested, with regard to meeting the demands for crop drying. Fear of the C.E.B. charge was ridiculous, because there was such a thing as diversity. There was a saving in labour and an assurance that the grain was dried properly, when using electricity. He looked forward to a single-phase motor with the characteristics of the three-phase motor and suggested the possibility of supply undertakings providing communal plants for farmers.

#### Superior British Service

Mr. J. I. BERNARD (E.D.A.) said it was necessary to study the user's requirements. British rural electrification practice was on a much more generous scale from the engineering and supply points of view than was the case in most countries abroad, where the farmer was limited to possibly 3 kW or less and the supply was unreliable. There was something more to be said for the electrode method of pasteurisation of which good accounts had come from the Dominions. The submersible pump was the electrical solution of the problem of deep well pumping.

Mr. E. W. GOLDING (University College, Nottingham) suggested that future development was largely a matter of the electrification of the small farms and spoke of the difficulty of obtaining reliable information as to the

utilisation of electricity on farms. Perhaps the recent census of farm machinery might help, but a detailed survey of the application of electricity to various farm processes would be better.

He was a little uneasy about following up some of the applications referred to in the paper. They were certainly most ingenious and electricity would be most helpful, but while much of the manual labour on the farm was irksome it was at least simple. If many of the complicated pieces of farm machinery were electrified, it would be necessary to ensure that they were properly maintained.

Mr. W. RIGGS (President, E.C.A.) said that the paper came at a most opportune time because farmers had money to spend and therefore should be most receptive; high farm wages would also ensure farmers taking greater interest in electrification. It was stated in the Scott Report that only 30,000 out of a total of 336,000 holdings were connected to the supply mains in 1938. That indicated the very large field available.

#### Simplification of Grinding Plant

Mr. MARTIN HARVEY, speaking of grinding, said that different farms had different requirements with regard to the meal for their animals. He did not think there need be more than three sizes of meal, which would reduce the number of screens and the cost of the machine. He advocated the use of the cyclone in handling grain, etc., and said that although the electric drier cost more in fuel than coke, a good deal of labour was saved.

Mr. S. A. STEVENS (Westinghouse Brake & Signal Co., Ltd.) considered that if motors were required that were cheap and light, they must be three-phase, which also provided simple starting arrangements. There had been considerable development of apparatus for converting from single-phase to three-phase, which should get over the reluctance of supply authorities to run three-phase distribution networks around farming areas.

Mr. G. O. McLEAN said that in an area of 1,500 sq. miles with which he was familiar there would be a great deal more farm electrification if times were normal and the necessary materials and labour were available.

Mr. G. MAY, who said he was an electrical engineer but had gone over to farming, remarked that, as the supply authority had wanted £2,000 for installing electricity on his farm, he had put in his own Diesel plant. He emphasised the need for a portable hoist and asked whether it would be possible to have batteries in trucks for carrying out some farm operations, the batteries being re-charged at night.

Mr. J. K. MOFFATT, who is in charge of the Rothamsted farm which has been electrified for more than ten years, said that if farmers were under-motored it was not their fault. They did not know where to turn for advice



or information. The local agents of agricultural machinery manufacturers usually had had no experience of electrical machinery and some clearing house was required. Perhaps the E.R.A. could provide it.

Mr. T. Pick also suggested the use of batteries. He added that it was time the electrical industry gave the farmer a low voltage having regard to the dangers when apparatus had to be used in very wet places.

The Author made a general reply to the discussion. It was not sufficient, he said, just to issue reports. E.R.A. had endeavoured in various ways to bring information to the notice of the farmer as well as to try things out in outlying places. Perhaps the Ministry of Agriculture was the worst offender with regard to not disseminating information in the most useful manner. He hoped to see in the various farming areas a body of experts able to give the farmer all the information he required, both on the agricultural and the engineering sides. It was to be hoped that the contractors would take a hand; at present they seemed to take a shorter view than the supply authorities. The whole sphere of steam requirements in dairies was being investigated and the pressure bogey would be dismissed once and for all. An E.R.A. report was forthcoming which very fully summed up the situation and made definite suggestions for the investigation of the field electrification side. Millions of acres all over the world had been ploughed electrically, partly from the point of view of economics and partly expediency. If they were to tackle that problem in this country they must start where the most advanced practice left off, viz., in New Zealand.

## CORRESPONDENCE

### Hot-water Tank Plumbing

AS an advocate of the "kink" in the expansion pipe on the hot-water system where immersion heaters are installed, I find the letter of Mr. Duncan W. Low extremely interesting, and the collapse of a tank such as he mentions is quite new to me.

It was found that the "kink" saved between one and two kWh a day on the typical installation on which the tests were carried out, which, at 1d. per kWh, represents a considerable sum in the course of a year. As, on an average, a really cold snap only happens about once in five years, the cost of electricity for preventing the freezing of the water in the expansion pipe seems a very expensive insurance, and the danger to which Mr. Low refers could surely be met by efficient lagging as there is always a certain amount of heat carried along the pipe by conduction.

Wolverhampton. T. A. G. MARGARY,  
*Electrical Engineer & Manager.*

## Letchworth Exhibition

ELECTRICAL development figures prominently in an exhibition opened at Letchworth by Mr. W. S. Morrison, Minister of Town and Country Planning, on Monday last. The exhibition has been organised jointly by the First Garden City, Ltd., and the Urban District Council, under the title "Letchworth To-day and Tomorrow," and besides showing what has already been achieved in the forty years' history of the First Garden City, indicates the lines of possible future development of the scheme.

Diagrams show that up to the outbreak of war about 3,000 fires, 2,400 cookers, 2,000 kettles, 3,500 irons, 750 water heaters, 700 washing machines and 900 other appliances had been connected and 15 million kWh was being sold annually. In addition to specimen apparatus a model kitchen suggests how electrical apparatus within the reach of everyone's purse, can be most conveniently arranged in a space 12 ft. by 9 ft. At the far end, under a window, is a stainless steel sink, over which is a 1½-gal. "Charlton" water heater. Built into the wall at the right is a 1½-cu. ft. "Electrolux" refrigerator.

Against one side wall is a work cabinet, while on the other is the latest type of Belling cooker (thermostatically controlled and with a glass inner door), with a work table alongside and a plug point (additional to the one on the cooker control unit intended for the kettle) over it for ironing, etc. On the remaining side of the room are an electric clock and a radio set. The whole lot of electrical appliances installed could be hired for a few shillings a week.

Of more immediate interest is a section on the care of apparatus, comprising a series of striking posters and a "casualty station" showing some of the breakdowns that are liable to occur through carelessness or lack of attention. The present need for economy in the use of electricity is brought home by a diagram and photographs of the production of electricity from coal.

### Supply Companies' Tenure

IN the reference to the White Paper based on the McGowan Committee's proposals for the reorganisation of electricity supply in last week's leading article, we said that the tenure of "retained" companies was limited to fifty years, with provision for their acquisition by a public body at ten-year intervals within that period. The words "within that period" were incorrectly used; the wording of Clause 17 of the White Paper was as follows:—

"It is proposed that in respect of all company undertakings retained under a Scheme, the company's tenure of the consolidated undertaking shall be such period not exceeding 50 years as may be prescribed by the Scheme: that in determining the period regard shall be had by the Electricity Commissioners to the dates when any of the existing distribution undertakings owned by the company would have become purchaseable by the local authorities; and that the consolidated undertaking under the Scheme shall be purchaseable as a whole at the end of the prescribed tenure, or at any interval of 10 years thereafter, by an existing or new public body to be duly authorised or constituted for the purpose, on the basis of capital properly expended less depreciation on a scale to be prescribed."

# Post-War Export Trade

## American View of Possibilities

**P**URSUING the official policy of stimulating interest in export possibilities after the war, the United States Bureau of Foreign and Domestic Commerce has published in *Foreign Commerce Weekly* a survey of post-war foreign markets for electrical goods. Some interesting deductions are drawn from known facts regarding trade in former years, on the warranted assumption that if the future is to be justly gauged, a review of the past is usually pertinent and helpful.

The shares in world trade of the three leading electrical exporters in 1937 were:—Germany 25 per cent., United Kingdom 23 per cent. and the United States 20 per cent.; Holland came next with 8 per cent. At about that time the annual world production of electrical goods totalled in value about £900 million, of which £500 million represented American manufactures. American makers therefore shared less in proportion to their production than other countries. Among the reasons assigned for this trend are the following:—(1) With a large market available at home, the foreign market is not aggressively attacked; (2) The different systems of supply in use outside the U.S.A. require different designs; (3) Many markets require styles which vary from those adopted in the United States; (4) Different standards of performance present obstacles, which, if overcome, reduce the competitive position.

### Estimate of Requirements

The survey recalls the progress of American electrical exports over a period of years, and on the supposition that post-war demands will in 1948 bring them up to a total of £39 million, it gives the following estimated distribution as a possibility. Unspecified electrical appliances make up the balance.

Class	£ (000)
Generators, converters, arc welding sets, parts and accessories	2,800
Primary batteries	1,060
Secondary batteries	1,000
Transformers	1,260
Power switches, lightning arrestors, etc.	800
Power switchboards	400
Meters and testing equipment	1,300
Motors and parts	4,000
Motor controls	800
Electric locomotives	400
Station and warehouse trucks	80
Portable electric tools	400
Electric lamps	400
Lighting fixtures	1,000
Electric refrigerators	4,800
Other motor-driven household appliances	1,500
Domestic heating appliances	400
Industrial electric furnaces	400
X-ray and therapeutic apparatus	700
Radio transmitting and receiving apparatus	6,600
Wire-communication apparatus	1,600
Wiring devices	1,500

The Bureau's study points out that special conditions reduce the usefulness of estimates based on pre-war values. For example, the life of equipment varies, sources of competition have been changing, and manufacturing plants have been established where none existed before. At the same time, although the source of incandes-

cent lamps in Holland may have been largely destroyed, other factories have been erected and others have been expanded. Something similar has occurred, too, with radio sets and valves, storage batteries and wiring devices.

In addition, the life of some electrical equipment differs greatly in varying climates. Refrigerators in hot, humid climates such as those of India or the Philippines, if they are built to temperate-climate specifications, have a life of three to four years. In this connection it is interesting to note that the effects of daily temperature variations in places where the relative humidity approximates 100 per cent. are receiving the attention of American manufacturers who are planning for post-war export markets.

Some probable future trends that have a reasonably solid basis of plausibility are cited. They apply to the first of the post-war years and may be summarised as follows:—

Strong competition between the United States, the United Kingdom, Sweden and Switzerland, Brazilian and Argentine competition will influence their own imports. Factories in occupied Europe will not quickly resume peace production. The European market for household appliances will take time to develop again. Australian electrical manufacturers may enter the markets of New Zealand, East Indies, South Africa and the west coast of South America. Demand for electric welding apparatus will expand rapidly. For batteries, recently erected local factories will supply a considerable portion of the demand. In areas of factory development shortage of servants will stimulate the sale of domestic household appliances. There will be increased local manufacture of wiring devices and lighting fixtures.

### I.E.E. Wireless Commemoration

**T**HERE is to be a commemoration meeting on May 3rd to mark the twenty-fifth anniversary of the formation in 1919 of the Wireless Section of the Institution of Electrical Engineers. It is to be preceded by a reception and tea at 4.30 p.m., after which a series of short addresses, which will review wireless engineering progress, will be delivered by Col. Sir A. Stanley Angwin (President, I.E.E.), Dr. W. H. Eccles, Prof. G. W. O. Howe, Admiral Sir Charles E. Kennedy-Purvis, Mr. H. Bishop and Dr. R. L. Smith-Rose, all past-chairmen of the section. In addition, there will be a short recital of gramophone records of important events in wireless development and, if time permits, cinema films of Sir Ambrose Fleming and the late Sir Oliver Lodge.

A feature of the meeting will be an exhibition of apparatus of historical interest which is being lent to the I.E.E. by the British Broadcasting Corporation, Marconi's Wireless Telegraph Co., Ltd., and others. Accommodation at dinner at the Waldorf Hotel (tickets 14s., exclusive of wines) must be limited to 200 members of the Section only, and it is regretted that provision cannot be made for members to take guests.

# COMMERCE and INDUSTRY

## Government and Research. Battery Passenger Cars?

### Heating Restrictions

**F**ROM Monday last in England and Wales and May 8th in Scotland until October 31st the use of any kind of fuel, including electricity, for heating shops, offices, places of entertainment and other non-industrial establishments is prohibited save under permit. The new Order does not apply to private houses, rooms in hotels, etc., reserved solely for residents, i.e., non-public rooms, industrial premises, hospitals, schools and civil defence posts. Should severe weather conditions demand it a general permit for the use of heating may be issued.

### Lightweight Motor

A remarkable motor, which is said to be 65 times faster than the conventional type and only one-fifteenth the weight of machines used for driving household appliances, has been made by the General Electric Co. of America. The motor weighs only 7 lb. and develops 3 HP at 120,000 RPM. It is water cooled and its bearings are lubricated with "oil mist," one of the tests it has undergone being a continuous run of eight hours. The new machine is to be employed for driving grinders and drills for aircraft components; it will not be generally available at present.

### Organised Research

A White Paper, Cmd 6514, describing existing Government machinery for the promotion of scientific research and development has been issued (Stationery Office 2d.), as a background for discussion of the part that the Government can play in this field after the war. The White Paper does not deal with work for war production and the fighting services. The Department of Scientific and Industrial Research is one of three research committees of the Privy Council, for which the Lord President of the Council is responsible, and discharges its functions largely through autonomous co-operative associations, which have now been set up and are financed by twenty-seven industries with the assistance of grants from the Government, related to the amounts they themselves contribute. The British Electrical and Allied Industries Research Association is one of these.

The bulk of the electrical and other engineering work undertaken by the Department itself is

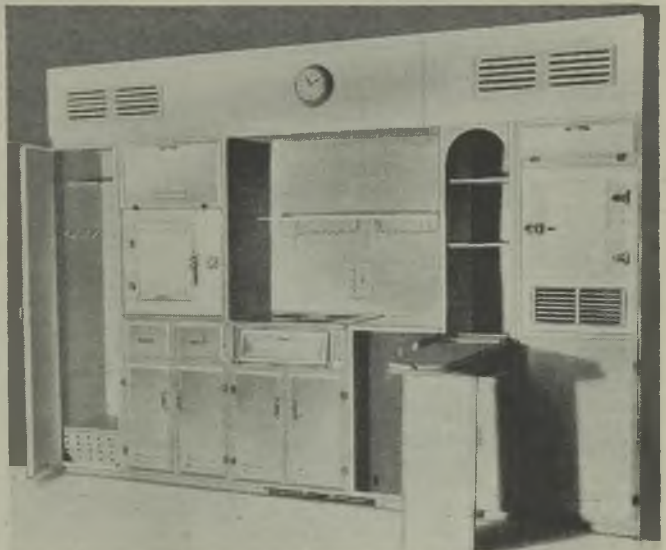
done at the National Physical Laboratory and the Fuel Research Station. The Ministry of Fuel relies largely on the latter for scientific advice, but it is also responsible, through the Safety in Mines Research Board, for a station for testing equipment to be used underground or as required by the Factory Department. The General Post Office also maintains a research organisation employing some 800 persons.

### Manufacturers' Agents

An increase in the total paid-up membership from 335 to 429 is recorded by the Manufacturers' Agents' Association of Great Britain and Ireland in its report for 1943. With regard to the agency bureau, the number of inquiries showed an improvement on 1942, although considerably fewer than before the war owing to such regulations as Limitation of Supplies and the closing down of the activities of foreign consulates, embassies, etc. The annual general meeting of the Association will be held at 6-7, Queen Street, London, E.C.4, on April 25th at 2.30 p.m., and will be followed by an extraordinary general meeting at which a special resolution regarding the payment of an entrance fee will be proposed.

### Mass-produced Kitchen Units

The accompanying illustration depicts the "Poplar" kitchen unit in the form in which it is to be mass-produced. A full description appeared in our last week's issue. Particular attention is drawn to the specially constructed Revo oven and hot-plate units; the "Sadia"



The "Poplar" kitchen unit as designed for mass-production



twin-element water heater giving a small amount of hot water immediately and 15 gal. within a short time; the drying cupboard; and the 1½-cu. ft. "Electrolux" refrigerator, the capacity of which can be increased by taking in the cupboard above.

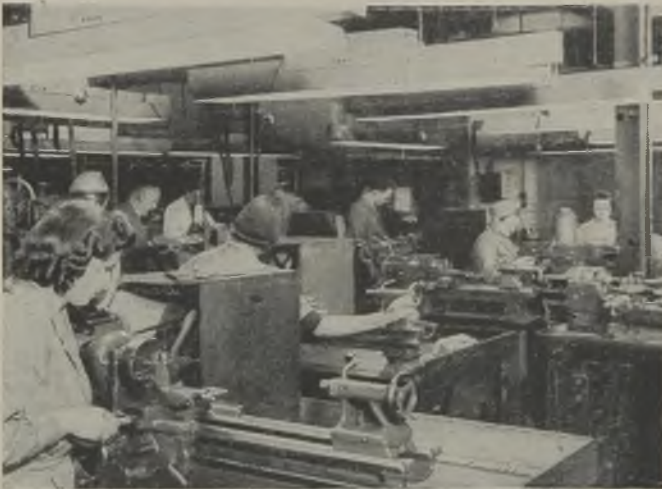
### Lighting and Production

Where a group of operations in manufacture or assembly used to be assigned to one type of operative, it is now common practice to "break down" a particular group into separate jobs and then train each worker for one operation only. The result is an appreciable increase in individual efficiency and collective output. This sub-division, however, has not only been applied to operations and to personnel but to

sources needed careful consideration and fluorescent tubes mounted as illustrated solved the problem. In the production of coils for various electro-medical devices girl operatives manipulate small gauge black enamelled wire against a black, or nearly black, background. The wire travels at considerable speed during the winding process and the necessary visual acuity is as high as possible, assisted by fluorescent lighting.

### Chromium Recovery

In the process of chromium plating small nodules of almost pure chromium are deposited in the vats and on the "suspenders" and "robbers" of the bath. At least one producer of chromium metal is interested in the commercial recovery of these nodules and chromium platers having an accumulation of nodules, or able to offer them in regular parcels, should communicate with the salvaging company whose address can be obtained from the Ministry of Supply, Chrome Ore, Magnesite and Wolfram Control, Broadway, Westminster, S.W.1.



Cool light sources are essential where mounting height is low

machinery and other equipment as well, including lighting, to ensure intensities appropriate to individual classes of operation.

For instance, in one factory the working area is illuminated by two kinds of lighting. Tungsten lamps mounted in dispersive reflectors are used to light an area where comparatively coarse work needing neither high intensity nor high quality illumination is carried out. In a portion where assembly and testing to fairly fine tolerances are carried out lighting as shadowless as possible and with a low surface brightness is essential and "Osram" fluorescent tubes are used to provide it. They are mounted, in line ahead, behind the working areas of the benches, thus providing good light values on both the horizontal and the vertical planes.

Close work mostly on materials with a high reflective factor is carried out in the machine shop. Here, too, a low brightness light source is necessary for the maximum reduction of reflected glare and fluorescent tubes are again used.

Precision work on small machine tools specially designed for the purpose, is carried out in yet another section of the same factory. Since only a low mounting height was available the question of heat generated by the light

senders and the name and address of the consignees is inserted in an adjacent space. The two top corners are turned over and bear the words "From" and "To" with indicating arrows. When the case is to be returned, these corners, which are perforated, are torn off without removal of the label, disclosing the words "To" and "From," thus reversing the direction of travel.

### Battery Car Services

In an address to a local organisation recently Councillor G. W. G. Armour, chairman of the Liverpool Corporation Transport Committee, visualised the stopping of trams a considerable distance outside the city and passenger transport by small electric battery cars from the inner tram termini to all parts of the city. He thought that two free journeys might be allowed to holders of, say, 5d. return tickets, while other journeys might cost 1d. or 1½d. in the city area. At other points on the main tram and bus routes, and particularly at such termini as Speke, West Derby and Norris Green, such vehicles might be developed to provide the luxury of almost a taxi service along the various secondary roads of the suburbs for distances up to a mile at a fare of 3d. for any stage within this maximum

### Returns Facilitated

As a means of ensuring the prompt return of empty packing cases and crates, the Bi-Way Label & Printing Co., Timperley, Cheshire, has devised a label which can be used without removal for both dispatch and return. It bears in one panel the printed name and address of the

distance, passengers being picked up and set down anywhere. With a very light body and no elaborate upholstery such a car might be designed to carry ten people and the fares could be collected automatically under the direction of the driver. He believed that there was a large potential public for such a service and if real wages increased in the future this luxury service would provide a large proportion of the Department's revenue.

Commenting on these proposals the *Transport World* points out that the national standard electric vehicle is designed to carry a payload of a ton with a mileage of 42 per charge, so that technically it should not be impossible to design a vehicle to carry out the duties suggested. In addition, the battery electric offers a solution to transport difficulties in rural areas; a vehicle carrying 16 to 20 passengers and with a range of 50 miles could operate services between villages and nearby towns. In Switzerland a service of this kind was started last year, making 30 trips daily between village and station and carrying 24 passengers.

### Contract Price Adjustment Formulæ

The latest figures for use in the contract price adjustment formulæ of the British Electrical and Allied Manufacturers' Association are as follows:—(a) Rates of Pay.—The rate of pay for adult male labour at April 15th shall be deemed to be 86s. 6d. (no change). (b) Costs of Material.—The index figure for intermediate products last published by the Board of Trade on April 15th is 173.0 (against 172.8) and is the figure for the month of March.

### Plastics Exhibition

Plastics, their use in war and peace, formed the subject of an exhibition staged recently by BX Plastics, Ltd., to demonstrate to their employees the importance of their work. Commencing with the formation of the British Xylonite Company in 1877, the display traced its history right up to the present, finishing with suggestions of probable opportunities for extending the scope of activities after the war. The indispensability of plastic materials in practically every weapon of war was perhaps the most striking impression created, and among the electrical applications indicated was the use of "Bexoid," "Distrene," "Xylonite," and p.v.c. for such items as radio apparatus, accumulators, vent plugs, torch cases, miners' lamps, cable conduit, cable covering, cable clips, foil for cable wrapping, connector guards, labels, dials, diathermy apparatus, and X-ray films.

### Palestine Import Restrictions

The *Board of Trade Journal* of April 15th contains details of revised lists of commodities whose importation into Palestine is subject to restrictions, as set out in a Government notice published in the *Palestine Gazette* of November 18th, 1943. Commodities which may not be imported except from specified countries in the Middle East include electric accumulators and dry batteries. Those which may be imported within quota limits include the following:—Electric generators; electric motors; electrical apparatus and appliances n.e.s.; electric welding, laboratory, photographic and X-ray apparatus; electrodes;

scientific instruments; insulating materials (micanite, presspahn, etc.); insulating porcelain bushings; insulating varnish; electric wire and cable; radios, parts and valves; refrigerators and parts; telegraphic apparatus; telephone accessories; and winding wire, plain, enamelled and insulated.

### Lamp Publicity

An effective counter model has been produced by Thorn Electrical Industries, Ltd., as an addition to its display material for "Atlas" lamps. This is the first of its kind to be issued



"Atlas Lamps" counter model

by the company. The model, constructed of plaster of paris, stands 9 in. high and is 10½ in. wide. It is carried out in brown, orange, yellow and blue, thus tying up with the familiar outdoor publicity signs.

### Institute of Physics Scottish Branch

The inaugural meeting of a new Scottish branch of the Institute of Physics will take place at 2.30 p.m. to-morrow (Saturday) in the Chemistry Buildings of the University of Glasgow. Further particulars of the branch may be obtained from the acting honorary secretary, Dr. R. S. Silver, F.Inst.P., c/o G. & J. Weir, Ltd., Cathcart, Glasgow, S.4.

### Faraday House Students

Referring to the leaderette on women students at Faraday House in our issue of April 7th, the Registrar tells us that no State bursaries have been awarded to Faraday House students.

### Trade Announcement

Sid Dagnall & Son, Ltd., state that they are opening additional premises at 389, Stratford Road, Birmingham (telephone, Vic. 2594/5) for offices, electrical sales and radio repairs. Their premises at 2, Fulham Road are retained for electrical contracting, stores and repair departments.

### Change of Name

The Ioco Rubber & Waterproofing Co., Ltd., is in future to be known as Ioco, Ltd.



# ELECTRICITY SUPPLY

## Lanark Rural Service. Rate Relief Contested.

**Ammanford (Carmarthen).—PURCHASE LOAN REPAYED.**—After twenty years of ownership of the electricity undertaking the Urban District Council has just paid the final instalment of the original loan. At the last meeting of the U.D.C. Councillor T. Davies, who was a member of the Council when the undertaking was purchased, recalled that it was bought for nearly £20,000.

**Conway (North Wales).—RATE CONTRIBUTION.**—The Electricity Committee has decided to make a grant in relief of local rates of £700, or 50 per cent. of the profits for the financial year ending March 31st, whichever is the lesser sum.

**Dagenham.—LAMPS IN COUNCIL HOUSES.**—In view of present difficulties the Council is reported to have discontinued its practice of supplying electric lamps and shades to tenants.

**Glasgow.—I.M.E.A. CONSTITUTION.**—At a recent meeting of the Electricity Committee Councillor Jean Roberts gave notice that at the next meeting she would move that the town clerk and the manager should be instructed to prepare a report on the constitution of the I.M.E.A. and the voting powers of the constituent members.

**RENEWAL OF CONTRACTS.**—The Electricity Committee received a report from the manager regarding the invitation of tenders for the supply of meters, stores, etc., during year commencing June 1st next. It was agreed, in view of the conditions prevailing at the present time, that competitive tenders should not be invited, but that the present contracts should be renewed for a further period of twelve months on the best terms obtainable, subject, where necessary, to price fluctuation clauses.

**Inverness.—ENGINEER'S REPORT APPROVED.**—At the last meeting of the Town Council it was agreed to approve the electricity manager's report on the boiler plant capacity at the local generating station and the improbability of the Electricity Commissioners sanctioning the necessary expenditure for new generating plant. The Council also adopted a recommendation that negotiations should be entered into with the Grampian Electricity Supply Co. for an additional supply.

**Lanarkshire.—PUBLIC SERVICES IN RURAL AREAS.**—Remarks by the chairman of the Clyde Valley Electrical Power Co. at the annual meeting held recently were criticised by Major Monteith, convener, at a meeting of Lanark County Council at Glasgow on April 5th. Referring to rural electrification the chairman of the Clyde Valley Co. had said that for a number of years the company had been urging farmers to electrify their steadings but economic circumstances in many cases prevented them. To Major Monteith that could only mean that the company's requirement of a 20 per cent. return on the cost of laying mains to afford a supply of electricity was beyond the pocket of the ordinary farmer, and that some revision of these exacting conditions was necessary. The County Council was the inspiration behind the introduction

of electricity in its rural areas by itself guaranteeing the return required by the company.

**Lancaster. — UNDERTAKING'S JUBILEE.**—This month the Corporation's electricity undertaking celebrates its jubilee. Councillor J. L. Dirkin stated at a City Council meeting that recognition of this important anniversary would have to be deferred.

**Liverpool.—MODIFIED LIGHTING.**—Detailed proposals have been submitted by the Civil Defence Emergency Committee to the Minister of Home Security for the installation of low-intensity lighting in the central area of the city.

**Nottingham.—RATE RELIEF CONTROVERSY.**—There was a lively debate on the question of the Electricity Department contributing towards the relief of the rates at the City Council's annual budget meeting. Presenting the estimates Ald. S. C. Armitage, chairman of the Finance and General Purposes Committee, recalled that for many years the electricity undertaking had contributed £24,500 to the rate fund. In recent years, for reasons connected with income tax, the total had been divided between a contribution towards the central administrative expenses and a direct contribution for the relief of the rates. The latter portion, amounting to approximately £9,000, might not be paid over in the ensuing year, he said, because so far as could be seen the profit would not justify it. This he attributed to the fact that electricity charges had been reduced in July, 1942. He understood that the Electricity Committee would review the position when the results for the year were definitely known.

Ald. H. Bowles pointed out that a contribution from the Electricity Committee meant rate relief to some people who were not entitled to it. He referred to the Gas Committee's policy in this respect. Ald. Sir Albert Atkey, however, contended that all right-thinking people would agree that trading undertakings should pay towards the rates of the city.

Coun. J. Willbery expressed the view that any trading undertaking which made charges in excess of the cost of production for the purpose of contributing to the relief of the rates was exploiting the people who used the commodity. The Electricity Committee was determined that the exploitation of consumers should not go on if it could prevent it, he said.

## Overseas

**Canada.—MONTREAL UNDERTAKING ACQUIRED.**—The undertaking of Montreal Light, Heat & Power Consolidated, which has been responsible for electricity and gas supply in Greater Montreal and has interests in street railway systems, has been taken over by the Quebec Hydro-Electric Commission. This Commission was established by special legislation which received Royal Assent last week. The chairman is the Minister of Roads (Senator Bouchard) and the members are Messrs. G. C. Macdonald, J. W. McCammon, L. E. Potvin and R. A. Latreille. It is reported that no decision has yet been made regarding the amount of compensation to be paid to shareholders.



# RECENT INTRODUCTIONS

## Notes on New Electrical and Allied Products

### An Interval Timer

**A**n electronic instrument for the accurate measurement of very short intervals of time has been designed and is being made by R. K. DUNDAS, LTD., The Airport, Portsmouth.

The device is self-contained, energised from ordinary AC mains, and simple to operate by unskilled users. Its range is from one millisecond to one second, making it convenient for timing relays, switches, contact breakers, fuses, stroboscopes, camera shutter releases, and all kinds of automatic machinery. Less obvious applications are to measuring viscosity, high

directly on a 4-inch meter scale which is calibrated in milliseconds. Special circuits ensure an almost complete absence of zero drift; the stabilising system renders accuracy totally unaffected by any normal change of valve parameters or in mains supply voltage.

A battery-driven model is available. The meter scale can be supplied with other calibrations (e.g., feet per second or relative viscosity) in cases in which the instrument is used under defined conditions for one special purpose.



"Microtimer" for measuring short intervals

accelerations and velocities, speed of chemical (especially explosive) reactions and the calibration of radiolocation apparatus.

The "Microtimer" principle is that a large capacitance condenser which has previously been charged with high-voltage DC is discharged, during the time interval which it is proposed to measure, through a constant current circuit into a selected high-stability precision condenser. The voltage developed across the second condenser is a function of the time during which the constant current flows, and is indicated by a DC valve voltmeter of exceptionally high input resistance, stabilised by the introduction of heavy negative feedback. Two diodes are included, one to by-pass the current that charges, or leaks through, the large condenser which later becomes the source of power for the discharging current, and the second to prevent the charge introduced into the precision timing condenser from leaking out after the interval to be measured has expired.

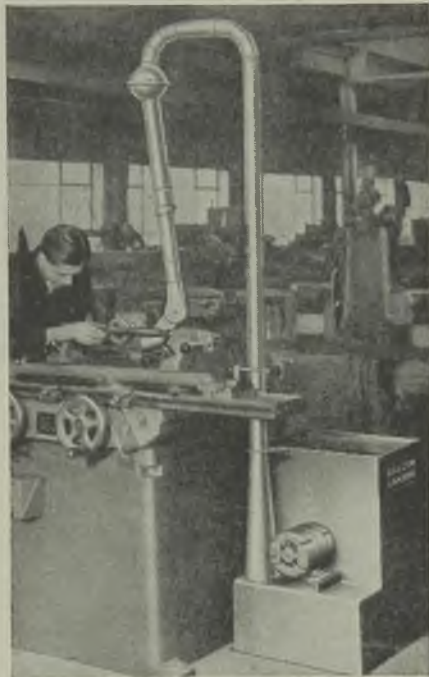
The standard model is controlled by the making or breaking of two pairs of external electrical contacts; any of the four combinations of makes and breaks can be used. It can also be operated directly without contacts by a photo-cell and valve amplifier.

Six ranges with maxima of 10, 20, 100, 200, 500 and 1,000 milliseconds are provided, and in all cases accuracy is within plus or minus 1 per cent. of full scale. Time intervals are read

### Dust Collectors

Pneumatic dust collecting machines are built on the unit principle for standing beside machine-tools, or underneath bench grinders, by DALLOW, LAMBERT & Co., LTD., Spalding Street, Leicester.

They are compactly self-contained, castor and trolley-wheel bases being available for mobility. The suction fan, driven at 2,800 RPM by a  $\frac{1}{4}$ -HP motor, is on the clean-air side to avoid abrasion and clogging of the impeller blades. Dust-laden air is induced at low velocity through a primary separating chamber, the heavier particles being collected in a drawer below, before the finer particles are extracted in a sleeve-bag filter. The latter is fitted with shaking gear with a hand oscillating knob. The latest type of suction pipe is vertical



Pneumatic dust extractor for machine shops

and rigid, as illustrated, projecting an adjustable nozzle above the machine it serves. A self-sustaining ball and socket joint and an adjustable telescopic pipe with finger screw locating device are incorporated in its design. There is a small adjustable suction nozzle attachment for final setting to a grinding wheel, or cutter head, without any attachment to, or interference with, the machine served.

### Brazing and Soldering

"Pyrobraze" brazing and soldering outfits offered by the ACRU ELECTRIC TOOL MANUFACTURING CO., LTD., 123, Hyde Road, Ardwick, Manchester, 12, are for AC single phase use

only. The metal case contains a tapped transformer and switch panel with electrode holder, clip, connecting cables and spare carbon electrodes.

The portable model is rated at 30 to 120 A for 3 to 5 min. intermittent use; the larger size, which is not portable, furnishes 30 to 130 A for 20 to 30 min. intermittent service, being also suitable for hard soldering sheet metal up to 18 SWG and wire up to 8 SWG.

The secondary voltage is from 3 to 8 V and the input ranges from 100 to 500 W while the equipment is in use, falling to 35 W when energised but not working. The heat generated by the equipment can be regulated between 300 and 1,000 deg. C.

## Mobile Power Plants

### Restoring Supply in Re-occupied Areas

**L**AST December it was announced that the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., had undertaken the building of ten 5,000-kW mobile plants to be used in restoring supplies in areas devastated by the enemy when they were re-occupied by the forces of the Allied Nations. The company has sent us brief details of these power plants.

The equipment is housed in a series of rail cars, the principal of which is the turbo-generator car illustrated herewith. There are two boiler cars each with a

**Turbo-generator car of 5,000-kW mobile power plant**

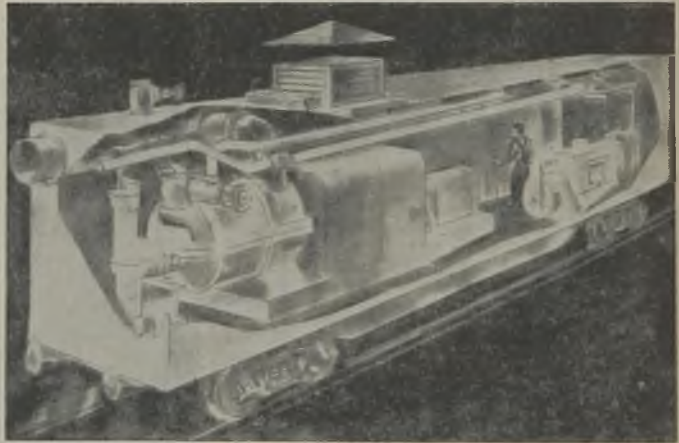
12-ft. chimney and the turbine exhaust passes to two air-cooled condenser cars. Each train also includes a car with bunks and living and working space for the train crew; an auxiliary equipment car containing the boiler feed pumps, air compressors, etc.; and a tank car for treated boiler water.

The trains will be able to generate power in almost any kind of weather. The equipment has been designed to operate at temperatures ranging from 40 F. degrees below zero to 95 F. above. Steam pipes coiled in the bottom of the tank cars will prevent the boiler water supply from freezing.

A tall wooden bunker will be erected to supply coal to the boiler cars where stokers will feed the fuel into the exhaust chambers. The boilers (80,000 lb. per hour) were designed to use even the poor type of coal found in certain parts of Europe.

Mr. L. B. McCully, Westinghouse Transportation and Generator Division manager, who is in charge of the project, says that the Allies' plan is to dispatch the trains into reconquered areas

on the heels of their advancing armies. Within a matter of hours after arrival these travelling power houses can be generating electricity for war production, military needs and civilian rehabilitation. This compares with nine months to two years required to rebuild a power house destroyed by the retreating enemy. The trains



may also be used to establish new industrial centres in undeveloped areas, supplying power until permanent generating plants are constructed. They will aid in placing war plants beyond the reach of enemy bombers and in saving materials and manpower that would otherwise go into building power transmission lines.

After the war the equipment in the trains can be removed and put on permanent foundations in new power houses, or the trains can be kept in readiness for floods or other emergencies.

In addition to these 5,000-kW trains, the Westinghouse Co. is producing twenty-four 1,000-kW mobile power houses of three cars each, which will generate sufficient power to meet the needs of a single large manufacturing plant or those of a small community.

# Electrical Manufacturers

## Annual Report of the B.E.A.M.A.

ONCE again circumstances have necessitated the drastic cutting-down of the annual report of the British Electrical & Allied Manufacturers' Association which was presented at the annual meeting yesterday (Thursday). The report therefore presents a somewhat incomplete outline of the Association's many activities during the past year. Close contact has been maintained with all the Government Departments concerned to the members' advantage.

A great deal of time and consideration have been devoted to the problems of post-war reconstruction. A questionnaire was received from the Board of Trade dealing with the position and needs of the industry after the war. Members were consulted and a report based on their views was made to the Board of Trade in January last. This is to be followed by a further report dealing with the particular difficulties and needs of the various sections of the industry.

Discussions are proceeding with the Board of Trade concerning the method of disposing of Government-owned electrical equipment which will become redundant after the war. It is confidently hoped that arrangements will be made which will both benefit the Treasury and avoid the disastrous effects on the industry which would result from unorganised disposal of this equipment.

The Electrical Machinery Export Committee and the Electrical Goods and Apparatus Export Committee have been continuously in touch with Government Departments on export trade problems, not only after the war but also in the difficult period between the cessation of the war in Europe and in the Pacific.

With regard to the Government control of prices after the war, the Association has been represented on several deputations to the Federation of British Industries to the Board of Trade and it is hoped that as a result satisfactory arrangements will be made.

The Association, through the Installations (Study) Committee, has had many discussions with the authorities concerned on the design of equipment for small houses. While it has not been possible to induce the Government Departments concerned to release labour and material for the production of prototypes, the Association has been asked to equip with electric cooking, heating and lighting apparatus two of several demonstration houses which have been erected in the London area.

New sections covering domestic electric cookers and steam engines were formed during the year. The three new welding

sections have functioned smoothly and have carried out much useful work.

Reference is made in the report to co-operation with kindred associations and it is recorded that during the year the British Engineers' Association materially altered its constitution; the Council hopes that in the near future a joint committee of this Association and B.E.A.M.A. will be set up which will give an opportunity for the engineering industry to speak with one voice on matters of major policy.

Twenty-one new members were elected during the year. The report concludes with references to the knighthoods bestowed on Dr. A. H. Railing and Messrs. George Bailey and Archibald McKinstry and to the death of Mr. W. C. Lusk (vice-president) and three members of the Council—Messrs. J. L. Wilson, C. Steward and G. J. Berry.

## Lighting Fittings

### Association's Annual Report

TWO more firms joined the Electric Light Fittings Association during 1943. The Association's annual report states that activities have been mainly centred in the Industrial and Commercial Fittings Section; war conditions have again restricted the work of the Ornamental and Decorative Fittings Section and the Street Lighting Fittings Section. All three sections are devoting attention to post-war reconstruction problems with a view to preparing plans for a rapid change-over from war to peace production as soon as circumstances permit.

Certain amendments to the constitution were embodied in a new edition of the rules which was formally approved at the annual meeting on March 29th. A strongly representative Technical Committee has been appointed to deal with the many technical problems which will arise in the future. This Committee is now engaged in developing a complete technical structure for the Association with sub-divisions appropriate to each class of lighting. Plans are also being laid for complete collaboration with the technical sections of kindred associations, e.g., the B.S.I., E.L.M.A. and E.D.L.A.C. (the Electric Discharge Lamp Auxiliaries Committee).

The Council is to co-operate with the E.L.M.A., through the National Industrial Electric Lighting Service, in the setting-up of "trial" installations in selected factories to exhibit examples of good lighting for the guidance of certain classes of industry. It is also studying the possibility of establishing overseas committees for the interchange of information and general collaboration on technical trends in illumination in overseas markets and other matters relating to illumination.



That part of the Trading Code operated by members applying to industrial and commercial fittings has been brought up to date and re-printed. Proposals are under discussion for making the Code relating to ornamental and decorative fittings as comprehensive as that applying to industrial fittings. To ensure the maximum co-ordination of selling policy in connection with discharge lighting fittings and control gear, a joint committee has been established with E.D.L.A.C.

Reference is made in the report to the raising of the quota for ornamental and commercial fittings, under the Limitation of Supplies Order, from 5 to 12½ per cent.

In conjunction with the Association of Public Lighting Engineers, a committee of the

Street Lighting Section has prepared and circulated to local authorities a questionnaire regarding their likely needs for putting their existing street lighting into working order when it may be used again. The Association has made proposals to the Illuminating Engineering Society with regard to street lighting layouts for secondary roads.

The Fluorescent Lighting Committee has brought the existing schedule up to date to include types of fluorescent lighting fittings introduced by members during the year. Mention is made of collaboration with other organisations and of the continued success of the arrangement by which bulk supplies of steel and cast-iron are secured for members through the Board of Trade.

## Education for Industry

### Finding Remunerative Employment

**I**N a letter to *The Times* of April 14th Sir Lynden Macassey, K.C., chairman of the governors of Queen Mary College, says that great expectations will be aroused by the appointment of a committee to consider higher technological education in relation to the needs of industry (*Electrical Review*, April 14th, p. 521).

He says that one important matter merits the most careful consideration. That is the organisation of technological education on such a basis as will provide an open door for technically trained graduates and students to pass directly into remunerative employment in industry. Unless that is achieved, the value which will be placed by students on technological education will not be such as will secure their necessary response, nor is industry likely to accept its value in practical production.

In Queen Mary College the difficulty of finding satisfactory employment for engineering graduates caused real concern. It seemed that the development of high-voltage electricity offered an opportunity for experiment. Accordingly, with the encouragement of Sir Andrew Duncan, then chairman of the Central Electricity Board, the expert advice of Sir Archibald Page, the Board's chief engineer, and the active co-operation of Sir Felix Pole, chairman of Associated Electrical Industries, Ltd., and the recommendations of Professor Macgregor Morris, based on his inspections in the United States and Germany, and financial assistance from the London County Council and the University of London, there was established a high-voltage testing laboratory, the first in any teaching institution in this country.

### Demand Exceeds Supply

Its success was instant. The engineering students got a practical training of immediate industrial marketability. Manufacturing firms sent materials to the laboratory to be tested on terms of commercial remuneration, and thereby established a direct link between the laboratory and industry. As a matter of interest Sir Lynden mentions that the laboratory was employed to test insulating materials for use on the Italian State Railways then being electrified to avoid the necessity of buying Welsh coal. It was soon found that the demand by electrical firms for students trained in the

laboratory far exceeded the supply. This kind of technological training of the ordinary student stands in a different category altogether from scientific or technological research. From his experience Sir Lynden suggests to the Committee the importance of exploring the practicability of its wide extension as a matter of national policy.

The writer also recalls that last year he suggested that the surplus machinery, machine tools, instruments, and appliances left in the possession of the Government at the end of hostilities should, in the first priority, be allocated to universities and university and technical colleges to re-equip and to modernise their engineering and technical departments.

## Birmingham Electric Club

### Fifty Years of Electricity

**T**HE March meeting of the above Club, with the president, Mr. A. M. Fletcher, in the chair, was addressed by Mr. W. E. Warrilow, M.I.E.E., on "Fifty Years in the Electrical Industry." He recalled the early days when the "battle of the systems" in electricity supply was at its height and towns vied with each other in adopting every different system, voltage and frequency then available. Shift engineers 50 years ago received £2 per week and regularly ran the risk of scalds, burns, shocks and being caught in belts and ropes. To-day there were encouraging signs of co-operation between manufacturers, station engineers and contractors, of pooling of patents, of exchange of data and of genuine effort to achieve and adopt standards in all branches of the industry.

Referring to Birmingham's contribution to electrical development, the speaker particularly cited the pioneering work of Henry Wiggin & Co., the metallurgists who gave makers of fires, cookers, hot-plates, heaters and furnaces a really reliable nickel-chrome, which had steadily supplanted imported wires and tapes, thereby making all apparatus using heating elements truly British. The speaker appealed for research in the fields of battery traction and the generation of electricity on a large scale from wind power.

# FINANCIAL SECTION

## Company News. Stock Exchange Activities.

### Reports and Dividends

A. Reyrolle & Co., Ltd., report that a profit of £396,712 was earned last year, as compared with £452,038 in 1942. After providing for depreciation, renewals, taxation, etc., there was a net profit of £117,532 (against £125,908). General reserve again receives £40,000 and £25,000 (against £35,000) is transferred to development expenditure account. The ordinary dividend is maintained at 12½ per cent. by a final payment of 7½ per cent. It is proposed to set aside £1,500 for local charities and £1,000 for special appeals in connection with the war. A balance of £134,597 (against £136,697) is carried forward.

Mr. N. Merz, the chairman, in a statement issued with the report and accounts, refers to publicity recently given to the question of the establishment of new industries. The company has, he says, over many years added to its great variety of productions and has not found any insurmountable difficulty in introducing such work with highly satisfactory results in a district which is usually looked upon as mainly occupied by heavy industries. Dealing with the accounts, he states that the company has created an additional fund for the benefit of employees, including women, who are not covered by the existing scheme. A part of net earnings has again been set aside for future development expenditure. This has not been neglected during the war period and preparations are in hand to deal with it more actively as opportunity arises.

The Automatic Telephone & Electric Co., Ltd., reports a profit on trading, dividends on investments, etc., amounting to £280,952 for the year ended December 31st last, after providing for taxation and adjustment of provision for contingencies. This compares with £261,888 in 1942. After providing for depreciation etc., the net profit is £212,312 (£191,005). Income tax takes £127,478 (£125,363) and a sum of £20,000 (nil) is transferred to war contingencies reserve. A final ordinary dividend of 7 per cent. is to be paid, making 10 per cent. with a bonus of 2½ per cent. (same) while the deferred dividend and bonus are again 10 and 2½ per cent., respectively, leaving £130,348 (£138,669) to be carried forward. A contingency provision of £63,110 set up in earlier years and no longer required has been utilised to augment the company's staff pension scheme and provident fund.

In a statement circulated with the report the chairman of the company, Sir Alexander Roger, says that factory output was the highest in the company's history, and he is convinced that the progress designed to secure prosperity and stable employment could not have been achieved under public ownership. With modern methods, up-to-date salesmanship and better technique the company is able to produce cheaply and it has learnt that the customer in every part of the world prefers to buy what he is willing to buy and at a price he is willing to pay. Fierce international competition will be just as rife in post-war years and will test industry to the limit, while

the political problems alone involved in permanent peace-making are becoming ever wider and more complicated.

A few directions in which he considers that the Government can help industry, and exports in particular, include (1) the relaxation and removal of war restrictions and control as early as possible; (2) the encouragement of enterprise at home and abroad in the interests of distribution to provide cheap and rapid communication of all kinds; (3) the cultivation of the closest, friendliest and mutually helpful relationship and commerce within the Commonwealth and those nations which incline towards us; (4) increased taxation allowances for wear and tear and obsolescence of plant and equipment; and (5) reduction, if not abolition, of E.P.T. Industry knows full well that no section of it can remain prosperous for long without national and international prosperity.

Newman Industries, Ltd., state that the net profit for 1943 was £70,978, as compared with £67,182 for 1942, after providing for depreciation, pensions, fees, etc. Provision for taxation needs £41,000 (against £33,000). The dividend on the increased ordinary capital is again 20 per cent. and £18,014 (against £16,606) is carried forward. Last year £10,000 was placed to general reserve. The issued capital has been increased by £156,000 to £425,000, including an increase of £50,000 to £180,000 in ordinary shares.

Telegraph Construction & Maintenance Co., Ltd.—The full accounts for 1943 show a rise in trading profit from £320,709 to £375,114, but income tax and E.P.T. increased from £270,000 to £323,642 and the net profit at £51,488 is only £2,123 higher. The allocation to reserve for contingencies is increased by £6,325 to £30,000. The ordinary dividend is maintained at 10 per cent. and the balance carried forward is £42,308 (against £43,541).

Hall Telephone Accessories (1928), Ltd., record a net profit for 1943 of £499,626, as compared with £258,410 for 1942. To this are added £12,986 (£13,696) brought in and £4,449 (£8,290) from previous tax over-provision. After deducting £445,000 (£217,000) for taxation, £20,000 (nil) for war contingencies, £20,000 (£25,000) for general reserve and £6,365 (£5,250) for additional fees, a final dividend of 5 per cent. is to be paid, making 10 per cent. (same) with a bonus of 2½ per cent. (same), leaving £5,536 to be carried forward.

Enfield Cable Works, Ltd., reports a net profit of £117,206 for the past year (against £166,623). The ordinary dividend is maintained at 12½ per cent. by a final payment of 6½ per cent. and £15,376 (against £13,170) is carried forward.

The directors state that the output increased during the year. The drop in profit is attributed to the altered character of the demand; satisfactory results are expected during the current year.

S. Smith & Sons (Motor Accessories), Ltd., have declared an interim dividend of 7 per cent. on the preferred ordinary shares. At an



extraordinary meeting on April 12th the shareholders unanimously adopted a resolution changing the company's name to S. Smith & Sons (England), Ltd. It was announced that a new company would be formed to maintain the motor accessories goodwill and that it was also proposed to form separate companies for aircraft and industrial instruments.

**Philco Radio & Television Corporation of Great Britain, Ltd.**—The Capital Issues Committee has approved in principle the increasing of the company's capital by £150,000 to £600,000. It is proposed to offer 100,000 new 6 per cent. redeemable cumulative preference shares to shareholders in the proportion of two new shares for each seven preference held and one new ordinary for each five ordinary shares held. Associated interests are to take up 50,000 new 2s. ordinary shares.

**The Ever Ready Trust Co., Ltd.**, announces that its net revenue for the year to March 31st last was £31,762 (against £28,893 in 1942-43). The final ordinary dividend is 7 per cent., raising the year's distribution from 9 to 10 per cent. and £12,418 (£10,656) is carried forward. The value of the company's net assets is said to be 39 per cent. above the issued capital.

**Fescol, Ltd.**, reports a net profit for 1943 totalling £6,738, which compares with £6,424 for the previous year. After paying the 7 per cent. preference dividend and an ordinary dividend of 9d. (6d.) per 1s. share, a sum of £2,353 (nil) is placed to reserve and £10,881 is carried forward.

**Sangamo-Weston, Ltd.**, announce a profit of £30,560 for 1943, after meeting taxation, against £35,494 in 1942. The dividend is again 15 per cent.

**The Brush Electrical Engineering Co., Ltd.**, has declared a dividend of 9 per cent. for 1943, against 8 per cent. for the preceding year.

**Herbert Morris, Ltd.**, are again paying an interim dividend of 5 per cent. free of tax.

**The Adelaide Electric Supply Co., Ltd.**, has declared an interim dividend of 5 per cent., as last year.

**Switchgear & Cowans, Ltd.**, announce the payment of a dividend of 20 per cent. for the past year (same).

## New Companies

**Robdor Radio & Electrical Appliances, Ltd.**—Private company. Registered March 30th. Capital, £2,000. Objects: To carry on the business of manufacturers of, and dealers in, amplifiers, sound reproducing machines, gramophones, electric accumulators and batteries, etc. Subscribers: M. Harris, 104, North Side, Clapham Common, S.W.4, and J. M. Reeves, 76, New Cavendish Street, W.1. Secretary: J. M. Reeves.

**Havil Motor Co., Ltd.**—Private company. Registered April 5th. Capital, £1,000. Objects: To carry on the business of electrical equipment specialists, manufacturers of, and dealers in, electric motors, batteries, accumulators, magnetos, dynamos, plant and accessories; electrical, radio, automobile and general engineers, and dealers in motor and electric vehicles, etc. Directors: J. A. Phillips, Mrs. E. M. Phillips

and Lawrence B. Phillips, all of 26, Buckley Way, Banstead, Surrey. Registered office: Havil Garage, Havil Street, S.E.5.

**Duralectrics, Ltd.**—Private company. Registered April 5th. Capital, £2,000. Objects: To carry on the business of electrical engineers and contractors, manufacturers of, and dealers in, radio sets and valves, radio gramophones and accessories, etc. Helena Somerville, 2 Woodlands Drive, Crofts Bank, Davyhulme, Manchester, is the first director. Registered office: Victory Mills, Gilpin Road, Urmston, near Manchester.

## Companies' Returns Statements of Capital

**Wholesale Electrical Supplies (Bolton), Ltd.**—Capital, £100 in 2s. shares. Return dated December 16th. All shares taken up. £100 paid. Mortgages and charges: Nil.

**Donovan Electrical Co., Ltd.**—Capital, £50,000 in £1 shares. Return dated January 11th. 29,100 shares taken up. £29,100 considered as paid. Mortgages and charges: Nil.

**Wireohms, Ltd.**—Capital, £6,400 in 4,000 preference and 2,400 ordinary shares of £1. Return dated December 31st. 2,055 preference and 2,395 ordinary shares taken up. £4,450 paid. Mortgages and charges: Nil.

## Mortgages and Charges

**Davey, Paxman & Co., Ltd.**—Satisfaction to the extent of £400 on December 7th, 1943, of trust deed dated May 31st, 1938, and registered June 7th, 1938, securing £100,000 debenture stock. (Notice filed March 31st, 1944.)

**Newman & Watson, Ltd.**—Satisfaction in full on or before February 1st, 1944, of mortgage registered June 29th, 1940, on which £636 10s. was owing.

**E. Shipton & Co., Ltd.**—Satisfaction in full on August 27th, 1943, of second debenture dated March 3rd, 1938, and registered March 9th, 1938, securing £10,000. Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated March 21st, to secure £7,000 and ranking *pari passu* with debenture for £3,000 dated September 13th, 1930. Holders: Branch Nominees, Ltd.

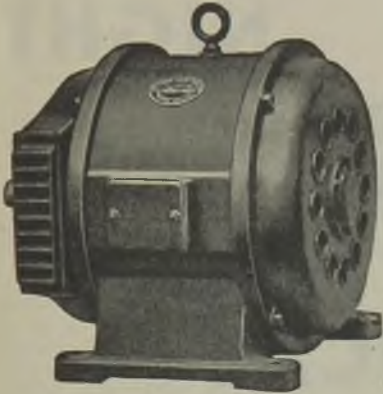
**Nevelin Electric Co., Ltd.**—Satisfaction in full between September 30th, 1937, and February 17th, 1944, of mortgage dated November 13th, 1936, and supplemental mortgage dated June 8, 1938, and registered November 14th, 1936, and January 14th, 1936, securing £300 and further advances amounting therewith to £3,500.

**G. E. Mortley Sprague & Co., Ltd.**—Debenture, charged on property at Lyons Crescent, Tonbridge, Kent, with fixtures, etc., and the company's undertaking and other property, present and future, including uncalled capital, dated March 21st, 1944, to secure all moneys due or to become due to Lloyds Bank, Ltd.

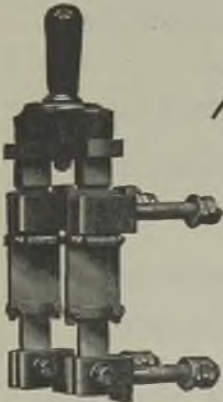
**Dowsing Co. (Electrical Manufacturers), Ltd.**—Assignment of proceeds of contracts, dated March 24th, 1944, to secure all moneys due or to become due to Barclays Bank, Ltd.



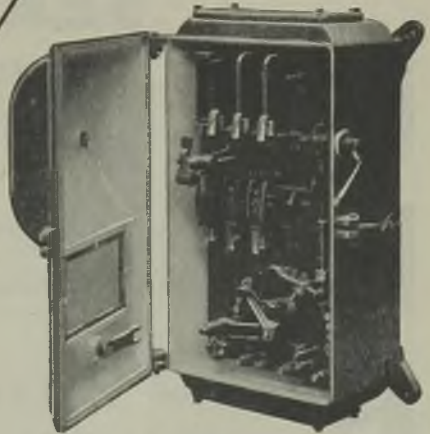
# THE VERITY RANGE



MOTORS



SWITCHGEAR



STARTERS



**VERITYS LTD. ASTON, BIRMINGHAM 6**

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# MACAULAY

## 4555

### DAY

### AND

### NIGHT



# BURDETTE'S ELECTRICAL SERVICE

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## STOCKS AND SHARES

TUESDAY EVENING.

**S**TOCK Exchange business is running irregularly but, on the whole, in rather greater volume than was the case last month. Investment is steadily absorbing whatever good stock comes to market, and speculation has revived in certain specialised directions, e.g., shipping shares, oil and mining. An interesting newcomer is on the way in the shape of fresh issues of Philco Radio & Television ordinary and preference shares. Brazilian Traction has increased its interim dividend by 25 cents., to 1 dollar per share, and the price of the shares, after being 27½, rallied to 27¾. An improvement of 1 per cent. to 9 per cent. for the year fulfilled expectation that the Brush Electrical dividend would please the company's shareholders.

### Home Electricity

The market for Home electricity supply shares shows a disposition to weaken a trifle, the reason being, according to market opinion, that there are a few tolerably large deceased accounts in course of realisation. That prices stand up so well as they do to selling of this order, at prices which afford a yield of little more than 4 per cent. on the money, is a matter of surprise. Metropolitan, for example, have come on offer at 40s. and County of London could probably be bought at the same price, while Scottish Power ordinary are quoted a few pence above £2. The yield is about 4 per cent. in each case. Midland Electric Corporation, now ex dividend, are on offer as to 5,000 shares at 44s. 6d., giving at that price £4 1s. per cent. on the money, and for 10,000 Edmundsons ordinary, 29s. 6d. per share is asked, this paying £4 1s. 3d. on the basis of the 6 per cent. dividend in each of the past three years. Another fair-sized line is 10,000 British Power & Light ordinary shares, available at 32s. 10½d. ex the recent dividend; these pay 4½ per cent. on the money.

### Cable & Wireless

Cable & Wireless is one of the few large industrial corporations which publishes some idea of the enormous amount of business that it handles. The particulars serve as a good advertisement for the combine's ordinary stock, the price of which holds its previous improvement at 81½. The annual dividend is due in June, and, being paid for the full year, will be worth 2 per cent. net if the previous 4 per cent. gross dividend is repeated. At the present price, and allowing for the accrued dividend, the yield is practically 5 per cent. on the money, comparing with £4 17s. per cent. offered by the 5½ per cent. preference stock at 113½ xd. Notwithstanding the putting out of action of a part of Cable &

Wireless service by war conditions, the confidence of the investor is continually being strengthened by the advertised statements that give details of the immense number of words passing daily over the company's system.

### Price Fluctuations

Southern Railway 5 per cent. preference, by a rise of 1½ to 115½, bears witness to the investor's hand. A line of several thousand pounds stock was taken off the market and, relieved of this burden, the price responded to a few further purchases. The company's 5 per cent. preferred is ¼ higher at 76½. Tilling shares hold their gain at 59s.; British Electric Traction deferred is changing hands around 1135. In the dollar list, International "Tel. & Tel." moved up to 17: Shawinigan Power went in the other direction.

Another rise of ¼, following a similar improvement last week, lifted International Combustion to 6¾. Reyrolle, at 68s. 9d., have recovered the dividend deducted from the price. Imperial Chemicals hardened on the dividend making again 8 per cent. for the year. London Electric Wire ordinary and Revo shares are both 1s. higher at 37s. 6d. and 41s. respectively. Callender's at 103s. 1½d. have risen 7½d. Veritys are now ex dividend and pay 5 per cent. on the money. Johnson & Phillips rose 6d. to 73s. 6d., Brush ordinary, on the dividend, increased to 9s. 6d. and India Rubber 5½ per cent. preference to 22s. 6d. De la Rue keep firm at 8¾. Crabtrees 37s. 9d., Enfield Cables 58s. ex, and Mather & Platt 52s. 6d. are slightly easier on the week. The newly introduced Rothermel shares have been changing hands in fairly large lines on the basis of 2s.

### Radio Shares

Speculation—or post-war investment—serves to keep interest alive in the radio group. Cossors remain one of the centres of popular attention. The price is a trifle better at 25s., E. K. Cole are unchanged at 26s. 6d., nor are E.M.I. altered at 29s. 6d. The Philco Radio & Television Corporation is expected to offer 6 per cent. redeemable preference shares at 20s. 6d. and florin ordinary shares at 10s. 3d. or 10s. 6d., by way of rights. On the report that the issue is to be made, the price of the Philco ordinary rose to 13s. 6d., reacting afterwards to 12s. 9d. The preference stand at about a guinea.

### Telegraph Construction

The disadvantage of a bad E.P.T. standard comes out forcibly in the report and accounts of the Telegraph Construction & Maintenance Company. Out of trading profits of £375,000 all but £51,000 is to be set aside for taxation, with the consequence that the net

(Continued on page 575)



# ELECTRICAL INVESTMENTS

## Prices, Dividends and Yields

Company	Dividend		Middle Price Apr. 18	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Apr. 18	Rise or Fall	Yield p.c.
	Previous	Last					Previous	Last			
<b>Home Electricity Companies</b>						<b>Public Boards</b>					
£ s. d.						£ s. d.					
Bournemouth and Poole ..	12½	12½	61/-	..	4 2 0	Central Electricity: 1935-60 (Civil Defence) ..	—	2	100	..	3 0 0
British Power and Light ..	7	7	33-	..	4 4 10	1935-75 ..	5	5	114	..	4 7 9
City of London ..	7	5½	27 6	..	4 0 0	1951-75 ..	4½	4½	107	..	4 4 1
Clyde Valley ..	8	8	41 6	..	3 17 0	1963-95 ..	3½	3½	104	..	3 7 4
County of London	8	8	40-	..	4 0 0	1974-94 ..	3½	3½	100	..	3 5 0
Edmondsons:						London Elec. Trans. Ltd. ..	2½	2½	97	..	2 11 3
7% Pref. ..	7	7	34 6	..	4 1 4	London & Home Counties 1955-75	4½	4½	113	..	3 19 8
Ord. ..	6	6	29-	..	4 2 9	Local Power Trans.:					
Elec. Dis. Yorkshire	9	9	45-	+6d.	4 0 0	A ..	4½	4½	121½	..	3 14 1
Elec. Fin. and Securities ..	12½	12½	55/-	..	4 11 0	B ..	5	5	119½	..	4 3 8
Elec. Supply Corporation ..	10	10	46/-	rd	4 7 0	C ..	3	3½	71	..	4 11 7
Isle of Thanet ..	Nil	Nil	18/-	..	—	West Midlands T.E.A. 1948-63	5	5	105½	..	4 12 4
Lancs. Light and Power ..	7½	7½	38-	..	4 3 4	<b>Telegraph and Telephone</b>					
Llanelli Elec. ..	6	6	26-	..	4 13 4	Anglo-Am. Tel.: Pref. ..	6	6	117½	..	5 2 2
Land. Assoc. Electric	3	4	23-	..	3 8 7	Def. ..	1½	1½	29	..	5 3 5
London Electric	6	6	28-	..	4 5 9	Anglo-Portuguese Cable & Wireless:					
London Power Bd. Deb. ..	5	5	105½	..	4 14 7	½ Pref. ..	5½	5½	113½	rd	4 17 0
Metropolitan E.S. ..	8	8	40-	..	4 0 0	Ord. ..	4	4	81½	..	4 18 2
Midland Counties ..	8	8	40 6	..	3 19 0	Canadian Marconi	\$1 Nil	4cts.	9 9	..	—
Mid. Elec. Power ..	9	9	44 6	-6d.	4 0 9	Globe Tel. & Tel.: Ord. ..	8½*	5*	37 6	..	2 13 4
Newcastle Elec. ..	7	7	30 6	..	4 13 0	Pref. ..	6	6	30/-	..	4 0 0
North Eastern Elec.: Ordinary ..	7	7	33 6	..	4 3 7	Great Northern Tel. (£10) ..	Nil	Nil	21½	..	—
7% Pref. ..	7	7	35-	..	4 0 0	Inter. Tel. & Tel. Nil	Nil	Nil	17	+½	—
Northampton ..	10	10	48-	..	4 3 4	Marconi-Marine ..	7½	7½	33-	..	4 11 0
Notting Hill 6% Pref. (£10) ..	6	Nil	11	..	—	Oriental Tel. Ord.	16	10	44-	..	—
Northwest Power: Ordinary ..	7	7	38-	..	3 13 9	Telephone Props.	6	Nil	16-	..	—
6% Pref. ..	6	6	30 6rd	+6d.	3 18 8	Tele. Rentals (5-)	10	10	11 6	..	4 7 0
Richmond Elec. ..	6	6	24 6	..	4 14 1	<b>Traction and Transport</b>					
Scottish Power ..	8	8	40-	..	4 0 0	Anglo-Arg. Trans.: First Pref. (£5) ..	Nil	Nil	2 6	..	—
Southern Areas ..	5	5	23-	..	4 7 0	4% Inc. ..	Nil	Nil	7	..	—
South London ..	7	7	28-	..	5 0 0	Brit. Elec. Traction: Def. Ord. ..	45	45	1135	..	3 19 4
West Devon ..	5	5	23 6	..	4 5 0	Pref. Ord. ..	8	8	175	..	4 11 5
West Glos. ..	4½	2½	24-	+6d.	3 18 4	Bristol Trans. ..	10	10	55 6	..	3 12 2
Yorkshire Elec. ..	8	8	43-	..	3 14 5	Brazil Traction ..	\$1	\$1½	27½	..	6 6 2
<b>Overseas Electricity Companies</b>						Calcutta Trams ..	5½	8½	38-	..	3 8 6
Atlas Elec. ..	Nil	Nil	6 3	..	—	Cape Elec. Trams	5	6	26-	..	4 12 4
Calcutta Elec. ..	7*	6*	37-	..	3 4 10	Lancs. Transport	10	10	45 6	..	4 3 0
Cawnpore Elec. ..	10	10	35-	..	5 14 3	Mexican Light: 1st Bonds ..	5	5	101½	..	4 18 7
East African Power	7	7	22-	..	4 4 10	Rio 5% Bonds ..	5	5	105½	rd	4 14 9
Jerusalem Elec. ..	7	5	28 6	..	3 10 2	Southern Ry.: 5% Prefd. ..	5	5	76½	+½	6 10 9
Kaloorie (10-)	5	5	10-	..	5 0 0	5% Pref. ..	5	5	113½	+1½	4 6 9
Madras Elec. ..	4*	Nil	23-	..	—	T. Tilling ..	10	10	59-	..	3 8 0
Montreal Power ..	1½	1½	22	..	6 16 4	West Riding ..	10	10	44 6	..	4 10 0
Palestine Elec. "A" ..	4*	5*	40 6	..	2 9 5	(Continued on next page)					
Perak Hydro-elec.	6	7	10-	..	—						
Shawinigan Power	83cts.	90cts.	15½	-1½	—						
Tokyo Elec. 6%	6	6	18	..	—						
Victoria Falls Power	15	15	15	..	3 11 7						
Whitehall Inv. Pref.	—	6	23 6	..	5 2 2						

\* Dividends are paid free of Income Tax.

Company	Dividend		Middle Price Apr. 18	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Apr. 18	Rise or Fall	Yield p.c.
	Pre-vious	Last					Pre-vious	Last			
<b>Equipment and Manufacturing</b>											
Aron Elec. Ord. . . . .	10	15	57/6	..	5 4 4	General Cable (5/-) 15	15	15/-	..	5 0 0	£ s. d.
Assoc. Elec. :						Greenwood & Batley 15	15	41/3	..	7 5 9	
Ord. . . . .	10	10	51/6	..	3 17 8	Hall Telephone (10/-) 12½	12½	28/6	+6d.	4 7 9	
Pref. . . . .	8	8	39/5	..	4 1 0	Henley's (5/-) . . . . .	20	26/9	..	3 14 3	
Automatic Tel. & Tel. 12½	12½	12½	61/3	+3d.	4 1 8	4½% Pref. . . . .	4½	24/-	..	3 15 0	
Babeock & Wilcox 11	11	11	50/-	..	4 8 0	Hopkinsons . . . . .	15	17½	65/9	-9d.	5 6 8
British Aluminium 10	10	10	47/6	..	4 4 1	India Rubber Pref. 5½	5½	22/6	+6d.	4 17 9	
British Insul. Ord. 20	20	20	51/6	..	3 14 4	Intl. Combustion 30	30	6½	+½	4 14 0	
British Thermostat (5/-) . . . . .	18½	18½	19/6	..	4 14 10	Johnson & Phillips 15	15	73/6	+6d.	4 1 9	
British Vac. Cleaner (5/-) . . . . .	15	30	28/6xd	..	5 5 1	Lancashire Dynamo 22½	22½	92/-	..	4 17 10	
Brush Ord. (5/-) 8	9	9	9/6	+6d.	4 14 9	Laurence Scott (5/-) 12½	12½	13/-	..	4 16 2	
Burco (5/-) . . . . .	15	17½	15/6	..	5 13 0	London Elec. Wire 7½	7½	37/6	+1/-	4 0 0	
Callender's . . . . .	15	20	5½	+½	3 17 6	Mather & Platt . . . . .	10	52/6	-9d.	3 16 2	
Chloride Elec. Storage 15	15	80/-	..	..	3 15 0	Metal Industries (B) 5	8	47/6	..	3 7 6	
Cole, E. K. (5/-) 10	15	26/6	..	..	2 16 7	Met. Elec. Cable Pref. 5½	5½	21/3	..	5 2 6	
Consolidated Signal 24	27½	6	..	..	4 11 5	Murex . . . . .	20	103/3	..	3 17 6	
Cossor, A. C. (5/-) 7½*	10*	25/-	+3d.	1 0 0		Pye Deferred (5/-) 25	25	26/3	..	4 15 3	
Crabtree (10/-) . . . . .	17½	37/9	-6d.	4 12 9		Revo (10/-) . . . . .	17½	17½	41/-	+1/-	4 5 4
Crompton Parkinson Ord. (5/-) . . . . .	20	22½	29/-	..	3 17 7	Reynolds . . . . .	12½	12½	68/9xd	+9d.	3 12 8
E.M.L. (10/-) . . . . .	6	8	29/6	..	2 4 2	Siemens Ord. . . . .	7½	7½	33/-	..	4 11 0
Elec. Construction 10	12½	52/-	..	4 16 2		Strand Elec. (5/-) 7½	10	7/9	..	6 9 0	
Enfield Cable Ord. 12½	12½	58/-xd	-1/-	4 6 2		Switchgear & Cows (5/-) . . . . .	20	18/6	..	5 8 1	
English Electric . . . . .	10	10	50/-	..	4 0 0	T.C.C. (10/-) . . . . .	5	7½	20/-	..	3 15 0
Ernst Lamps (5/-) 25	15	21/3	..	3 10 8		T.C. & M. . . . .	10	50/-	..	4 0 0	
Erickson Tel. (5/-) 22*	20*	52/9	..	4 11 5		Telephone Mfg. (5/-) 9	9	10/9	..	4 3 10	
Ever Ready (5/-) 40	40	39/-	..	5 2 7		Thorn Elec. (5/-) 20	20	23/3	..	4 6 0	
Falk Stadelmann 7½	7½	33/6	..	4 9 7		Tube Investments 20	20	96/6	..	4 3 0	
Ferranti Pref. . . . .	7	7	30/-	..	4 12 4	Vactric (5/-) . . . . .	Nil	Nil	14/9	..	—
G.R.C. : Pref. . . . .	6½	6½	34/-	..	3 16 6	Veritys (5/-) . . . . .	7½	7½	7/8xd	..	5 0 0
Ord. . . . .	17½	17½	91/6	..	3 16 6	Walsall Conduits (4/-) 55	55	47/6	..	4 13 7	
						Ward & Goldstone (5/-) . . . . .	20	26/6	..	3 15 6	
						Westinghouse Brake 12½	14	72/3	..	3 17 6	
						West, Allen (5/-) 7½	7½	7/3	..	5 3 5	

\* Dividends are paid free of Income Tax.

**Stocks & Shares** (Continued from page 573) profit is no more than £2,100 higher. The dividend, as previously announced, is maintained at 10 per cent., a rate which has been distributed now for seven consecutive years, with a capital bonus of 5 per cent. for the year 1939. For the years 1933, 1934 and 1935 no dividend was paid, a loss having been incurred in the first two. Resumption of dividends started in 1936.

**Hall Telephone**

Hall Telephone Accessories reported a record profit for 1942, but this was easily beaten by that for 1943. The balance of £829,000 is £256,000 up: the net earnings at £54,600 are £13,200 better. The dividend and bonus, making 12½ per cent. for the year, are maintained, and in respect of last year, war contingencies fund is allocated £20,000 against nothing in the previous year. At 28s. 6d. the price is 6d. higher on these excellent results. The company manufactures telephone apparatus, automatic coin-collecting, ticket-collecting and other machines, besides carrying on an advertising agency, and doing general light engineering

business. With the aid of the Special Areas Commissioners, the company built a new factory in South Wales seven years ago. The trading profit of £60,000 for the year 1935 compares oddly with the £829,000 for 1943. The issued capital is £322,560 in 10s. shares. The yield at the present price comes to £4 7s. 9d. per cent. The scope for post-war expansion in the dividend is obvious from the 1943 profits.

**Automatic Telephone**

The Automatic Telephone & Electric Co., Ltd., like Hall Telephone Accessories, places £20,000 to war contingencies, against nothing for 1942. As already announced, the dividend and bonus on both classes of shares, the "A" and "B," are repeated at 12½ per cent. The price of the shares is 9d. up at 61s. 3d., giving a return of £4 1s. 8d. per cent. The output of the company for last year reached a record, and the net profit rose by £21,000. The meeting takes place at Liverpool on Thursday in this week. The chairman's statement, circulated with the figures, makes an interesting review, briefly summarised, of the present position and the future outlook for industry as a whole.

# NEW PATENTS

## Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

**A**LLMÄNNA Svenska Elektriska Aktiebolaget and G. Rydbeck.—“Electrical lightning arrestors.” 15793. November 9th, 1942. (560306.)

F. Aughtie, F. R. Thurston and E. P. Coleman.—“Electrical strain gauges.” 14162. October 8th, 1942. (560260.)

Babcock & Wilcox, Ltd.—“Tubulous boilers.” 13724/42. October 24th, 1941. (560385.)

Birmingham Aluminium Casting (1903) Co., Ltd., and P. Pritchard.—“Electric resistor furnaces for the heating and melting of metals.” 17131. December 2nd, 1942. (560352.)

H. E. Brain and Automatic Telegraph & Radio Transceiver Co., Ltd.—“Electromechanical switch suitable for use on telegraphic transmission apparatus.” 16779/41. August 26th, 1942. (560285.)

British Insulated Cables, Ltd., and W. Holttum.—“Electric cable joints.” 16703. November 25th, 1942. (560342.)

British Thomson-Houston Co., Ltd.—“Contact arrangements of electric switches.” 15208/42. October 31st, 1941. (560264.)

“Compressor unloaders.” 14211/42. October 9th, 1941. (560349.) “Refrigerator cabinets.” 17395/42. December 13th, 1941. (560359.)

“Load equalising in electrical power systems.” 17530/42. December 16th, 1941. (560363.) “Flashlamps.” 17867/42. December 23rd, 1941. (560368.) “Electric protective devices.” 13731/42. October 1st, 1941. (560386.)

British Thomson-Houston Co., Ltd., and R. T. Coe.—“Contact breakers for electrical ignition apparatus.” 17672. December 11th, 1942. (560367.)

British Thomson-Houston Co., Ltd., and H. R. Ruff.—“Stroboscopic illumination device using an electric-discharge lamp.” 15819. November 9th, 1942. (560307.)

S. Carlisle.—“Machine for bending trays which carry cables in electric wiring installations.” 15869. November 10th, 1942. (560395.)

Cinema-Television, Ltd., and G. S. Elphick.—“Supports or holders for electron-discharge devices.” 16268. November 17th, 1942. (560337.)

Electroflo Meters Co., Ltd., A. Smithson and A. L. Hancock.—“Relay or follow-up devices.” 13773. October 1st, 1942. (560331.)

English Electric Co., Ltd., and P. W. Seewer.—“Hydraulic power plant.” 15123. November 28th, 1942. (560263.)

Foster Transformers & Switchgear, Ltd., and R. G. Lowe.—“Electrical switches, fuse switches or combined switch-fuses of the enclosed type.” 15804. November 9th, 1942. (560272.)

W. W. Groves (Briggs Manufacturing Co.).—“Electric welding apparatus.” 12133. August 28th, 1942. (560376.)

Igranic Electric Co., Ltd., and H. H. Rapley.—“Means for accurately spacing articles on

conveyors.” 17670. December 11th, 1942. (560366.)

T. E. B. James, Lamp Manufacturing & Railway Supplies, Ltd., and Linley Engineering Co., Ltd.—“Means for electrically indicating at a distance the condition of the flame of a railway signal or like lamp.” 17817. December 15th, 1942. (560400.)

R. G. Jones.—“Electroplating cylindrical articles.” 17925. December 17th, 1942. (560402.)

Lodge Plugs, Ltd., A. G. S. Herbert and B. Hopps.—“Electrical contact pieces.” Cognate applications 15720/42 and 11049/43. November 6th, 1942. (560394.)

J. Lucas, Ltd., H. E. Whitehouse and J. W. Reid-Jones.—“Distributors for spark-ignition apparatus.” 13451. September 24th, 1942. (560259.)

M. & C. Switchgear, Ltd., and R. Morrison.—“Couplings for remote control apparatus for electric machinery.” 16750. November 25th, 1942. (560350.)

Mullard Radio Valve Co., Ltd., C. W. Vinall, W. C. Barry and C. E. Maitland.—“Variable electric condensers.” 17156. December 2nd, 1942. (560372.)

Revo Electric Co., Ltd., and F. H. Reeves.—“Fluorescent tubular discharge lamp fittings.” 15445. November 3rd, 1942. (560305.)

A. Reyrolle & Co., Ltd., and J. W. Bayles.—“Air-break electric circuit-breakers and arc chutes therefor.” 12450. September 3rd, 1942. (560257.)

Sangamo Weston, Ltd.—“Measuring instruments.” 14478/42. October 23rd, 1941. (560334.)

Standard Telephones & Cables, Ltd.—“Radio beacon with quadrant identification.” 17652/42. December 17th, 1941. (560364.)

“Antennæ.” 15701/42. November 8th, 1941. (560271.)

Telephone Manufacturing Co., Ltd., and H. Lovesey.—“Guards for machine tools.” 17022. November 30th, 1942. (560351.)

Western Electric Co., Inc.—“Step-by-step switches particularly for automatic telephone systems.” 16461/42. November 26th, 1941. (560396.)

R. C. Williams and G. W. B. Electric Furnaces, Ltd.—“Furnaces with agitating conveying means.” 13518. September 25th, 1942. (560299.)

## TRADE MARK APPLICATIONS

**T**HE following applications have been made for British trade marks, objections to which may be entered within a month from April 12th :—

SWAN (design). No. 625,284, Class 9. Wire ropes for electrical purposes.—Garnock, Bibby & Co., Ltd., Old Swan Rope Works, St. Oswald's Street, Liverpool.

GENWIND VACUUM CLEANER (design). No. 626,262, Class 9. Electric vacuum cleaners.—



D. B. Williams, 89, Highway Road, Leicester.  
**LECUPLIT.** No. 626,544, Class 11. Apparatus and installations for lighting.—Liverpool Electric Cable Co., Ltd., 24, Queen Anne's Gate, Westminster, London, S.W.1.  
**VEDA.** No. 627,117, Class 17. Insulating material, insulating sleeves, insulators and parts thereof (not included in other classes), insulation parts, threads, cords, tape and braid, all being

wholly or mainly of india-rubber; and jointing packings.—Jones Stroud & Co., Ltd., Vida Mills, New Street, Long Eaton, Derbyshire.  
**PHILITEX.** No. 626,840, Class 19. Slabs, blocks, panelling, doors, cement and mortar, all being goods (not of metal) for use in building or construction and impervious to penetration by X-rays.—Philips Lamps, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

## CONTRACT INFORMATION

### Accepted Tenders and Prospective Electrical Work

#### Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

**Australia.**—**VICTORIA.**—State Electricity Commission. May 3rd. 132- and 66-kV current transformers. Spec. 43-44/46.

**QUEENSLAND.**—Brisbane City Council. May 5th. Two (or alternatively three) 600-V mercury arc rectifiers, each 1,000-kV rating, together with transformers, switchgear and accessories. General manager, Department of Transport.

**Plymouth.**—May 1st. Corporation Electricity Supply Department. Low-voltage underground network disconnecting boxes. (April 14th.)

**West Midlands.**—April 28th. Joint Electricity Authority. Automatic fire-fighting equipment. (March 31st.)

#### Orders Placed

**Cardiff.**—Health Committee. Accepted. Fluorescent lighting, Llandough Hospital operating theatre (£137).—G.E.C.

**Glasgow.**—Transport Committee. Accepted. Overhead fittings.—British Insulated Cables. Tubing.—Accles & Pollock; Potter Cowan & Co.

**London.**—**LEWISHAM.**—Health Committee. Recommended. X-ray unit (£1,805).—A. E. Dean & Co.

**Newcastle-on-Tyne.**—City Council. Accepted. Electrical repairs to Council houses (£155).—R. H. Patterson.

Education Committee. Accepted. Electrical work at a number of school sculleries.—Falconar, Cross & Co.

**Sheffield.**—Electricity Committee. Accepted. Switchgear for twelve months.—Crompton Parkinson; A. Reyrolle & Co. Cables for twelve months.—W. T. Glover & Co.

**Sunderland.**—Town Council. Accepted. Battery-charging motor-generator for Transport Department (£118).—English Electric Co.

#### Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

**Barrow-in-Furness.**—Prefabricated hospital extension; borough engineer.

**Cardiff.**—Reconditioning 53 houses at £500 each; city engineer.

**Darlington.**—British Restaurant, North Road (£3,000); borough engineer.

**Dumfries.**—Houses (20) for Town Council; burgh surveyor.

**Essex.**—Additions, county hospital, Broomfield (£32,000), A.R.P. depots (£2,700), technical college, Park Road, Colchester, youth centre, Sawyers Hall Lane, Pitsea, and dining hall and kitchen at Whitehall Lane School, Chingford (£2,500); J. Stuart, county architect, County Hall, Chelmsford.

**Eton.**—Depot, Iver Heath; R.D.C. surveyor, Denmark House, Windsor Road.

**Felling (Co. Durham).**—Completion of partly built houses; H. Fawcett, U.D.C. surveyor.

**Gateshead.**—Canteen sculleries at schools. Contractors: J. Sutton & Son and N. Yeaman, both of Gateshead.

Storage building for the Town Council (£1,200); borough surveyor, Town Hall.

**Hampshire.**—Extensions at Girls' High School, Basingstoke; county architect, The Castle, Winchester.

**Hendon.**—Extensions, Garden Suburb School (£1,121); Buckingham & Sons, Ltd., builders, Vivian Avenue, Hendon, N.W.4.

**Hereford.**—Maternity and child welfare department at Fulby House Hospital; borough surveyor, Town Hall.

**Huddersfield.**—Extensions to Technical College, Queen Street South; borough engineer.

**Hull.**—Accommodation for dietetics at Westerlands, Elloughton (£1,717 with equipment); A. Rankine, city architect, Guildhall.

**Huntingdon.**—Handicraft room, dining room and kitchen at Fletton Secondary School (£1,990); county architect, Walden House, Huntingdon.

**Ilkeston.**—Mess room and stores; Stanton Ironworks Co., Ltd.

**Inverness-shire.**—Kitchens and dining accommodation at schools; director of education, County Buildings, Inverness.

**Isle of Wight.**—Junior building school, East Cowes (£2,035), and additions, St. Mary's Hospital, Parkhurst; county architect, County Hall, Newport, I.W.

Restaurant, Newport (£1,452); A. E. Jukes & Son.

**Kettering.**—Girls' hostel at Headlands; secretary, Y.W.C.A., Castilian Street, Northampton.

**Lanarkshire.**—Houses (40) at Shotts; county architect, Hamilton.

Crematorium; county clerk, Hamilton.

**Lichfield.**—Additions, Wissage Hospital; Mid-Staffs Joint Hospital Board.

**Liverpool.**—Extension of theatre block, Broad-green Hospital; L. H. Keay, city architect, Blackburn Chambers, Dale Street.

**Luton.**—Erection of temporary school at Alder Crescent; borough engineer, Town Hall.

**Middlesbrough.**—Communal dining hall at the Children's Homes; borough engineer.

**Middlesex.**—Adaptation and equipment of Heatham House, Twickenham, for use as training centre for youth work; county architect.

**Motherwell.**—Hostel, etc., for Motherwell United Y.M.C.A.; secretary.

**Newcastle-on-Tyne.**—School sculleries (£2,200); G. Bainbridge, builder, 358, West Road, Newcastle-on-Tyne.

Workshop at the Manors for Charlton & Co., brassfounders; Bewley & Scott, builders, Dunston-on-Tyne.

**Paisley.**—Rehabilitation of Paisley Grammar School after fire (£10,180); Dansken & Purdie.

**Pembrokeshire.**—Permanent dining and classroom accommodation at Ambleton School; county architect, Council Offices, Haverfordwest.

**Scarborough.**—Factory, Seamer Road; F. W. Plaxton & Son.

**South Shields.**—Pump house for the Tyne Dock Engineering Co., Ltd.; J. G. Thompson & Sons, Fowler Street.

**Stafford.**—Extensions at General Hospital for rehabilitation centre; secretary to General Hospital Board.

**Stoke-on-Trent.**—Extensions to City Maternity Hospital; A. Burton, city engineer, Town Hall.

**Trowbridge.**—Building for recreation centre, Flower Show Field; U.D.C. surveyor.

**Wallsend.**—British Restaurant, Station Road; J. A. Blench, borough surveyor, Town Hall.

**Warwickshire.**—Large central kitchen, Tile Cross; A. C. Bunch, county architect, Shire Hall, Warwick.

**West Ham.**—Kitchen and dining room, site adjoining Municipal Secondary School; borough engineer, Town Hall, E.15.

**Worksop.**—Wartime day nursery, Canch recreation ground (£1,535); J. H. & W. E. Ilett, builders, Dock Road.

**York.**—Consultation clinic; C. J. Minter, city engineer.

## Power Supply in Portugal

### Wartime Shortage of Fuel

JUDGING from the 390-page annual report for 1942 of the Portuguese National Board of Electrification, a copy of which we have received from the chief engineer, the position of the power supply industry in Portugal has become very difficult largely owing to the short supply of coal and liquid fuel. The position with regard to oil-engine plant is particularly acute, some having had to be closed down while at others producer-gas plant has been installed. Interlinking lines have been provided between many of the hydro-electric plants in the northern part of the country and the oil-operated stations with the object of easing the situation as far as possible.

In March, 1942, the powers of the National Board were extended and a decree was issued restricting the use of electricity for both public and private purposes and in many cases re-arranging the working hours of factories, especially in areas dependent for their power supply on thermal-operated stations.

In the circumstances it is not surprising that for the first time there was a decrease in power production (about 3 per cent. compared with an increase of 4.2 per cent. in 1941). The total output fell from 479 million to 465 million kWh; actually hydro-electric production rose from 191 million to nearly 217 million kWh, but against this the output of thermal stations decreased from 288 million to 248 million kWh. In the aggregate 70.8 per cent. of Portugal's electricity was generated from national fuel (water, coal and lignite), 27.1 per cent. from imported coal and 2.1 per cent. from liquid fuel.

As a result of the joint working of the gas and electricity undertaking in Lisbon in view of the scarcity of coal, the gas side of the concern was able to supply 11,215 metric tons of gasworks residuals for steam raising purposes at the electric power station, from which fuel 4.1 million kWh was generated during the year.

The number of power stations in the country, both hydro-electric and thermal is 657 and their aggregate capacity 282,574 kW, these figures comparing with 654 and 279,830 kW the year before. The 1942 total comprises 109 hydro-electric (86,249 kW) and 548 thermal plants (196,325 kW).

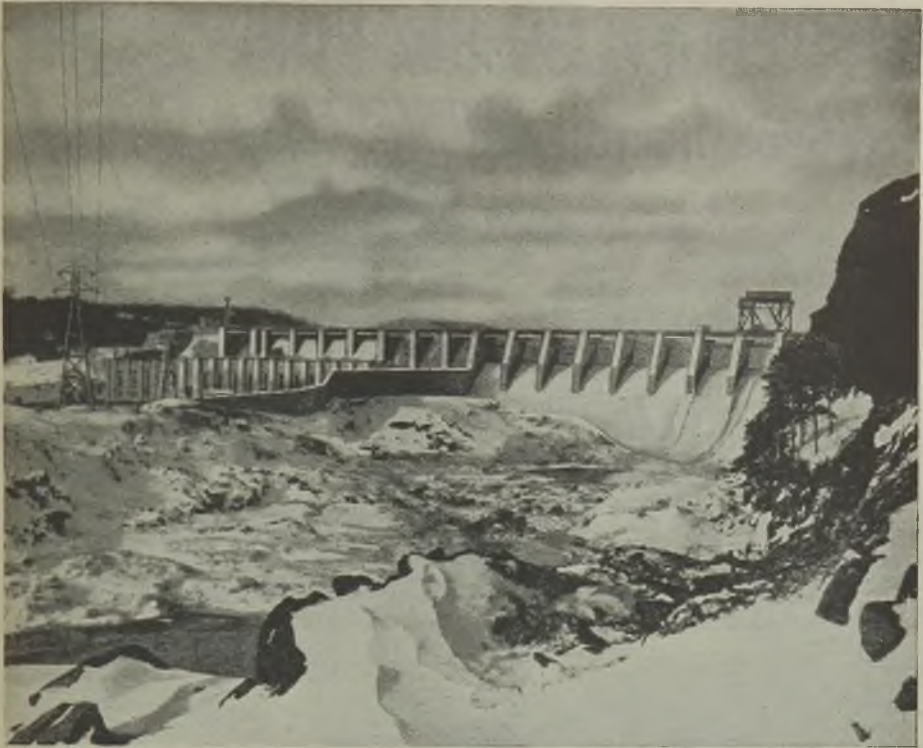
Among the new hydro-electric stations is one at Ponte de Esperanca on the River Ave with a capacity of 3,400 kVA. Several new stations are in course of construction, but work has been held up owing to the war.

The consumption of power throughout Portugal during 1942 amounted to 387.8 million kWh as against 404.6 million kWh in the previous year. A table shows that 19.8 per cent. of the consumption was for lighting, 16.4 per cent. for traction, 57.2 per cent. for industrial and agricultural uses (in which class the textile industry, taking 75.8 million kWh, was the largest consumer) and 6.6 per cent. by the electro-metallurgical and chemical industries.

The difficulty of obtaining supplies of cables and their higher prices as a result of the war prevented any great extension of the high-voltage transmission lines.

### Fatalities in Mines

IN 1943, the number of fatal accidents in mines and quarries was 774—a reduction of 172 compared with the previous year. A provisional statement issued by the Ministry of Fuel and Power (Stationery Office, 1d.) shows that of the 710 killed in coal mines, eight came under the heading "electricity" (the same as in 1942 when the total from all causes was 877). The proportion below ground and on the surface differed, however, the figures being three and five last year and seven and one in the previous year.



Photograph by courtesy of the Canadian Official News Bureau

**FAMOUS HYDRO ELECTRIC STATIONS**

*The Chute a Caron power-house and dam is shown framed in the majestic beauty of a North Quebec winter landscape. Situated at Shipshaw on the Saguenay River, this huge project was rushed through by an army of Canadian workmen to enable 1,500,000 H.P. of electrical power to be added to the increasing war effort — this means more aluminium and more planes for the big offensives.*

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*Electricity and Water Meters of Quality*

**TERMINAL HOUSE, LOWER BELGRAVE ST., LONDON, S.W.1**



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THE INTERNATIONAL ELECTROLYTIC PLANT CO LTD SANDY CROFT CHESTER



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### UNITS



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Catalogue sent free on request.

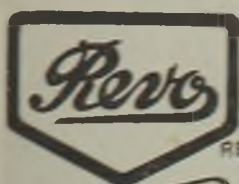
**MEK-ELEK Engineering Ltd., 17 Western Road, Mitcham, Surrey**

Phone: MITcham 3072

Cables: MEKELITE, London

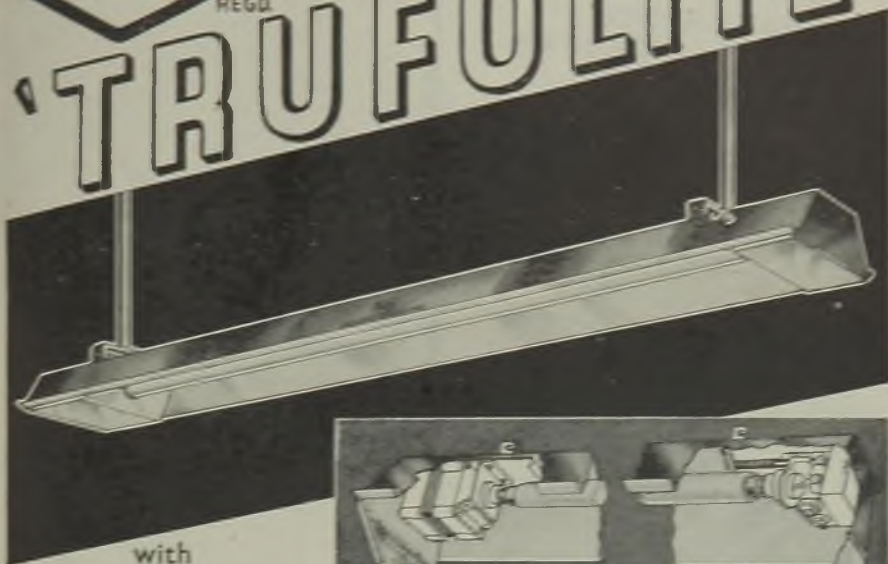
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*Full particulars and prices on application to*

**REVO ELECTRIC Co. Ltd. TIPTON, Staffs.**

# MAKE YOUR 'ELECTRICS'

*still more  
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*A Municipal Refuse Collector driven by a Britannia battery, which is in commission in one of our biggest midland cities.*

By powering your 'Electrics' with Britannia batteries you will effect considerable economy. Because the special construction of their cells gives immense mechanical strength, these batteries withstand the severest stresses of traction service, and consequently have an exceptionally long, trouble-free life, which means a substantial cut in operating costs.

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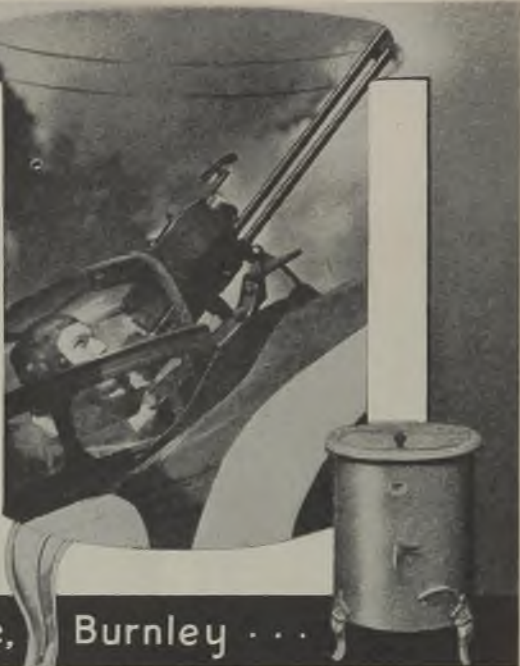
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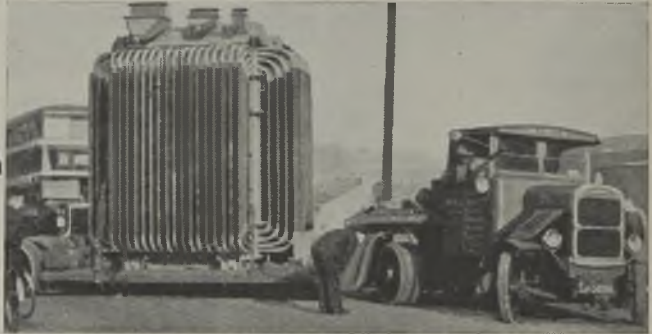
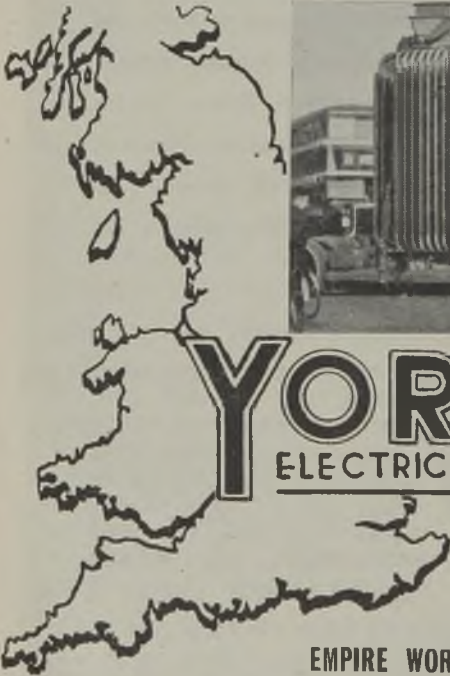
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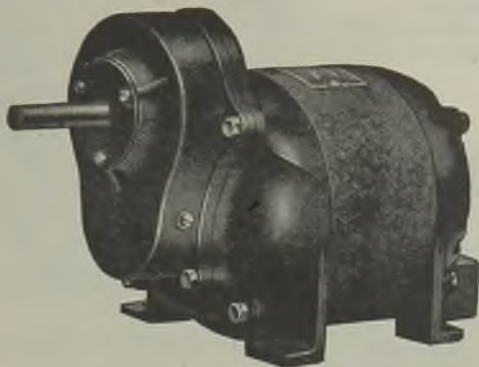
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TYPE  
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Have single reduction spur gear, totally enclosed in an oilbath, the shafts running on double row ball bearings. The special steel motor pinion meshes with a bakelised linen final gear, carried between bearings, and both gears are automatically lubricated. Final shaft speeds are between 1,750 r.p.m. and 350 r.p.m., and the motor can provide 60 cycle speeds on a 50 cycle circuit.

The dimensions are the same for all voltages and speeds.

The space occupied is the same as that of a 1,400 r.p.m. motor of the same power. Horsepowers are  $\frac{1}{4}$ ,  $\frac{1}{2}$  and  $1$ , developed at the final shaft, so that no allowance need be made for gearbox losses.

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# WHAT IS MEASUREMENT ?

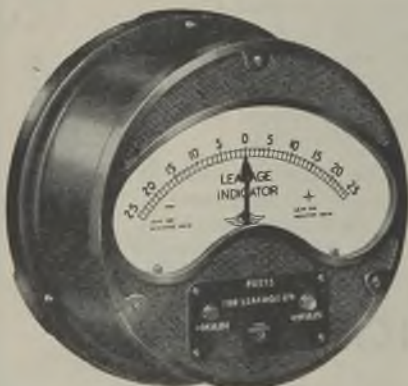


You can see a "pint." You can measure it quite easily (yes, we know what you would rather do with it). You can't see volts, not even if there are "a lot of 'em"—but you can measure them.

## FOR ACCURATE MEASUREMENT USE ACCURATE INSTRUMENTS



M.I.P. Instruments have earned a world-wide reputation for precise and accurate performance. When installing electrical instruments, remember that it always pays to have the best. Specify M.I.P. They represent the recognised standard in dependability and long service.



The illustration shows leakage indicator for D.C. mains. 8" round projecting pattern cases.

## MEASURING INSTRUMENTS

(PULLIN) LTD.

Electrin Works, Winchester Street, Acton, W.3

## 20-Way Junction Box



### DIE CAST IN ZINC ALLOY

The body and cover of this Junction Box\*, are die cast in zinc alloy. Compared with the methods previously used, die casting has effected an enormous saving by the elimination of machining operations. On the first order, calling for some 3,000 boxes, production by zinc alloy die casting enabled a saving of more than 10,000 man-hours when compared with the previous production method.

Zinc alloy die casting permits of the production of castings of accurate dimensions, requiring little or no machining and having good mechanical properties. Combined with low metal costs and long die life, these properties have made zinc alloy die castings suitable for many applications—in peace as well as in war.

\* Shown considerably reduced in size, they are pressure die cast in zinc alloy conforming to B.S. 1004.

ZADCA

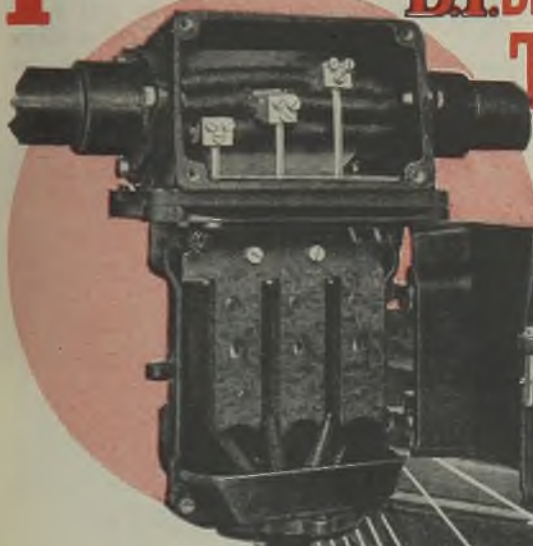
No. 10 in a series of advertisements issued by the Zinc Alloy Die Casters Association, an organisation formed by the Industry to improve the technique of zinc alloy die casting and to promote a fuller appreciation of the properties and applications of the castings. The Association's Technical Committee will be pleased to advise on the design and properties of zinc alloy die castings.

ZINC ALLOY DIE CASTERS ASSOCIATION, TURL ST., OXFORD

# POWER

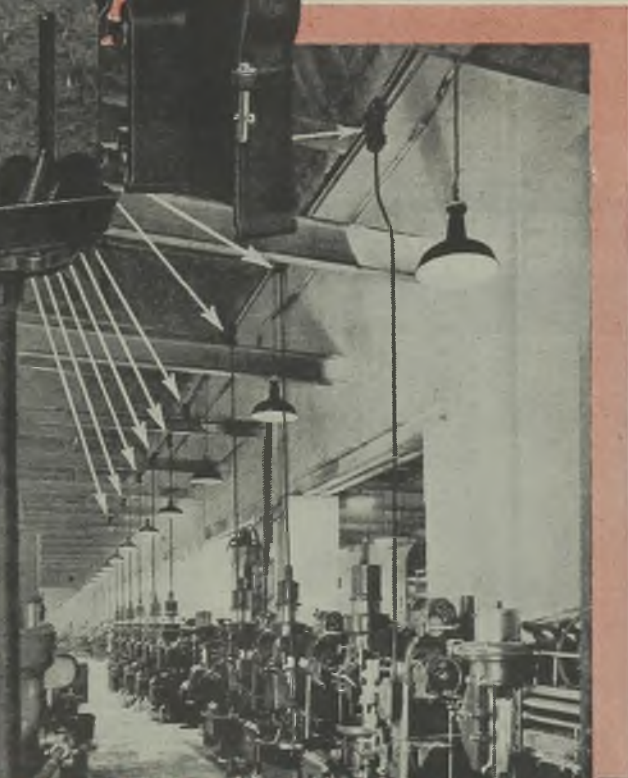
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# B.I. DETACHABLE FUSED TEE BOX



- For use with V.I.R. Cables in conduit systems.
- Assembly comprises conduit chamber and detachable fused tee box.
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- Tee box provides fuse protection for individual machines.
- Installation is simple and economical.
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*Not so long Ago*

**P**RIOR to the invention of the Davey Safety Lamp, fire damp in coal mines made the use of naked flames a major hazard. The only alternative where this gas

was indicated (usually by canaries or tame mice), was the light produced by a sparking machine worked by a pit boy.

Nowadays, of course, electricity has solved this particular problem as it has so many others, which leads us to the reflection that the history of Venners is analogous to the history of the electrical industry in the way in which problems have been met and overcome with a resultant service of complete dependability.

MALDEN



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KINGSTON BY-PASS ROAD,  
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# DENNIS SWITCHGEAR



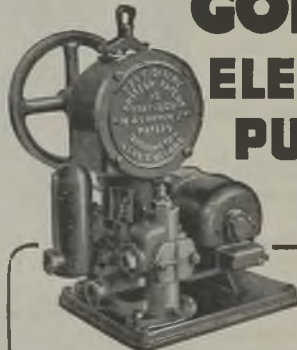
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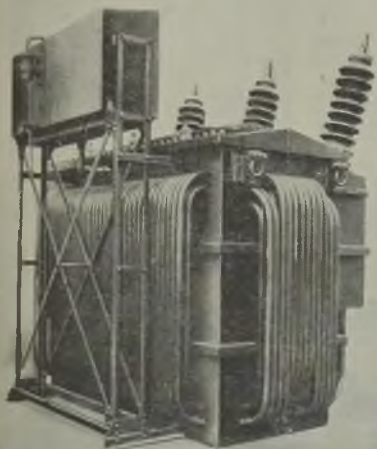
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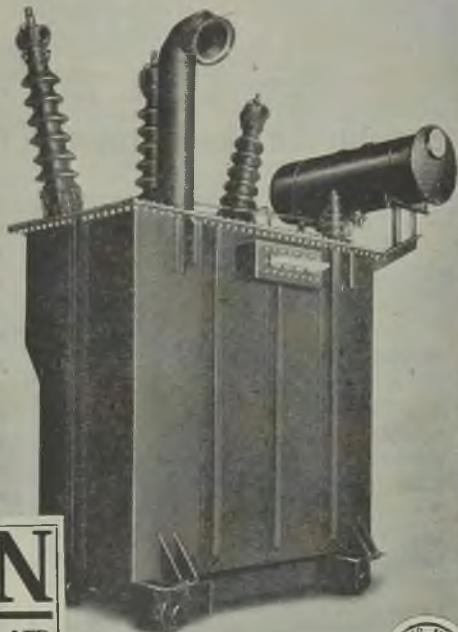


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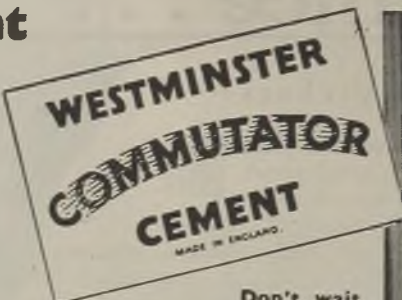
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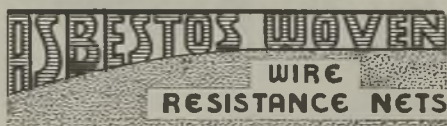
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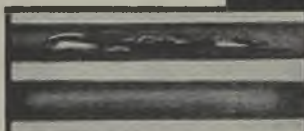
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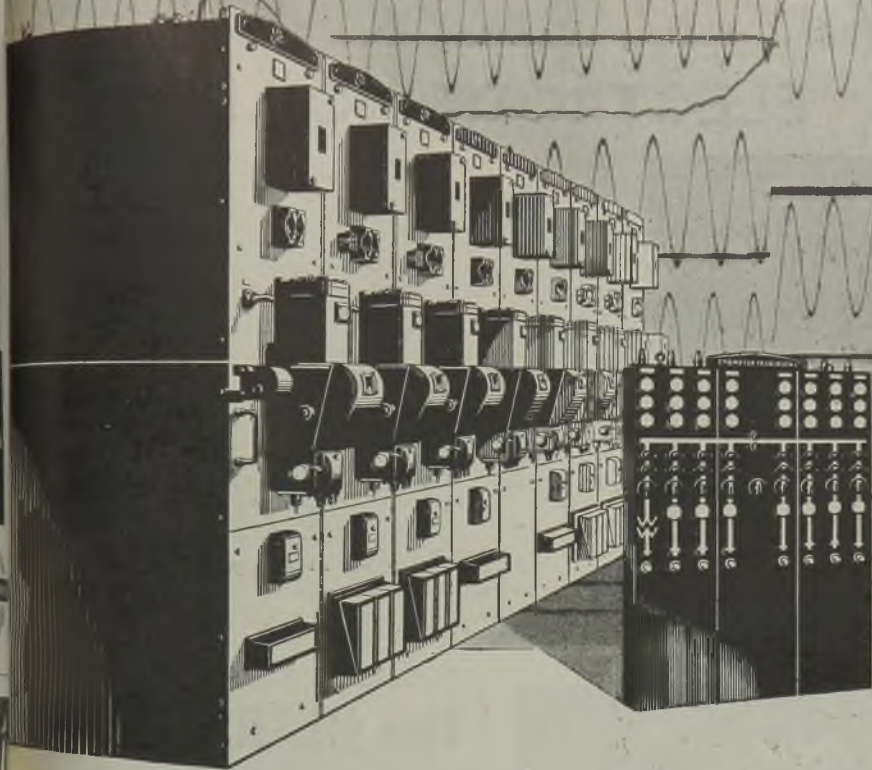
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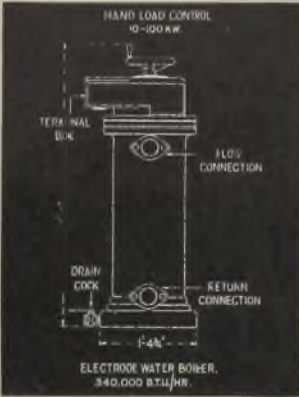




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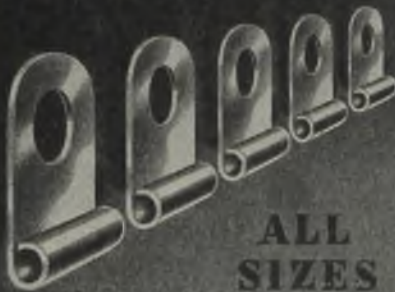
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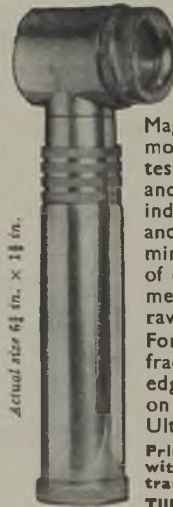


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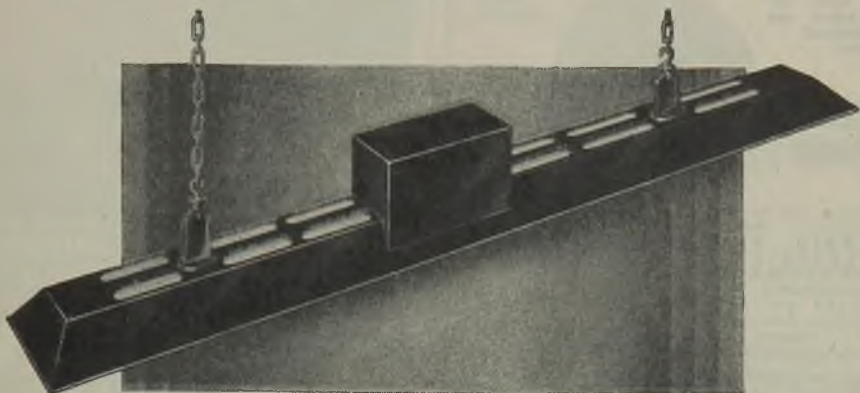
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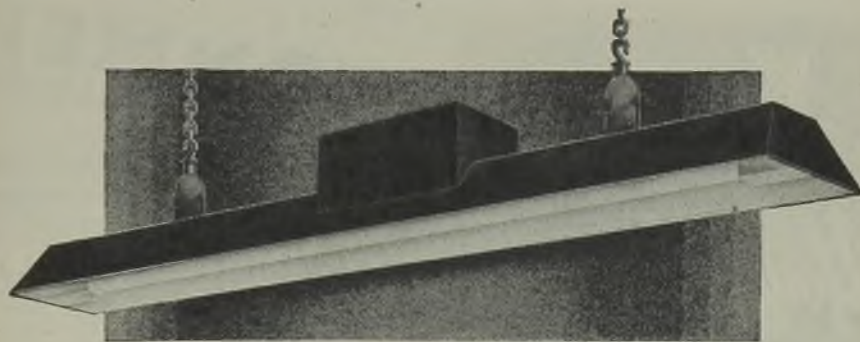
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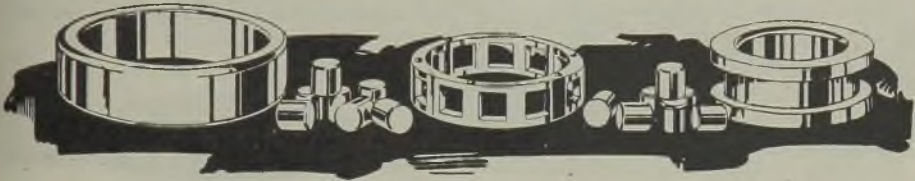
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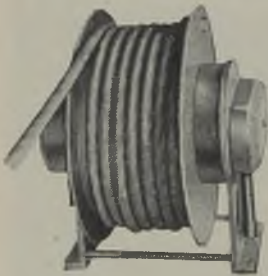
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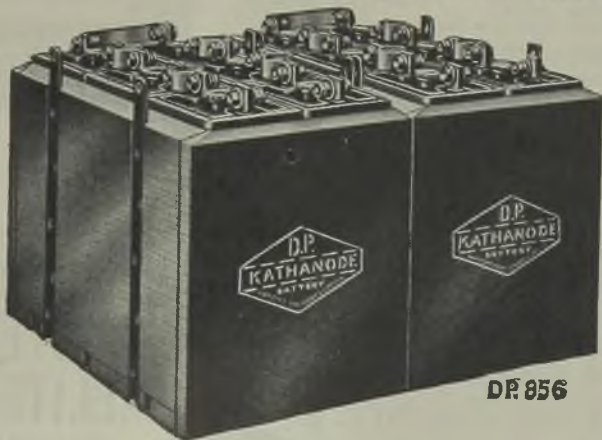
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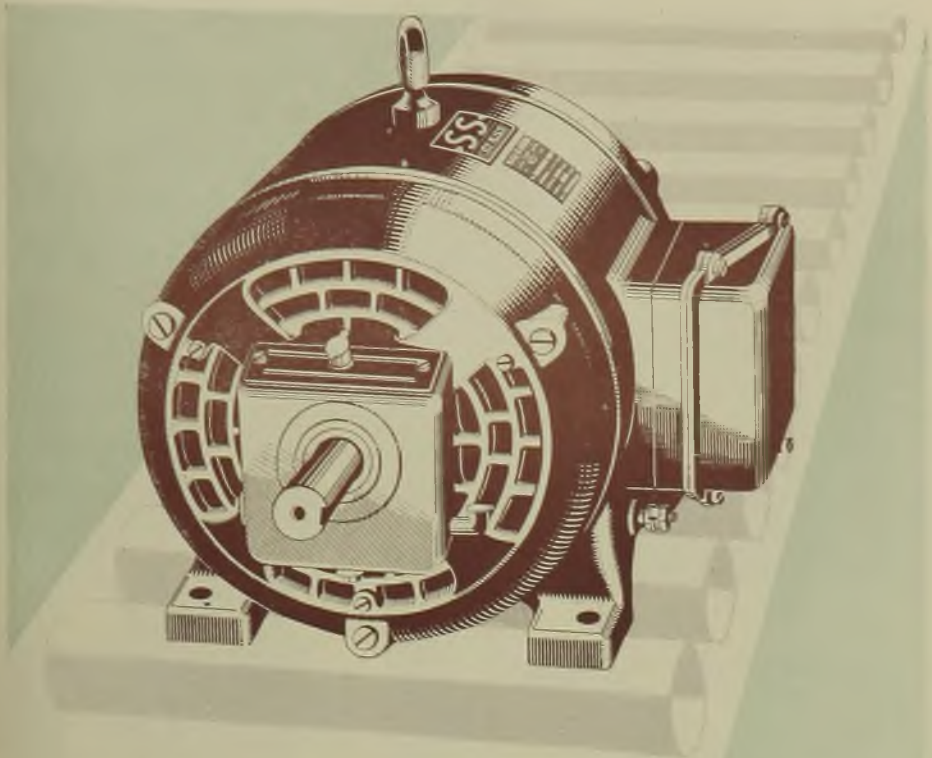
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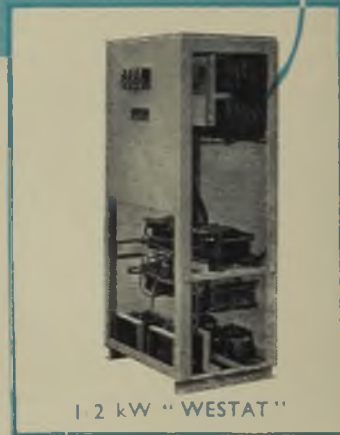
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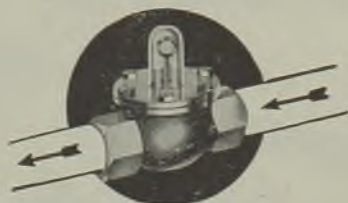


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Applications should be returned to the Principal at the College, at the earliest possible date.

H. BOYES WATSON,  
Chief Education Officer.

Education Office,  
Warrior Square,  
Southend-on-Sea.  
31st March, 1944. 4870

### LANCASTER TECHNICAL COLLEGE

(Principal: F. Bell, D.Sc., Ph.D., F.R.I.C.)

**F**ULL-time Lecturer in Electrical Engineering. Applicants should hold a University Degree or equivalent qualifications and have had industrial experience.

The subjects to be taught will be mainly those of the National Certificate Course in Electrical Engineering.

Salary in accordance with the Burnham Scale, plus bonus.

Forms of application may be obtained from the undersigned, to whom they should be returned by the 8th May, 1944.

JAMES GREEN,  
Director of Education. 4909

High Street House,  
Lancaster.

### CITY AND COUNTY BOROUGH OF GLOUCESTER

Appointment of Electrical Engineer and Manager

**T**HE Corporation invite applications for the appointment of Chief Engineer and General Manager of their Electricity Undertaking.

Particulars, with terms and conditions of the appointment, can be obtained from me by sending a stamped and addressed foolscap envelope.

L. O. NEED,  
Town Clerk. 4917

Guildhall, Gloucester.  
April, 1944.

**A**SSISTANT Sales Engineer, preferably with experience of small motors. Excellent post-war prospects. Klaxon Limited, 201 Holland Park Avenue, London, W.11. Phone, Park 6861. 4860

**B**RANCH Manager required, capable of continuing the development of wholesale distribution of electrical equipment in Luton. The position is permanent and residence in the area is essential, for which purpose a house is available if desired. Will applicants please give the following details in writing—age, experience, amount and method of remuneration expected, and when available. —Alliance & Surrey Wholesale Ltd., 62, Great Russell Street, London, W.C.1. 4902

**C**ABLEMAKING Engineer required, British Dominions, with mechanical engineering training, knowledge of technical side of cable manufacture, experience in manufacture of rubber and paper insulated cables, accustomed to handling labour. Apply—Box 4899, c/o The Electrical Review. 4899

**E**XEMPT Man (young preferred) with previous electrical trade experience, by Nottingham wholesalers, to train for responsible position including estimating, correspondence, control of staff. State age, trade experience, salary required.—Box 4911, c/o The Electrical Review.

**L**EADING Electrical Accessories Manufacturers require Representative for North-East Coast, with good connection amongst wholesalers and supply companies.—Box 4886, c/o The Electrical Review.

**R**EQUIRED, for essential works, Jig and Tool Draughtsman and Designer. Lad straight from school considered. Write full particulars—Secretary, Graham Farish Ltd., Mason's Hill, Bromley, Kent. 4901

**S**TOREKEEPER Manager required for wholesale house on South Coast, safe area, must have knowledge of cable, lamps and general accessories. State experience and whether exempt M.S. to Box 4904, c/o The Electrical Review. All replies treated in strict confidence.

**S**TOREKEEPERS required to work in either London or Croydon. Will applicants please give the following details in writing—age, experience, remuneration expected, and when available.—Alliance & Surrey Wholesale Ltd., 62, Great Russell Street, London, W.C.1. 4903

**S**TOREMAN required by London office of wholesale distributors. Please write, stating experience, age, salary required, etc., to—Box 4858, c/o The Electrical Review.

**S**TORES Assistant. Applicants, stating age and salary required, should have had stores experience and thus familiar with goods handled by—Wholesale Electric Co. Ltd., 37, Vauxhall Bridge Road, S.W.1. 4887

## APPOINTMENTS FILLED

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision. We will then insert a notice free of charge under this heading.

## SITUATIONS WANTED

**A**DVERTISER (41), 25 years integrating meters and electrical instruments, 12 years as test superintendent and assembly foreman in mass production, desires change with advancement and post-war prospects.—Box 5792, c/o The Electrical Review.

**E**LECTRICAL Engineer, age 46, now desires settled position, 4 years supply undertakings, 4 years military service last war, 18 years with and still employed by leading cable and apparatus manufacturers and installers as contract supervisor. Experience L.V. networks, ring mains, substations, all types of cables up to 66 kV, testing and localising, C.E.B., P.O., A.M. and W.D. contracts. Responsibility for weekly payroll up to £1,500. Interior installations, metering, radio.—Box 5771, c/o The Electrical Review.

**ELECTRICAL** Contract Engineer (33), extensive experience all types of installations, underground and overhead distribution, estimating and administrative duties, seeks similar position home or abroad. Free soon.—Box 5800, c/o The Electrical Review.

**ELECTRICAL** Contractor's Foreman, 25 years in trade, 15 years with London firm. Free.—Box 5795, c/o The Electrical Review.

**ELECTRICAL** Engineer (31), desires administrative position offering excellent prospects, would prefer semi-outside position, good all-round training, own car, now free, exempt. London area.—Box 5796, c/o The Electrical Review.

**ELECTRICAL** Engineer (36) seeks senior post. Wide practical and executive experience in works maintenance, plant installation, contracting and repair work. A.M.I.E.E. Salary commensurate with responsibility. Present level £550.—Box 5802, c/o The Electrical Review.

**ELECTRICAL** Supervising Engineer seeks position electrical contractors, 25 years' experience in control of contracts, office routine, labour, store control. Free.—Box 5794, c/o The Electrical Review.

**ELECTRICIANS**, two, require situations abroad. Experienced in contracting, maintenance, line and cable laying.—Box 5793, c/o The Electrical Review.

**EX-Engineering** Apprentice, Higher National Certificate standard, at present employed upon production planning and foreman of small motor assy., requires responsible position or power house work.—Box 5765, c/o The Electrical Review.

**GENTLEMAN**, age 36, seeks executive post, expert motor engineer, wide experience in aircraft industry, also erection and maintenance of H.T. switchgear, transformers, etc., strong disciplinarian. Positions held, senior foreman, factory supervisor, assistant works manager. Own car. Free shortly.—Box 5797, c/o The Electrical Review.

**MANAGER** (38), with first-class telecommunications technical and administrative experience, seeks change. Investment if necessary.—Box 5791, c/o The Electrical Review.

## FOR SALE

Traders buying and selling hereunder must observe the Restriction of Resale Order, S. R. & O. 1942 No. 958.

### GEORGE COHEN, SONS & CO., LTD.

SUPPLIERS OF SECONDHAND  
GUARANTEED ELECTRICAL  
PLANT.

SHOWROOMS AT: WOOD LANE,  
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STANNINGLEY, NEAR LEEDS.

Telephone: Pudsey 2241.

27

### WATER TUBE BOILERS IN STOCK

Three 12,000 lbs. evaporation, 200 lbs. W.P.	
One 12,000 .. .. 160 .. ..	
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We install complete, including brickwork. Economisers, Pumps, Piping Valves, Generating Sets and Motors in stock. Please send us your enquiries; we can give immediate delivery.

**BURFORD, TAYLOR & CO., LTD.,**  
Boiler Specialists, Middlesbrough.  
Telephone, Middlesbrough 2622.

82

## SHEFFIELD CORPORATION ELECTRICITY DEPT.

Sale of Scrap Plant

Neepsend Power Station

**THE** Electricity Committee invites Tenders for the purchase and removal of—

One Willans & Robinson Steam Turbine and Condenser with one Dick Kerr Alternator, of a capacity of 8,500 kW, with ancillary plant.

One English Electric Turbine and Condenser (originally coupled to 12,500-kW alternator) and ancillary plant.

A Schedule and Specification of the Plant for disposal is available on application to the undersigned and the Plant may be inspected by appointment.

In the execution of the work of removal the successful Tenderer will be required to comply with the Standing Orders of the City Council relating to standard rates of wages and conditions of labour.

The Corporation reserves the right to accept Tenders for the whole or part of the Plant referred to.

Tenders to be forwarded to the Town Clerk, Town Hall, Sheffield, 1, enclosed in the official envelope provided, which must be sealed and bear no name or mark indicating the sender, and received by him not later than first post on Monday, the 8th May, 1944.

Tenders received after the time stipulated herein will not be considered.

Commercial Street,  
Sheffield, 1.  
April, 1944.

**JOHN R. STRUTHERS,**  
General Manager.

4890

## THE "G.P.U." PROCESS IS AN OUTSTANDING ENGINEERING FEATURE!

**BECAUSE** existing material (often lying surplus in your works) can be used to produce any unusual Electrical Equipment urgently required, thus overcoming all difficulties of long delivery, licences, etc., while still guaranteeing the result expected, technically as well as economically.

Before buying new, consult our Engineers who have specialised for many years in building the well-known

"G-POWER-UNITS"

J. Gerber & Co. Ltd., Eng. Works, Wembley, Mdx.

Please ask for Production Range Leaflet.

4894

### ELECTRIC MOTORS & DYNAMOS

**WE** hold one of the largest stocks of New and Second-hand Motors. Secondhand machines are thoroughly overhauled. Inspection and tests can be made at our Works.

For Sale or Hire. Send your enquiries to:—

**BRITANNIA MANUFACTURING CO., LTD.,**  
22-23, BRITANNIA STREET,  
CITY ROAD, LONDON, N.1.

Telephone: 5512-3 Clerkenwell.

13

### ECONOMISERS IN STOCK

TWO Green's Economisers, 208 tubes, 250 lbs. W.P.  
ONE Green's Economiser, 128 tubes, 185 lbs. W.P.  
All guaranteed re-insurable and first-class condition only, low prices. Quotations per return. Installations delivered and erected complete.

**BURFORD, TAYLOR & CO. LTD.,**  
7, Commercial Street, Middlesbrough. Telephone 2622.

65

**THURROCK URBAN DISTRICT COUNCIL**

Grays Electricity Undertaking

Plant for Disposal

**T**HE Electricity Committee of the Grays Electricity Undertaking invite tenders for the purchase, dismantling and removal of:—

Two 350-kW Rotary Converters, complete with O.I.S.C. Transformers and H.T. and L.T. Switchgear. All in good running condition. Makers: Metropolitan-Vickers Electrical Co. Ltd. Voltage: A.C. 3,300—50 cycles; D.C. 465/515—shunt. Speed: 1,000 r.p.m.

Also: One 10-panel D.C. Feeder Switchboard with air-break circuit-breakers and knife switches.

Forms of Tender and Conditions of Sale may be obtained on application from the Electrical Engineer, Maidstone Road, Grays, Essex.

Tenders, to be in sealed envelopes endorsed "Tender for Plant," must be delivered to the undersigned by 20th May, 1944.

A. E. POOLE,  
Clerk to the Council. 4916

Council Offices,  
Grays, Essex.

**REBUILT MOTORS AND GENERATORS**

**L**ONG deliveries can often be avoided by purchasing rebuilt secondhand plant. We can redesign or replace surplus plant of any size.

SEND US YOUR ENQUIRIES.

OVER 1,000 RATINGS ACTUALLY IN STOCK HERE.

**DYNAMO & MOTOR REPAIRS LTD.,**  
Wembley Park, Middlesex.

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Also at Phoenix Works, Belgrave Terrace, Soho Road, Handsworth, Birmingham.  
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THORNTON HEATH 4278-8. 96

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Reconditioned A.C. and D.C. Motors and Starters Equal to New.

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**FOR SALE: CONDITION EQUAL TO NEW**

**2-speed Pole-changer Motors**

**E**ACH complete with Makers' Selector Switch and Contactor Circuit Breakers; having 3-overload releases and no-volt release:—

- "G.E.C." 8 1/2 h.p., 900/225 r.p.m., 400 v., 3-ph., 50 c., ball-bearing.
- "G.E.C." 9/6 h.p., 740/360 r.p.m., 440 v., 3-ph., 50 c., ball-bearing.
- "G.E.C." 17/15 h.p., 690/230 r.p.m., 380 v./400 v., 3-phase, 50 c., ball-bearing.
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**UNIVERSAL ELECTRICAL CO.,**

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**O**NE 83-h.p. vertical twin-cylinder PETER Atomic Diesel Engine, 350 r.p.m., with circulating pump, exhaust, water, air piping and charging compressor. New 1936.

Two duplicate practically new 30-h.p. "NATIONAL" vertical high-speed Diesel Engines, each with silencer and exhaust piping, new air motor for starting. Secondhand 230-volt D.C. Generators available for direct coupling if required.

**NEWMAN INDUSTRIES, LTD., YATE, BRISTOL,**  
4915

**MODINSTAL ELECTRIC COMPANY, LIMITED**  
INDUSTRIAL INFRA-RED APPARATUS FOR PAINT DRYING.  
COMPLETE EQUIPMENTS OR SINGLE UNITS PROVIDED.

GUARANTEED HEAT GENERATORS.

**OLDHAM WORKS, OLDHAM TERRACE,**  
ACTON, W.3, LONDON.

Telephone: Acorn 3504/5.  
**M.E.C. APPARATUS, DULL EMITTER SYSTEM.** 46

**A** large stock of surplus Ebonite, Fibre, Carbon Rods, A.I.D. Turnbuckles, etc., also Searchlights (sale or hire), Mirrors, Lenses, also Winches of our well-known self-sustaining types. Hundreds of thousands supplied during the last 40 years to Govt. Depts., corporations and traders.—London Electric Firm, Croydon. 4814

**A** and D.C. House Service Motors, all sizes, quarterly and prepayment, reconditioned, guaranteed one year. Repairs and recalibrations.—The Victa Electrical Co., 47, Battersea High Street, S.W.11. Tel. Battersea 0780. 19

**A** C. and D.C. Motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 4422). 5631

**A** C. Motors, 1/50th h.p. to 2 h.p., from stock, for essential work only.—Johnson Engineering, 86, Great Portland Street, W.1. Tel. Museum 6373. 15

**A** ERIAL Cables, all sizes quoted for: good deliveries against Government contract numbers.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5803

**A** LTERNATOR, 500 kVA, 3-p., 50 c., 400/440 v., 750 revs., direct coupled exciter, 2 brgs., on bedplate.—Stewart Thomson & Sons, Port Road, Seaford, Liverpool, 21. 58

**A** LTITUDE Tower Ladders, several in stock.—Shaftesbury Ladders Ltd., 453 Katherine Rd., London, E.7. 42

**B**ANK of Ellison D.C. Oil-filled Circuit Breakers, withdrawable type, 460 volts, two-pole, consisting of: Two Circuit Breakers, each of 800 ampere capacity, two of 375 amperes, three of 230 amperes, four of 117 amperes, complete with totally enclosed busbars of ample capacity, consisting of positive, negative and middle wire, and all forming one unit. Additional to, and incorporated in above, are two Ellison open type, 500-ampere, 3-pole Circuit Breakers and one Whipp & Bourne open type, 500-ampere, 2-pole Circuit Breaker. The above complete with trifurcating boxes, etc. For further particulars apply—Box 4882, c/o The Electrical Review.

**B**ELT Grinders or Sanders, 4" wide belt, £5 5s.; 6" wide belt, £10 10s.—John E. R. Steel, Clyde Mills, Bingley, Phone 1066. 52

**B**EST English Cables, 1/044 up to 127/103, deliveries against M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5804



**CARBONS**, large stocks assorted sizes, solid and cored.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 5805

**CRYPTO** Motor Generator, 200 v., 2-phase, 50 c., input 6.8 v. D.C., 400/400 amps. output, with switchgear. Price £85.—Universal Electrical Co., 221, City Road, London, E.C.1. 70

**ELECTRIC** Pumps for sale, new, suitable for sands, air raid shelters, garden watering, etc.—Southern Imticon Co. Ltd., 190, Thornton Road, Croydon. 34

**FOR** sale, Crypto Motor and Generator, Motor 415 volts, 6 amps., generator 240 volts D.C., 8 amps. For further particulars apply to—Steward, Wellhouse Hospital, Barret, Herts. 4884

**GENERATING** Sets for sale, petrol and crude oil, A.C. and D.C., including 10 kW, 400/3/50 petrol set.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 4913

**GRAMPIAN** Radiogram Amplifier, Universal with microphone and 5 P.A. Loudspeakers, 18 watt output, excellent condition. Cost £111 16s. Suitable small factory. Offers and enquiries—Box 4900, c/o The Electrical Review. 70

**HEAVY** duty Arc Welding Plants, 200 amps. Price £31 10s. complete. Also Spot Welders, £38 15s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 50

**HOBART**, 3 h.p., 200/240 v. D.C., 500 r.p.m., direct on etc., £15.—Universal Electrical, 221, City Road, London, E.C.1. 4891

**HOUSE** Meters, 200/240 v., A.C. or D.C., 3, 5 and 10 amps., at 17s. 6d. each.—Universal, 221, City Rd., London, E.C.1. 69

**LEAD**-covered and Armoured Cables, P.I. and V.I.R., various special lines at low prices.—Edwards Bros., 20, Blackfriars Road, London S.E.1. 5806

**MOTOR** Generator by Mortley Sprague, double ended, giving 4,000 volts at 1 amp., complete with three-phase, 480 volts input to transformer with single-phase output to motor, complete with switches and field regulators and exciter unit. Best offer wanted.—Gerald Marcus, The Ranch, West Drive, Sonning. 4892

**MOTOR** Generator Set, 5 kW, by Laurence Scott, 200/210 volts D.C.; Dynamo, 100/80 volts D.C., 1,000 revs. Both machines shunt interpole, each with two bearings.—Thomas Mitchell & Sons Limited, Bolton. 4885

**MOTOR** Generator Sets and Convertors, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co., Ltd., 22/26, Britannia Walk, City Road, London, N.1. Telephone, Clerkenwell 5512, 5513 & 5514. 28

**MOTORISED** ½" Bench Drilling Machine, 13 speeds, £11 11s.—John E. R. Steel, Clyde Mills, Bingley, Phone 1066. 51

**NAMEPLATES**, Engraving, Diesinking, Stencils, Steel Punches.—Stiwell & Sons Ltd., 152, Far Gosford Street, Coventry. 14

**PHONE** 98 Staines. 250-kW Browett Steam Set, 220 v. D.C.; 60-kW Allen Crude Oil Set, 220 v. D.C.; Weir Feed Pump, 93" x 7" x 21", 18-h.p. Electromotor Motor, 415/3/50; 35-kW Tangey Crude Oil Engine and 220-v. Dynamo; 4" Turbine Pump, 450' head.—Harry H. Gardam & Co. Ltd., Staines. 30

**PHOTO**-Electric Cells, 90 v., 21s. each.—Universal, 221, City Road, London, E.C.1. 71

**PORCELAIN** Cleats, 2 and 3 groove, various sizes ex stock, price list.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 5807

**PORCELAIN** Insulators and Spindles, also Cleats, cheap.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 5808

**ROTARY** Converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 16

**SELF**-Priming Electric Pumps, 300 g.p.h., £11 11s.—John E. R. Steel, Clyde Mills, Bingley, Phone 1066. 53

**SINGLE**-core V.I.R., Braided Flexible, heavy insulation, carry 24 amps., cheap.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 5809

**STAFF** Time Checking and Job Costing Time Recorders (all makes) for quick cash sale. Exceptional condition. Write—Box 528, Smiths, 100, Fleet Street, London, E.C.4. 31

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**18** h.p., 400/3/50, 565-revs., S.R., "L.D.M." direct cpd. on C.I. bedplate to a worm reduction gear ratio 565/244 revs., O.I. Allen West starting gear.—Greenhalgh Bros., Burton's Field Mill, Atherton. 4834

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**188**-kW Steam-driven Alternating Set, 440/3/50, direct coupled exciter and switchboard, £400, ex site.—Stewart Thomson & Sons, Port Road, Seaford, Liverpool, 21. 59

**200** h.p., 400/3/50, 485-rev., S.R., Mather & Platt, 3-bearing type, with Ellison switchgear.—Greenhalgh Bros., Burton's Field Mill, Atherton. Phone 117. 41

**250**-kVA Alternator, 400 volts, 3-phase, 50 cycles, 750 revs., with direct coupled exciter.—Midland Counties Electrical Engineering Co. Ltd., Grice Street, Spon Lane, West Bromwich. 36

**1,000**-kW Turbo-Alternator Set, made by Metropolitan-Vickers in 1920, 3-phase, 50 period, 400 volts, steam pressure 200 lb., jet condenser. At present running. Apply—Fatons & Baldwin Ltd., Halifax, Yorks. 4821

### ARTICLES WANTED

**DIESEL** Alternating Set, 75-150 kW, 400/3/50, direct coupled, pref. on bed, urgently wanted. Full details and price to—Box 4896, c/o The Electrical Review.

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**MANUFACTURERS'** Agents require continuous supplies of Cycle Front and Rear Lamps, Torch Cases, etc. Please write—Box 4857, c/o The Electrical Review.

**MERCURY** (Quicksilver) wanted. Write for packing instructions. Gold, Silver and Platinum also purchased.—Collingridge & Co., Ltd., Dept. F, Riverside Works, Riverside Road, Watford. (Tel. 5963.) 4863

**SINGLE** Inlet Fan required to give 50,000 cu. ft. of air per min., with A.C. motor, 50 h.p., 440/500/3/50.—Box 4897, c/o The Electrical Review.

**URGENTLY** wanted, Storage Batteries from 100-250 ampere capacity, 54 cells. In good order, ready for use.—Box 4895, c/o The Electrical Review.

**WANTED**, Ceiling Fans, 36"-72" dia., single phase or 3-phase; all descriptions, secondhand pref. (not exhaust fans).—Box 4898, c/o The Electrical Review.

**WANTED**, Generator, between 25 and 35 h.p., 100 v., speed between 600 and 800, D.C., compound wound. Also Field Regulator for same.—Box 4907, c/o The Electrical Review.

**WANTED**, Rotary Converters, any size.—Universal, 221, City Road, London, E.C.1. 22

**WANTED**, Vacuum Impregnating Equipment for electrical machinery.—Box 4914, c/o The Electrical Review.

**WANTED**, 3 750-r.p.m., 415-v., 3-phase, 50-cycles, 5-h.p. ball-bearing motors.—Box 4908, c/o The Electrical Review.

**3** h.p. Electric Motor, 200 volts, 1-phase, 50 cycle repulsion on capacitor type.—U. T. C., 13, Deptford Bridge, S.E.8. 5801

**WORK WANTED AND OFFERED**

**MOTOR REPAIRS**

**R**EWINDING and Repairs. Small Motors and Electric Tools rewound and repaired by firm having long experience in this work. Guaranteed work and prompt service. Large assortment of Motors available from stock.

**SOUTHERN IGNITION CO., LTD.,**  
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CROYDON.  
THORNTON Heath 4276-8. 87

**SMALL ARMATURE SPECIALISTS**

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**BROOM'S ELECTRICAL RE-WINDS,**  
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**A**RMATURE, Rotor and Stator rewinds and repairs; fractional to 60 h.p. Prompt deliveries.—T. A. Boxall & Co., Horley, Surrey. Phone 654. 5770

**C**APACITY available for Winding; Armatures, Stators and Coils. Quantities preferred.—Kingsland Electric Service, 111, Clarence Rd., E.5. Amherst 4166. 5745

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**M**ACHINING Work, for Centre Lathes up to 8 1/2 in. M centres and medium-sized milling (good grade work preferred).—The London Electric Firm, Croydon. Up-lands 4871. 56

**N**EWLY formed Limited Company wish to contact manufacturers interested in the production of Modern Hearing Aids.—Box 5780, c/o The Electrical Review.

**R**EPAIRS and rewinds, A.C. and D.C. motors, domestic appliances, etc.—J. S. Ramsbottom & Co. Ltd., Bow Street, Keighley. 54

**AGENCIES**

**A**GENCIES wanted for S., S.E. and W. England and S. Wales by already existing organisation with excellent connection.—Box 5773, c/o The Electrical Review.

**M**ANUFACTURERS' Agents, covering the whole of Great Britain and Colonies, are desirous of contacting manufacturers with a view to sole selling rights (either commission or buying), post-war arrangements considered.—Box 23, c/o The Electrical Review

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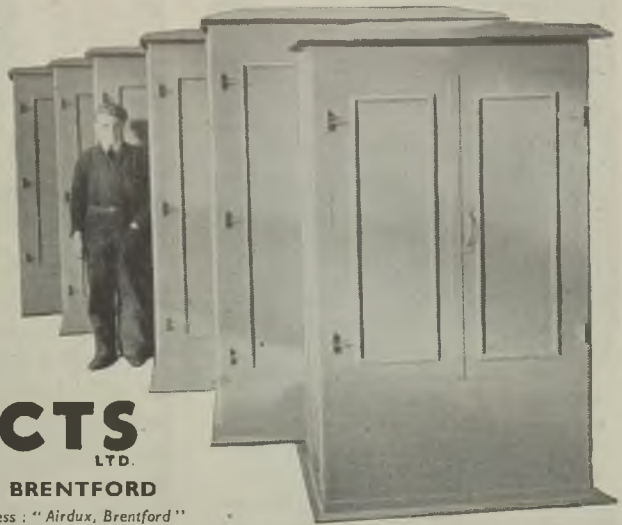
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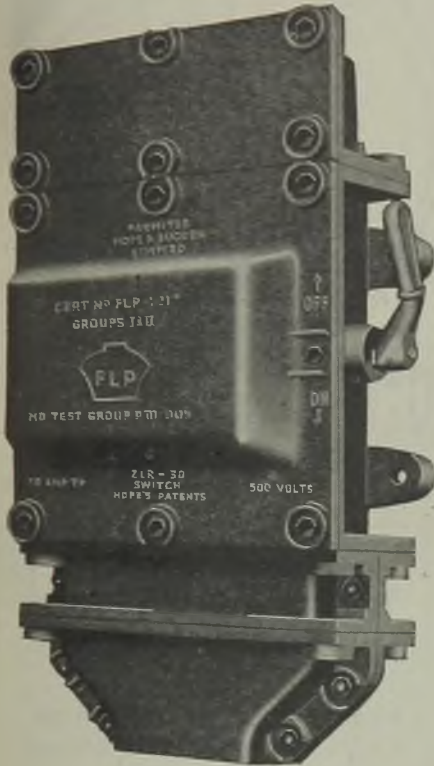
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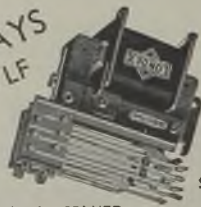
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