

2448 *11. 07. 1947*

THE

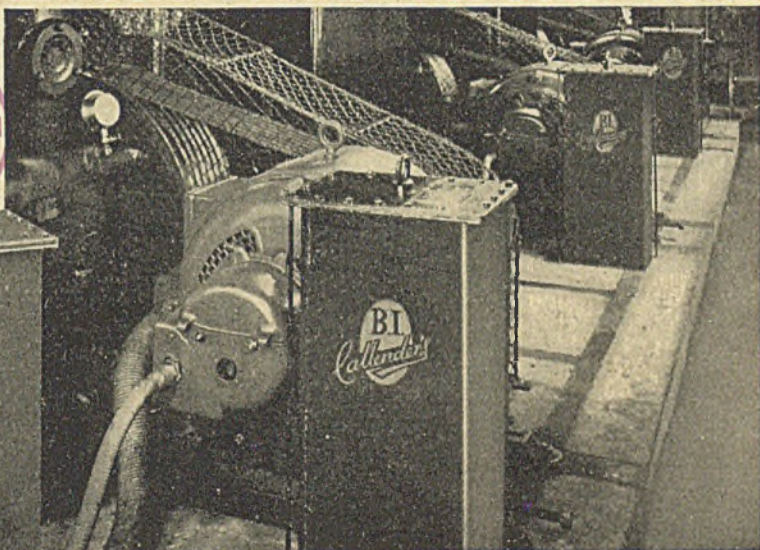
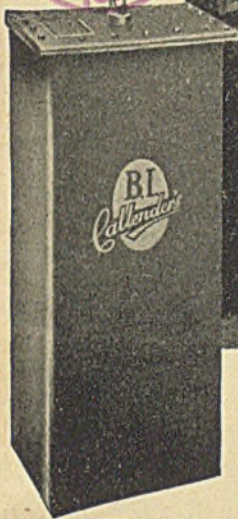
# ELECTRICIAN

THE TECHNICAL NEWSPAPER OF THE ELECTRICAL INDUSTRY

19

## IMPROVED P.F. MEANS REDUCED LOAD

BIBLIOTEKA  
POLITECHNIKI  
SLASKIEJ



B. I. Callender's automatically controlled capacitors correct the power factor of individual motors to a figure consistently higher than .95 at all loads. A higher power factor reduces the load on all cables back to the source of supply, improves performance, reduces starter maintenance costs and saves the Nation's power.



## POWER CAPACITORS

BRITISH INSULATED CALLENDER'S CABLES LIMITED

31 JANUARY, 1947  
SIXPENCE



*... fits any hole?*

**That's right.**

*Even if the hole's too big?*

**That's right.**

*And even if the hole's too small?*

**That's right.**

*And one of the two takes any screw?*

**That's right.**

*They must be ruddy  
marvellous plugs, mate!*

**That's right!**

*And remember this, because Philplugs fill the hole, no matter what kind of a hole you make, you can always make a firm fixture with Philplug Adaptas. And another thing, because you can use one of these 2 for any screw you get a perfect fixture every time—that's the beauty of Philplug Adaptas.*



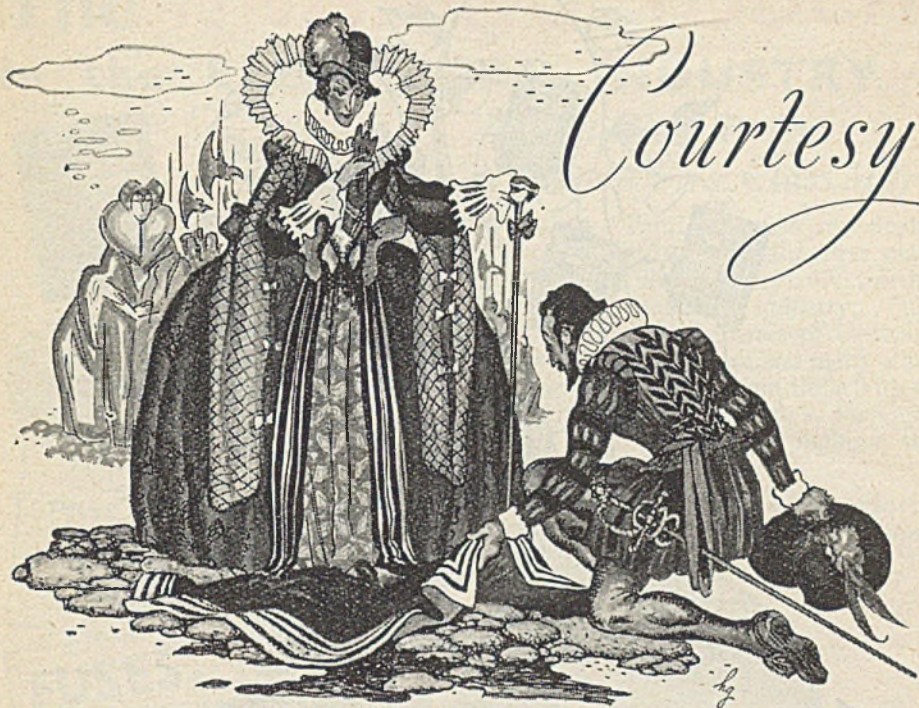
**One of  
these 2 for  
any screw**



# PHILPLUGS fill the hole

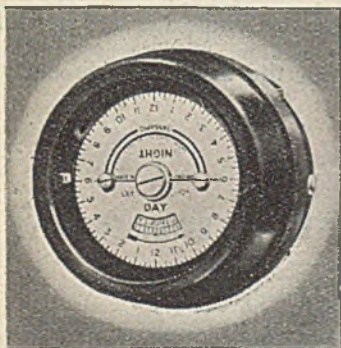
PHILPLUG PRODUCTS LIMITED · LANCELOT ROAD · WEMBLEY · MIDDLESEX · TELEPHONE : WEMBLEY 0140

C.R.C. 11a



*One hardly expects acts of gallantry in modern business—but today even courtesy seems to be sadly missing. This organisation has always set itself very high standards of service and helpfulness—and in the present supply situation, there is evidence that this spirit is widely appreciated. You may say that courtesy will not help you to get delivery of time switches or meters more quickly.*

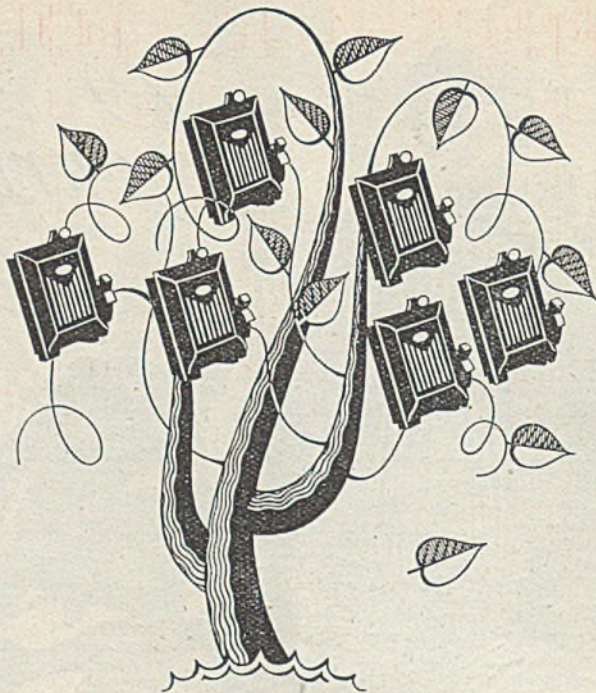
*Maybe not—but you will know that individual cases will have individual attention... and that everything humanly possible will be done to help.*



## SANGAMO WESTON

### METERS & TIME SWITCHES

Great Cambridge Road, Enfield, Middlesex  
Telephone: Enfield 3434 & 1242



## *If switchgear grew on trees*

If M.E.M. equipment could be produced without labour or materials, the present heavy demand could be met without delay. None the less, every effort

is being made to increase output in spite of shortages, controls and restrictions. As fast as the M.E.M. factory can turn out the goods, supplies are being rushed to the wholesalers. So keep in touch with *your* wholesaler and he will see that you are supplied with the least possible delay.



**MIDLAND ELECTRIC MANUFACTURING CO. LTD., TYSELEY, BIRMINGHAM, 11**  
 SWITCH, FUSE AND MOTOR CONTROL GEAR, ELECTRIC FIRES  
 AND LOCALISED LIGHTING EQUIPMENT

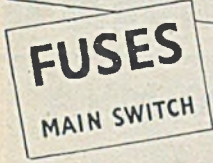
London Showrooms & Stores: 21-22 Rathbone Place, W.1 : Manchester Showrooms & Stores: 48-50 Chapel St., Salford, 3

# The **FINISHING TOUCH** in the **ELECTRICAL INDUSTRY**★

*A First Class Product  
deserves a First Class Mark*

"Trapinex" Paint Transfers provide the modern method of marking first class products in brilliant effect, truly worthy of the greatest names in industry. That is why the manufacturers of electrical equipment featured here and many other leaders in all industries pin their faith to "Trapinex" Paint Transfers, for capitalising their goodwill throughout the world.

"Trapinex" Paint Transfers are **printed** with special paint of colours many times



**EVER READY**

**WARNING. VOLTAGE JACKS  
USE HIGH RESISTANCE VOLTMETER**

★ **EVERY INDUSTRY** has a thousand uses for "Trapinex" Paint Transfers (additional to the more obvious uses for publicity, display and packaging) in Workshop, Factory, Office, for Nameplates, Brand Marks, Monograms, Patent Numbers, Instructions, Diagrams, Wiring Layouts, Warnings; Type, Catalogue or Serial Numbers.

brighter than printers' ink. Any number of colours may be printed and applied to any smooth surface, in striking design or cut out effect without film or paper background to mar the distinctive display—Brilliant, Durable, Weatherproof, and so easy to apply.

**ADVICE** freely given, but when you write for prices please state: (1) Size, (2) Quantity, (3) Number of Colours, (4) Purpose, (5) Wordings required, (6) A rough sketch would help. **WE HAVE NO STOCK LINES OR PRICE LISTS.**

# TRAPINEX



Trapinex (Regd.) Paint Transfers are fully patented and manufactured only by  
**TRAPINEX LTD., 19, COMMERCE WORKS, HIGH ROAD (Opposite Town Hall), WOOD GREEN, N.22**  
'Phone: Bowes Park 6811 'Grams: 'Trapinex, Wood, London' Cables: 'Trapinex, London'

**HIGH-SPEED • ARC CONTROLLED • SINGLE-BREAK DESIGN**

**TYPE  
E5**

**OIL  
CIRCUIT  
BREAKER**

**750 & 1000 MVA  
22 & 33 kV  
400 - 800 Amp.**

***Fully tested and Certificated in  
accordance with BS 116/1937, Pt2***

The type E.5 low-oil-content circuit-breaker is of the completely phase segregated, arc-controlled horizontal single-break design. The breaker mechanism is simple, robust and trip-free, and has a high-speed operating characteristic.

Type F.E.5 metalclad units of the single or duplicate busbar pattern are arranged to incorporate the type E.5 circuit-breaker, each assembly comprising a completely phase segregated, fully interlocked metalclad equipment.

**COOKE & FERGUSON**

**ELECTRICAL DIVISION**

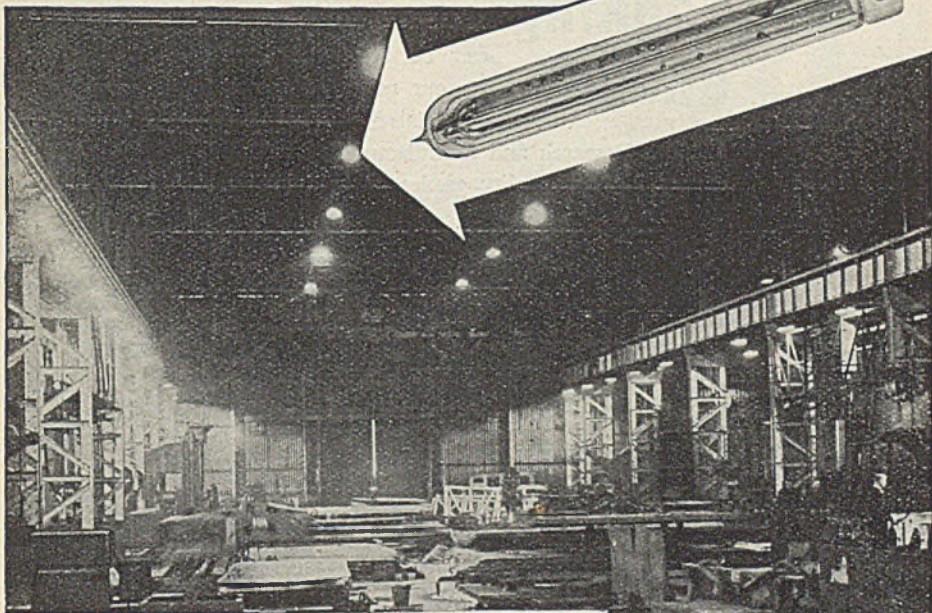
**LIMITED**

**VICTORIA STREET  
MANCHESTER II**



**40-41 CRAVEN HOUSE  
KINGSWAY, W.C.2**

# GOOD LIGHTING **AND** FUEL ECONOMY...



The use of Philips Sodium Lighting enables the essential objectives of Good Lighting and Fuel Economy to be attained.

**GOOD LIGHTING**, because of the high visibility obtained under the golden sodium light, due to enhanced brightness contrasts, high visual acuity, and freedom from glare.

**FUEL ECONOMY**, because of the high luminous efficiency of Philips Sodium Lamps, and their moderate consumption (SO/H 140W, 85W, 60W and 45W). Their long useful life reduces maintenance costs. For A.C. Only.

The Philips Lighting Service is at your disposal.



# PHILIPS

## SODIUM LIGHTING

PHILIPS LAMPS LIMITED (LIGHTING DEPARTMENT)  
CENTURY HOUSE, SHAFTESBURY AVE., LONDON, W.C.2

BRANCHES & SALES DEPOTS AT:

BIRMINGHAM, BRISTOL, BLACKBURN, CARDIFF, EDINBURGH, GLASGOW, LEEDS,  
LIVERPOOL, MANCHESTER, NEWCASTLE-ON-TYNE, NOTTINGHAM, SHEFFIELD.

**FOR VISIBILITY**

**SAFETY AND**

**ECONOMY**

(LD233D)

# Looking ahead..

The needs of the moment and future requirements can be adequately met by our range of Plastic Materials of proved merit. Modern Research and Manufacturing methods ensure highest quality grades being available.

## CELLOBOND

Synthetic Resin Adhesives for general and specific purposes.

## GELMOLD

Cellulose Acetate Compression and Injection Moulding Powders.

## CHLOROVENE

Polyvinyl Chloride Materials for Cable Sleeveings and Insulation, Extrusion, Sheeting, etc.

## EPOK

Phenolic and Cresylic Synthetic Resins and Solutions. Urea-Formaldehyde Synthetic Resin Adhesives.

## ISOLENE

Polyisobutylene for cable insulation, adhesive tapes and protective coatings.

## ROCKITE

Phenolic and Cresylic Moulding Powders, Extruded Sections, Resins.

*Sole Distributors:*

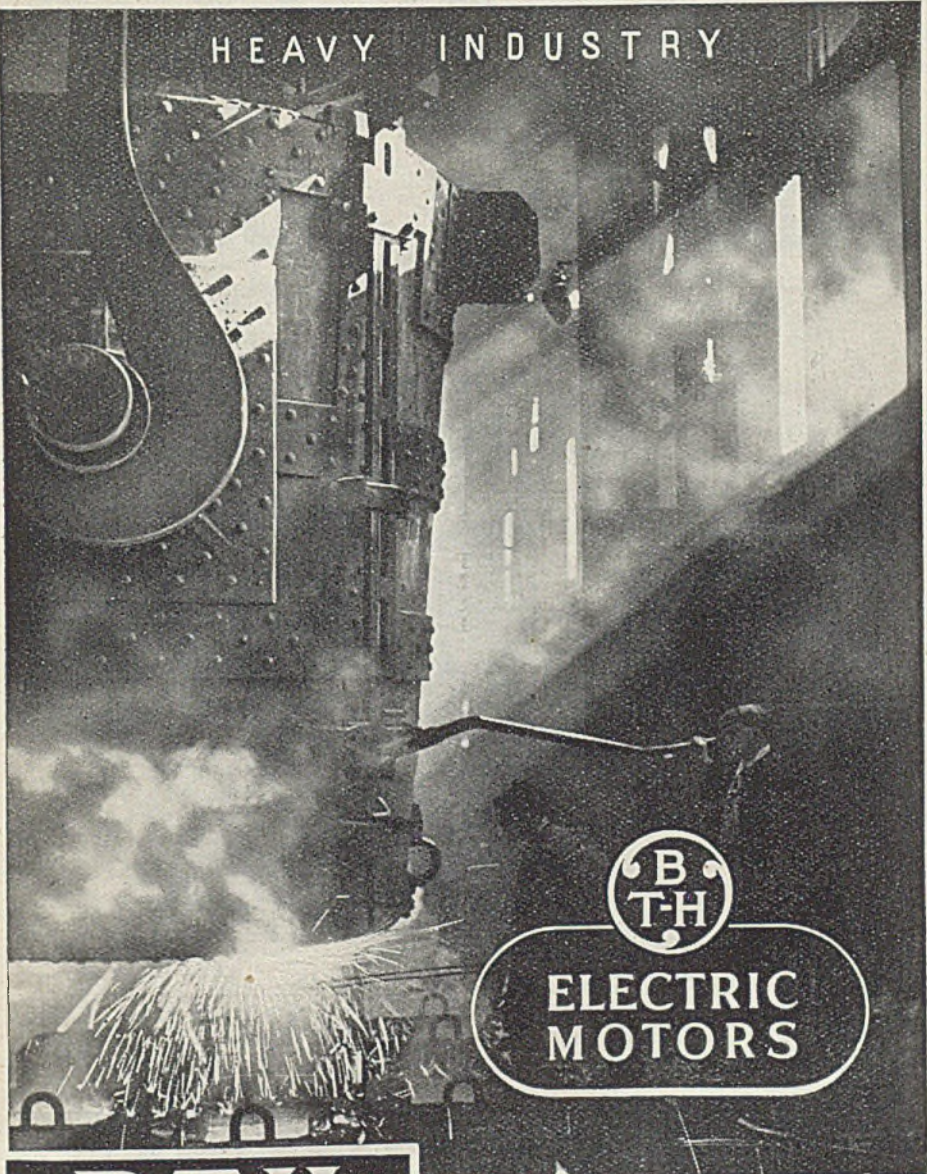
# F.A. HUGHES & CO. LIMITED

ABBAY HOUSE, BAKER STREET, LONDON, N.W.1

Telephone WELbeck 2332 (5 lines). Telegrams: Distancing, Norwest, London



HEAVY INDUSTRY



**ELECTRIC  
MOTORS**

**BTH**

**RUGBY**

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED, RUGBY, ENGLAND.

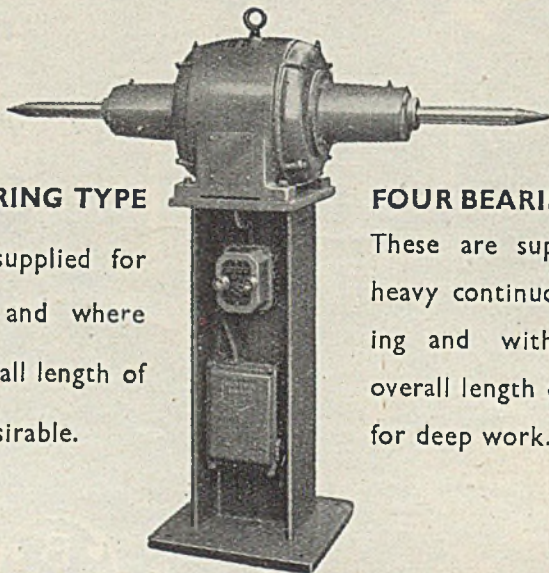
A3702



# B & H Electric

## POLISHING MOTORS

These machines are Totally Enclosed type and are wound for standard voltage 400/440—3-phase A. C. Supply. Other voltages are special to order.



### TWO BEARING TYPE

These are supplied for light work and where shorter overall length of spindle is desirable.

### FOUR BEARING TYPE

These are supplied for heavy continuous working and with greater overall length of spindle for deep work.

Illustrating the Four Bearing Type for A.C. 3-Phase supply with Push Button Starter and 3-Pole Isolater Switch.

All types have extended shafts with taper screwed false noses. Each type is supplied with floor stand on which the Starter is mounted. When D.C. machines are supplied, a Rheostat Starter is fitted. With 3-phase machines a 3-pole Isolater Switch is supplied as standard.

## BUCK & HICKMAN LTD

*Electrical Tools Division*

**ALBEMARLE ROAD, BECKENHAM, KENT**

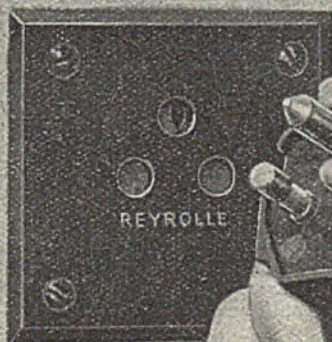
HEAD OFFICE:  
WHITECHAPEL ROAD  
LONDON, E.1

BRANCHES:  
ALPERTON BIRMINGHAM  
GLASGOW MANCHESTER

# Fused-Plugs and Sockets

3 kW 230 VOLTS

- ONE SIZE ONLY FOR ALL DOMESTIC APPLIANCES FROM AN ELECTRIC CLOCK TO A 3 kW FIRE
- PLUG-PIN FUSED FOR 3 AMPERES OR 13 AMPERES
- SOCKET CONTACTS ARE SHUTTERED
- FLUSH-TYPE, SURFACE-MOUNTING, AND CONDUIT-BOX-MOUNTING SOCKETS ARE AVAILABLE



ASK FOR  
PAMPHLET No. 1203

MANUFACTURE  
LICENSED UNDER  
LETTERS PATENT

**REYROLLE**  
HEBBURN-ON-TYNE ENGLAND

Bastian & Allen, Ltd. ....	333
British Cork Mills, Ltd. ....	333
British Insulated Callender's Cables Ltd. ....	Cover i
British Mica Co., Ltd. ....	382
British Rototherm Co., Ltd. ....	326
British Thomson Houston Co., Ltd. ....	311
Brooks & Bohm, Ltd. ....	380
Buck & Hickman, Ltd. ....	312
Burdette & Co., Ltd. ....	382
Carlisle Electric Manufacturing Co., Ltd. ....	321
Castle Engineering Co. ....	322
Churchill, H. & D., Ltd. ....	318
Clarke, H., & Co., Ltd. ....	329
Chas. Clifford & Son, Ltd. ....	333
Cooke & Ferguson, Ltd. ....	308
Cornercroft, Ltd. ....	316
Dorman & Smith, Ltd. ....	316
D. S. Plugs, Ltd. ....	378
Duratube & Wire, Ltd. ....	322
Electrical & General Accessories (Leicester), Ltd. ....	330
Electricity Services, Ltd. ....	380
Electrolux, Ltd. ....	384
Electro Plastics, Ltd. ....	383
Ericsson Telephones, Ltd. ....	378
Fluorescent Spares ...	380
General Electric Co., Ltd. ....	340
Hampton Works, Ltd. ....	331
Hawkins, L. G. & Co., Ltd. ....	324
Howells Electric Motors ...	382
Hudson Pressings, Ltd. ....	326
Hughes, F. A., & Co., Ltd. ....	310
Instanta Electric, Ltd. ....	380
International Correspondence Schools, Ltd. ....	314
Linread, Ltd. ....	315
Litholite Insulators & St. Albans Mouldings, Ltd. ....	331
Liverpool Electric Cable Co. ....	317
Lundberg, A. P., & Co. ....	339
Lyons, Claude, Ltd. ....	331
Mavitta Drafting Machines, Ltd. ....	380
Micramatic Electric Instruments Co., Ltd. ....	383
Midland Electric Mfg. Co., Ltd. ....	306
Metropolitan Vickers Electric Co., Ltd. ....	Cover iv
Midland Electric Manufacturing Co., Ltd. ....	306
Mosses & Mitchell, Ltd. ....	380
National Fire Protection Co., Ltd. ....	328
Painton & Co., Ltd. ....	325
Philips Lamps, Ltd. ....	309
Philplug Products ...	Cover ii
Presspahn, Ltd. ....	326
Pultra, Ltd. ....	320
Reels, Ltd. ....	332
Revill Carter & Co. ....	333
Reyrolle, A., & Co., Ltd. ....	313
Rivlin, J. ....	326
Sangamo Weston, Ltd. ....	305
Santon, Ltd. ....	327
Scholes, George H., & Co., Ltd. ....	324
Sound ...	333
Symonds, R. H., Ltd. ....	332
Taylor Tunnickliff & Co. ....	379
Telegraph Condenser Co., Ltd. ....	319
Temple Electric Co., Ltd. ....	377
Transformer & Electrical Co., Ltd. ....	326
Trapinex, Ltd. ....	307
Trumeter Co., Ltd. ....	320
Tullis Russell & Co., Ltd. ....	381
Universal Tools, Ltd. ....	330
Walker Crossweller & Co., Ltd. ....	333
West Insulating Co., Ltd. ....	382
Westinghouse Brake & Signal Co., Ltd. ....	Cover iii
Whiteley, B. S. & W., Ltd. ....	323
Wiggin, Henry, & Co., Ltd. ....	328
Wilcox, Edward, & Co., Ltd. ....	383

# CREATIVE PIONEERS

in

# TECHNICAL TRAINING

The INTERNATIONAL CORRESPONDENCE SCHOOLS made history when they founded the now world-famous method of giving sound practical Courses of Technical Instruction by post. Fifty-five years ago they opened the Gates of Opportunity to millions of ambitious men and women, and cleared the way to new vistas of life.

The success of the Correspondence System originated by the I.C.S. was from the outset so remarkable, it revolutionized so many lives, it proved itself to be such an immense educational boon, that many universities, scientific institutions, and private organisations adopted it for their own teaching purposes.

To-day there are Correspondence Schools of all kinds. Some of them are doing excellent work. But there is only one I.C.S.—the first in time and prestige, the greatest in educational work already accomplished, and the largest in teaching staff and number of students.

Creators and still leaders, without a peer in fame that has spread to every land, with graduates who have succeeded beyond their hopes in at least fifty countries and provinces, and with ever stronger and wider activities—such are the INTERNATIONAL CORRESPONDENCE SCHOOLS, forming the largest educational institution of its kind in the world.

## INTERNATIONAL CORRESPONDENCE SCHOOLS, Ltd.

Kingsway, London, W.C.2.

Instruction Centres also in  
SYDNEY, WELLINGTON, CAPE  
TOWN, MONTREAL, BOMBAY,  
CAIRO, SCRANTON, MADRID,  
MEXICO CITY, BUENOS AIRES  
AND OTHER CITIES.



# A SCREW THAT USES ITS HEAD



The Phillips Recess Screw prevents burrs, with a much stronger head.

The Phillips Screw prevents wobbling starts, giving first-time straight assemblies.

Drivers cannot slip. The Phillips Screw, once on the bit, stays on.

**THE PHILLIPS RECESS HEAD SCREW** fits firmly and snugly on to the 4-winged driver bit to form a single rigid straight line unit. Once applied it screws home quickly and cleanly first time and every time. The driver bit cannot slip out of the Phillips engineered Recess to score work surfaces or injure workers' hands. Try Phillips Recess Head Screws on your assemblies. Watch your production figures climb; watch your work improve; and notice how you save on costs as you cut out waste.

A Booklet on the Phillips Screw giving more details is available. Write to Linread, Ltd., Dept. (PS), Sterling Works, Cox Street, Birmingham, 3, for a copy. We are always pleased to advise on fastening problems.



# Linread Phillips Screws

*A beautiful and  
practical table lamp*



AVAILABLE FOR  
IMMEDIATE DELIVERY

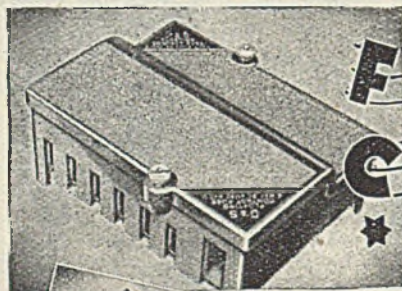
The "Wandalite" Adjustable Table Lamp gives light exactly where you want it; always "stays put" yet its balanced action moves at a finger's touch. One of the many good things the Cornercroft organisation has in hand.

Write for Illustrated  
Leaflet and Trade Terms.

REGISTERED MARK  
**WANDALITE**  
ADJUSTABLE TABLE LAMP

**CORNERCROFT (PLASTICS) LTD.**  
subsidiary of Cornercroft Ltd. ACE WORKS, COVENTRY

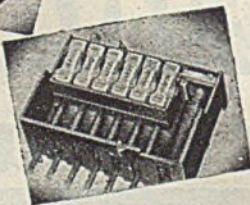
® WL13



# FLOATING CONTACT

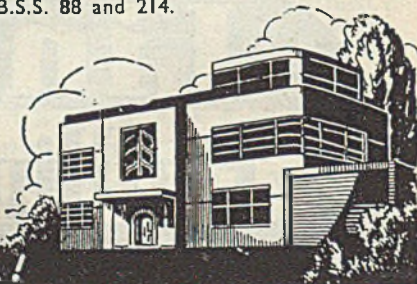
★ *the NEW distribution*

- Dimensions only  $7\frac{3}{8}'' \times 6\frac{1}{2}'' \times 4\frac{1}{4}''$ .
- Power Lighting and Heating "under one roof."
- Saving in wiring cost and space.
- Each row of fuses a separate unit.
- Each fuse in its own compartment.
- Conforms to B.S.S. 88 and 214.



2 sizes—4 way and  
6 way.  
30 A. max. cap.

Write for F.C. leaflet



*The NEW House will need it...!*

Announcement of Dorman & Smith Ltd., Manchester, London, Glasgow.

EIF46



# cables and flexibles

for

QUALITY  
DURABILITY  
SERVICE



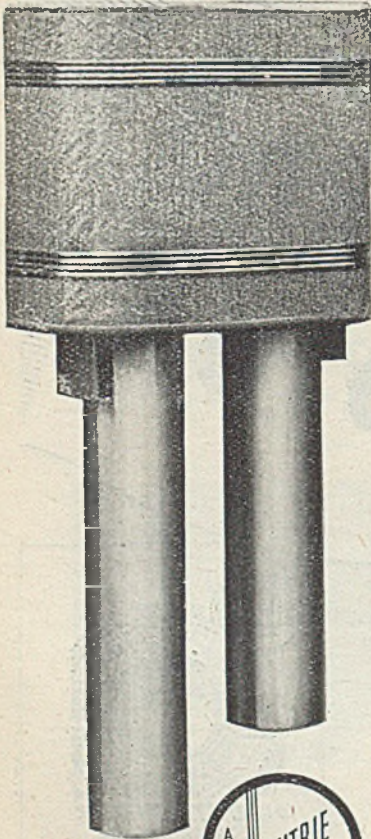
Members of the CABLE MAKERS ASSOCIATION

**THE LIVERPOOL ELECTRIC CABLE COMPANY LTD**  
LINACRE LANE • BOOTLE • LIVERPOOL • 20

# The Melo-chyme

## DOOR CALL

—BRINGS HARMONY  
TO THE *Home*



At each pressure on the door push the Melo-chyme emits a deep resonant note of two harmonious tones and is a delightful contrast to the irritating shrill of the normal door bell.

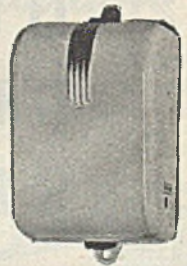
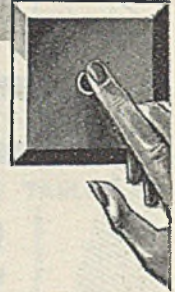
Exceptionally simple fitting. Operates from battery or mains.

PRICE

**47/6**

Transformers for use with the Melo-chyme door Call - - - -

**15/6**



Also at  
BIRMINGHAM  
MANCHESTER  
GLASGOW  
NEWCASTLE

For full particulars apply to  
**H. & D. CHURCHILL LTD.**  
(Wholesale and Export)  
WALNUT TREE WALK, KENNINGTON, LONDON, S.E.11

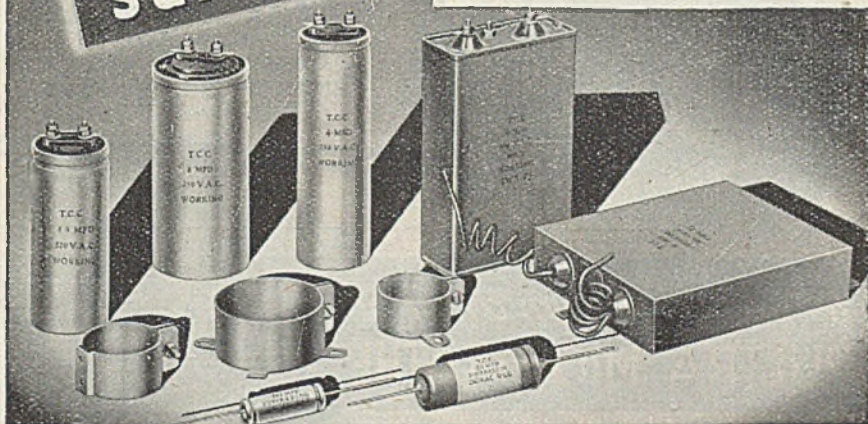


# TCC

## CONDENSERS

for **POWER FACTOR  
CORRECTION and  
INTERFERENCE  
SUPPRESSION**

especially for  
**Discharge &  
Fluorescent  
Lighting**  
•  
**Neon Signs**  
•  
**A.C. Motors**



**A Condenser Service  
second-to-none for value,  
quality and deliveries . . .**

As soon as sufficient labour and raw materials are available, the Electrical trade will proceed to satisfy the pent-up demand for Fluorescent Lighting. Such apparatus, in common with Neon Signs and most types of A.C. Motors, needs Power Factor Correction and Radio Interference Suppression by means of Condensers. Freed from most of their essential war-time commitments, T.C.C. are now applying their energies and resources to this specialised work.

Illustrated above is a small selection of our comprehensive range of special types designed for the Continuous A.C. Working conditions encountered in this sphere. The compact cylindrical types for Power Factor Correction are housed in Aluminium containers, completely hermetically sealed, with the condenser element impregnated in petroleum jelly under a high vacuum process. The more familiar rectangular tin box patterns are similarly treated and can be supplied in an infinite variety of shapes and sizes, with convenient methods of mounting to suit designers' requirements. The "streamlining" of fittings calls for co-operation from the condenser maker, and T.C.C. Engineers are ready and willing to work with you in such matters.

CONDENSER SPECIALISTS FOR 40 YEARS.

**THE TELEGRAPH CONDENSER CO. LTD.**

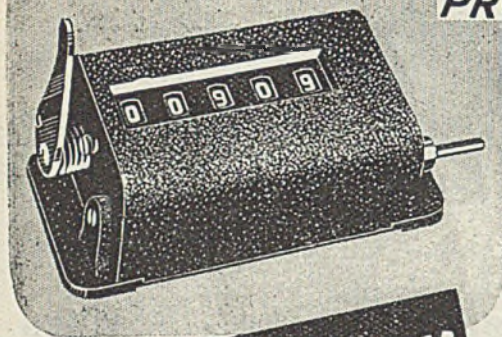
INDUSTRIAL DIVISION

NORTH ACTON • LONDON • W.3

Telephone. ACORN 0061

# TRUMETER

## PROTECTS PROFITS



One of these infallible automatic counters on a machine makes expensive over-production or time-wasting under-production impossible. You can see at a glance exactly what has been turned out. There is a TRUMETER for every requirement — counting up to seven figures, in revolutions and stroke, measuring in yards, feet or metres and fractions thereof and recording r.p.m. of shafts, etc.

Illustrated is TRUMETER SENIOR Rev. Counter, for all-winding machines, measuring machines, conveyor belts, etc.

Write for details of the TRUMETER that will help you.

**TRUMETER CO., LTD.,**  
(Dept. E/8),  
**SUNNYSIDE WORKS,**  
**LEICESTER RD., SALFORD 7.**  
(Associated with Measure-Meters Co. Ltd.)

*best on any  
COUNT*

TC 8

## *It's possible to turn a hair on a* **PULTRA MICRO-LATHE**

The ability to perform such a delicate operation is evidence of the efficiency and versatility of Pultra Lathes and their equipment. They are ideal for all small work calling for maximum accuracy.

Write for Catalogue CA 4.

**PULTRA**  
MANCHESTER

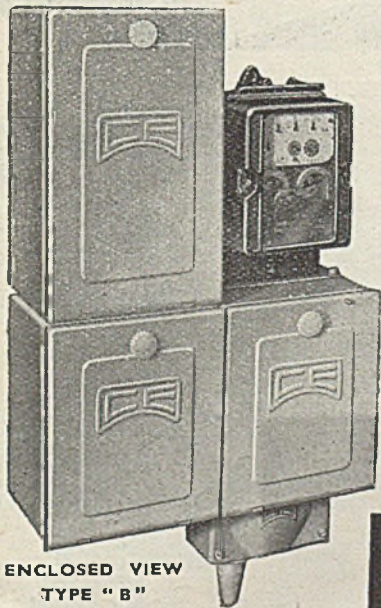
**PULTRA LTD**  
24 GRAVEL LANE, SALFORD 3,  
MANCHESTER. Phone. BLA. 9181.



*Photograph  
by courtesy of  
Miles-Martin Pen  
Co. Ltd.*

**CEMDU**  
CARLISLE ELECTRICAL MAINS  
DISTRIBUTION UNIT

*The up-to-date,  
Compact, and  
Flexible supply  
Control . . . . .*



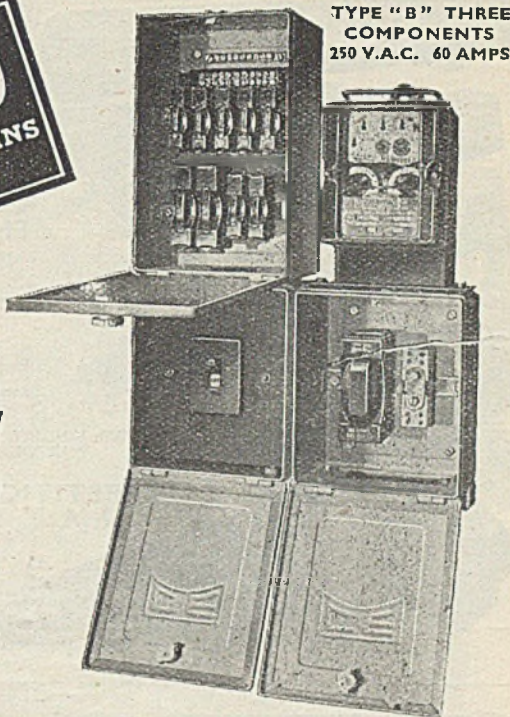
ENCLOSED VIEW  
TYPE "B"

Also Available:-

TYPE "C" TWO COM-  
PONENTS SINGLE TARIFF  
250 V.A.C. 60 AMPS.

TYPE "D" TWO COM-  
PONENTS DOUBLE TARIFF  
250 V.A.C. 60-30 AMPS.

Ⓢ C5



TYPE "B" THREE  
COMPONENTS  
250 V.A.C. 60 AMPS

Already in use by many supply authorities CEMDU is the up-to-date, trouble-free and most flexible system for the intake and distribution of electricity.

Comprising one unit housing all domestic supply control CEMDU banishes the usual chaotic conditions at the incoming end. It can be placed in any position. Supplied 60 ampere or 60 and 30 ampere double pole Main Switch Control. Any meter can be fitted; consumers' fuses are rewirable and extensions are a very simple matter. CEMDU is supplied in attractive black or cream stove enamelled finish.

Write for full particulars to the sole manufacturers.

**CARLISLE**  
ELECTRICAL  
MANUFACTURING CO. LTD.  
Bentcliffe Works, Eccles, Lancs.

Phones: Eccles 1691-2-3-4. Telegrams: "Carlectric" Eccles.



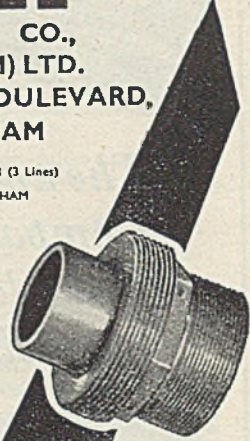
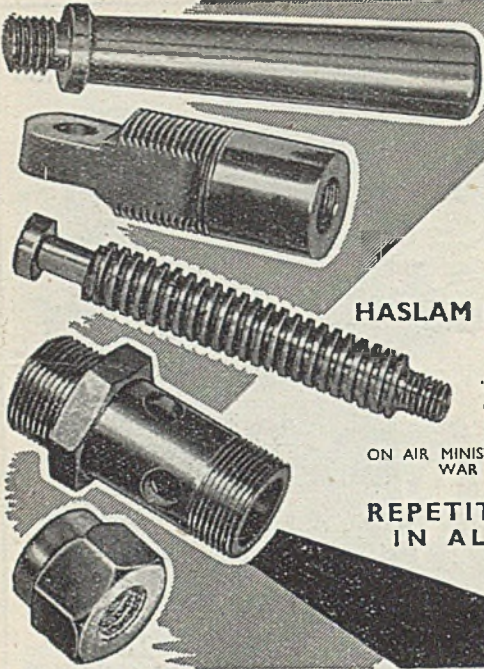
# THE CASTLE

ENGINEERING CO.,  
(NOTTINGHAM) LTD.  
HASLAM ST., CASTLE BOULEVARD,  
NOTTINGHAM

\*PHONE: NOTTINGHAM 46068 (3 Lines)  
\*GRAMS: CAPSTAN, NOTTINGHAM

ON AIR, MINISTRY, ADMIRALTY AND  
WAR OFFICE LISTS

REPETITION WORK  
IN ALL METALS

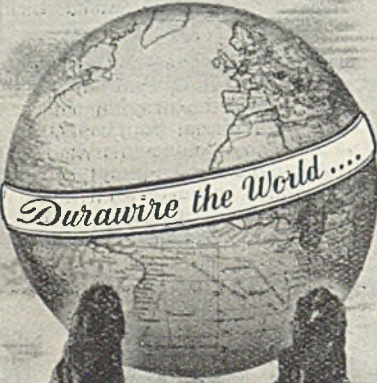


DURAWIRES

DURACABLES

DURATUBE

DURASLEEVE



DURASTRIP

DURATHREAD



*Trustworthy Friends*



*Trustworthy Friends*



**DURAWIRE**  
YOUR ELECTRICAL WORK AND BE SURE

• Sole Manufacturers: DURATUBE & WIRE LTD; FELTHAM, MIDDLESEX, ENGLAND •



# ELEPHANTIDE

REGISTERED

The **BRITISH MADE**  
PRESSBOARD INSULATION

for

**TRANSFORMERS  
SWITCHGEAR  
MOTORS**

and all other

**ELECTRICAL  
APPARATUS**

**B. S. & W. WHITELEY LTD.**

POOL-IN-WHARFEDALE · YORKS.

Telegrams: "WHITELEY, POOL-IN-WHARFEDALE"

Telephone: ARTHINGTON 98 and 99

LONDON OFFICE: 104 HIGH HOLBORN, W.C.1

Telephone: CHAncery 7646



Please fill up the form below and send to us so that we may put your name on our mailing list. We will then keep you informed of our developments. L. G. Hawkins & Co. Ltd., 30/35, Drury Lane, London. W.C.2

PLEASE USE TYPEWRITER IF POSSIBLE

NAME .....

ADDRESS .....

DELETE AS NECESSARY RETAILER-WHOLESALE  
MANUFACTURER

YEAR ESTABLISHED ..... TRADE ASSOCIATIONS  
MEMBER OF .....

HAD YOU A PRE-WAR A/C WITH L. G. HAWKINS & CO., LTD.?  
YES—NO

# W

# Y



ELECTRICAL  
PRODUCTS  
for

## STRENGTH

*'Wylex must be good'*

GEORGE H. SCHOLES  
and Co. Ltd.

Wylex Works, Wythenshawe  
MANCHESTER

- *Continuously Variable Potentiometers*
- *Miniature Wire Wound Resistors*
- *Vitreous Wire Wound Resistors*
- *Tubular Wire Resistors*
- *Preset Resistors*
- *Instrument Stud Switches*
- *Stud Potentiometers*
- *Variable Attenuators*
- *Fixed Attenuators*
- *Plugs and Sockets*
- *Faders*
- *Knobs Etc.*

Telephone:  
Northampton 2820

Telegrams:  
"Ceil/Northampton"

## Products from the House



PAINTON & COMPANY LIMITED  
KINGSTHORPE NORTHAMPTON

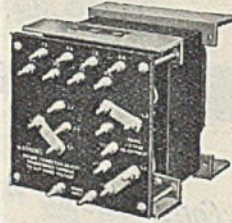


For accurate  
Temperature,  
measurement  
and control.

# Rototherm

THE BRITISH ROTOTHERM CO., LTD.,  
Merton Abbey, S.W.19. Liberty 3406.

## POWER TRANSFORMERS of QUALITY



up to 10 kVA

(As supplied to H.M.  
Government)

by The Transformer  
& Electrical Co. Ltd.

Eastern Works, Eastern  
Road, Walthamstow, E.17

Available Capacity — Immediate Delivery  
Keystone 5031/2

## PRESSPAHN, LTD.

Electrical Insulative Material Manufacturers



EST. 1900

Telephone;  
BRADFORD 5050

Telegrams & Cables:  
"PRESSPAHN"  
BRADFORD

REGISTERED OFFICES:  
38 WELL ST., BRADFORD, England

## SOCKETS

3 PIN, 5 AMP, SHUTTER  
Available in good quantities

COMPACT BALLAST UNITS  
including strikers

TENATHERAM SOIL HEATERS  
FULL LIST ON REQUEST

**J. RIVLIN**

16/17, BRUNSWICK STREET, LEEDS, 2  
Telephone 21515

ELECTRIC MOTOR & ARMATURE REWINDS

AUTOMOBILE GENERATOR

AND

STARTER ARMATURE REWINDS

OUR SPECIALITY

**48** HOUR SERVICE



PROMPT  
ATTENTION  
GIVEN TO ALL  
ENQUIRIES

RELIABLE SERVICE IN ELECTRIC MOTOR RE-WINDS.



# Why it pays to specify "SANTON"

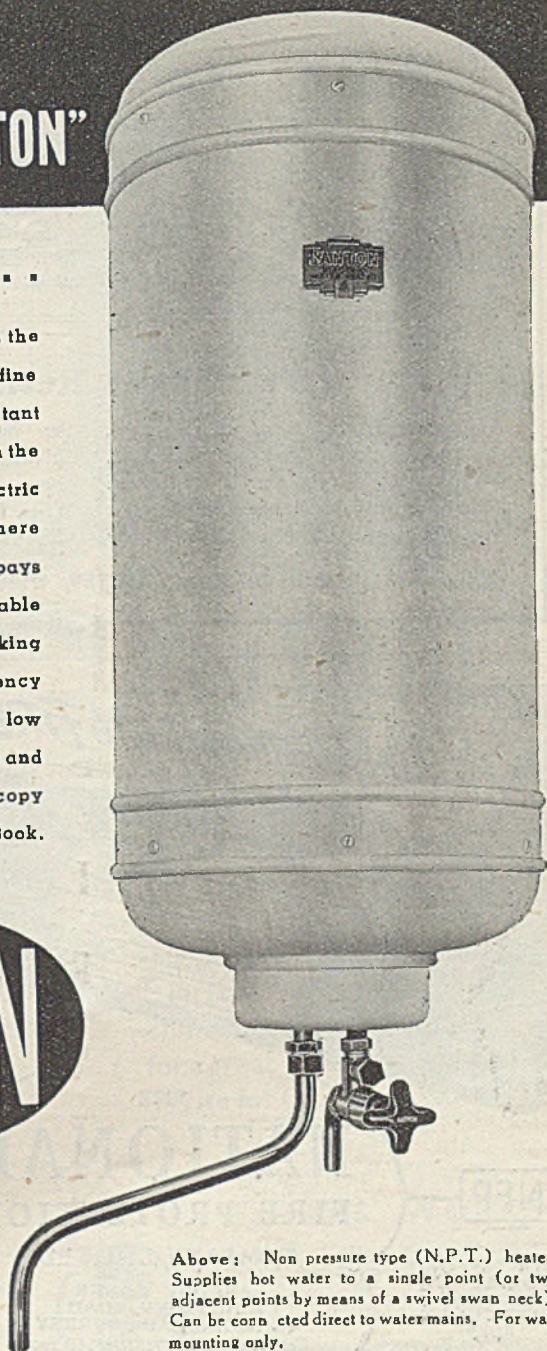
## (4) Santon Quality . .

SANTON quality comprises the main factors—good materials, fine workmanship and, most important of all, thirty years experience in the design and manufacture of electric water heaters of all types. There are many other reasons why it pays to specify SANTON. More reliable elements ensure longer working life, increased thermal efficiency cuts down electricity bills and low watt density minimises scaling and maintenance. Write for your copy of the new SANTON Data Book.



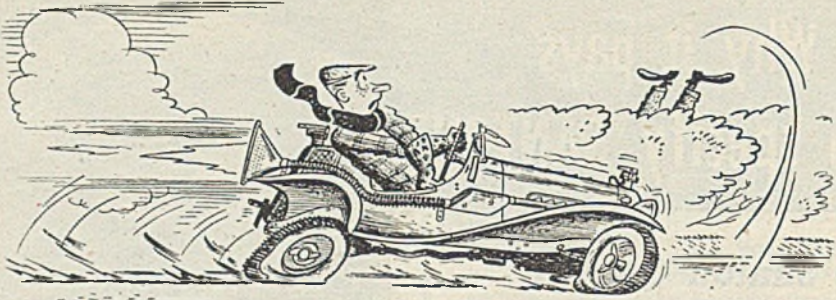
### ELECTRIC WATER HEATER

TRADE MARK "SANTON"  
9934 F



Above: Non pressure type (N.P.T.) heater. Supplies hot water to a single point (or two adjacent points by means of a swivel swan neck). Can be connected direct to water mains. For wall mounting only.

A QUESTION OF RESISTANCE



*Brookbank*

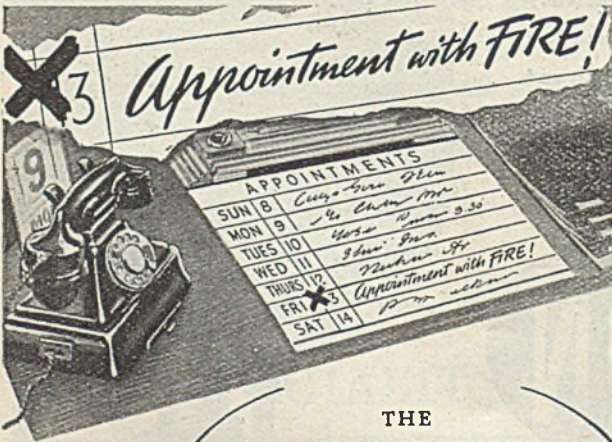
**Frictional Resistance**

Amongst the many forms of resistance, several can be extremely tiresome. If, however, your problem is concerned with electrical resistance materials, it would be worth your while to investigate

the properties of the well-known Brightray series of nickel-chromium alloys. It will save you a deal of trouble. Write for a free copy of our booklet 'Electrical Resistance Materials.'

**HENRY WIGGIN AND COMPANY LIMITED, WIGGIN STREET, BIRMINGHAM, 16**

4B/W/1



**Do you know when fire will break out in your premises?**

Be prepared against such a possibility. Install "National" the most efficient fire fighting equipment on the market and take advantage of our maintenance service to ensure you are always ready to combat the danger wherever and whenever it threatens.



**THE NATIONAL FIRE PROTECTION**

**COMPANY LIMITED.**

ARGOSY WORKS  
FINGS' ONE ROAD  
LEATHERHEAD · SURREY  
Telephone: LEATHERHEAD 2208

WRITE FOR ADVICE ON YOUR OWN PARTICULAR RISKS



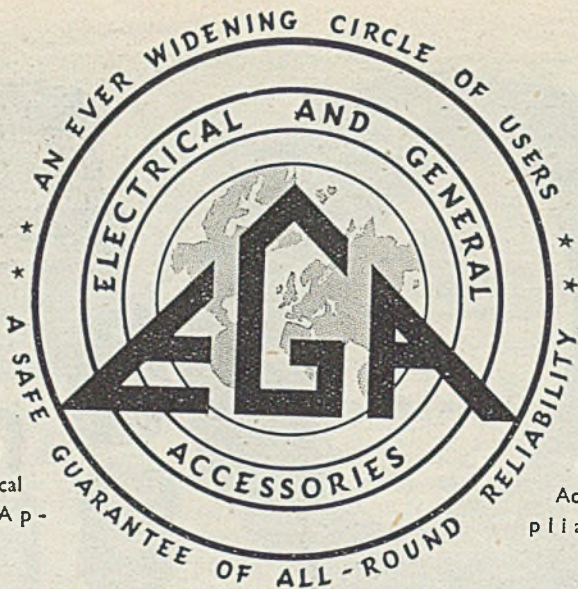
## PIRTOID SECTIONS

Laminated bakelite sections, machined from tube and sheet materials. The ease with which "Pirtoid" can be machined makes it suitable for a great variety of uses. Write for Catalogue No. P/44.

H. CLARKE & CO.,  
(MANCHESTER) LTD.  
PHONE: ECCLES 2001 - 2 - 3 - 4 - 5  
GRAMS: Pirtoid, Phone, Manchester



ATLAS WORKS  
PATRICROFT  
MANCHESTER



Manufacturers of  
Fittings, Electrical  
Domestic Ap-

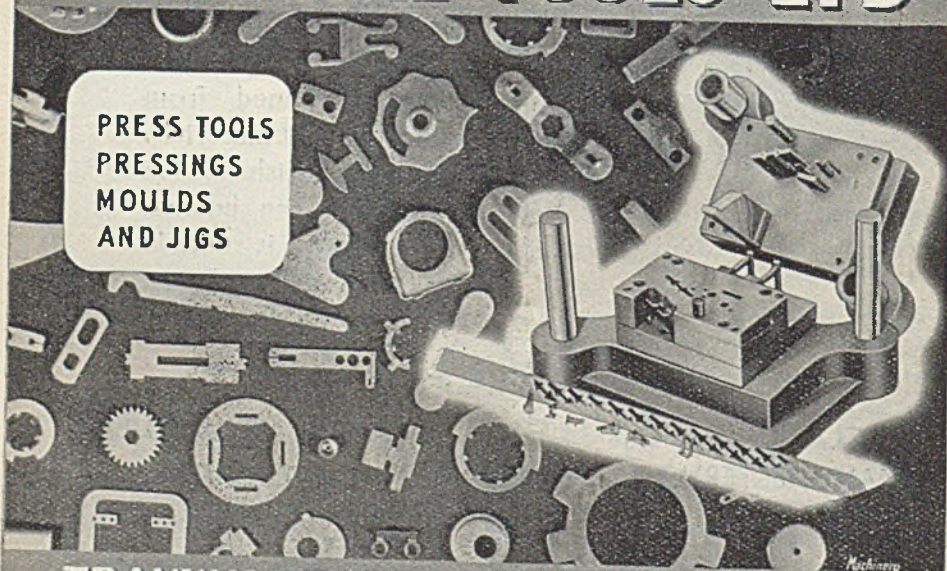
Conduit Lighting  
Accessories and  
pliances, etc.

**ELECTRICAL & GENERAL ACCESSORIES (LEICESTER) LIMITED**

Telephone: CENtral 5641/2/3 7. NEWHALL STREET, BIRMINGHAM, 3 Telegrams: Elgenic, Birmingham

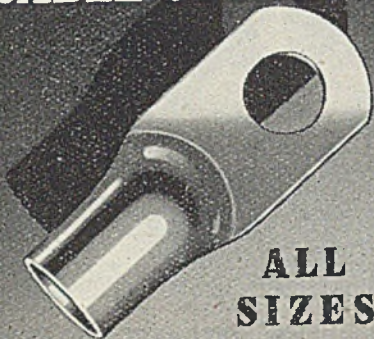
**UNIVERSAL TOOLS LTD**

PRESS TOOLS  
PRESSINGS  
MOULDS  
AND JIGS



**TRAMWAY PATH · MITCHAM · SURREY**

# Copper CABLE SOCKETS



ALL  
SIZES

The HAMPTON WORKS  
(STAMPINGS) LIMITED  
PRESSWORK EXPERTS

TWYNINGS ROAD, STIRCHLEY, BIRMINGHAM  
Tel.: KINGs Norton 2901 (3 lines). 'Grams: Radiagills, B'ham.

# Litholite

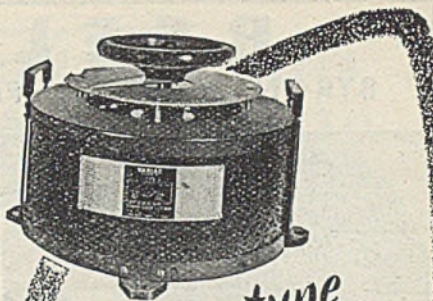
40 Years  
of

# Plastic Moulding

LITHOLITE INSULATORS &  
ST. ALBANS MOULDINGS LTD.

## WATFORD

'PHONE: WATFORD 4494



The new type  
50B

# 'VARIAC' REGULATING TRANSFORMERS

Roughly triple the  
power rating of  
the '100' Series

The Type 50 B Variac, handling 7 kVA at 230 V in. represents valuable addition to the Variac range, and will find many applications in industry.

50 B 7kVA Input 230 V (tap at 115 V), output 0-230 or 0-270V. Rated current 20 amps. Max. 31 amps.

Excellent deliveries can be arranged. Most types are in stock. Other Variac types range from 165 watts to 7 kW. Write for bulletin 424 E and circular 146 E for complete data.

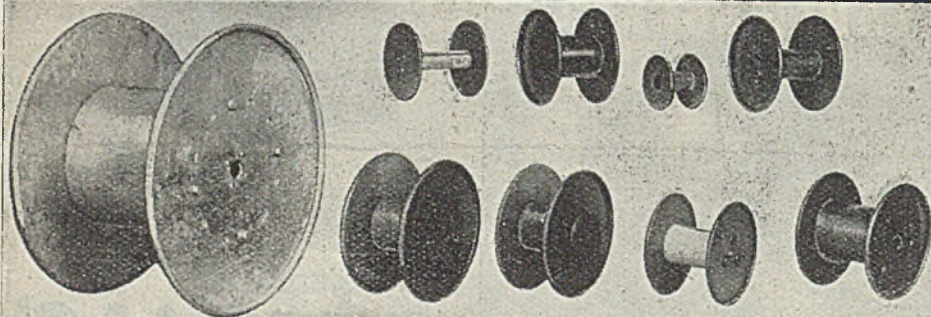
# Claude Lyons LTD

ELECTRICAL AND RADIO LABORATORY APPARATUS ETC.

180 Tottenham Court Road, London, W. 1  
and 76, Oldhall Street, Liverpool, Lancs.

# REELS LTD.

BYRON STREET : PRESTON : 'PHONE : 3922

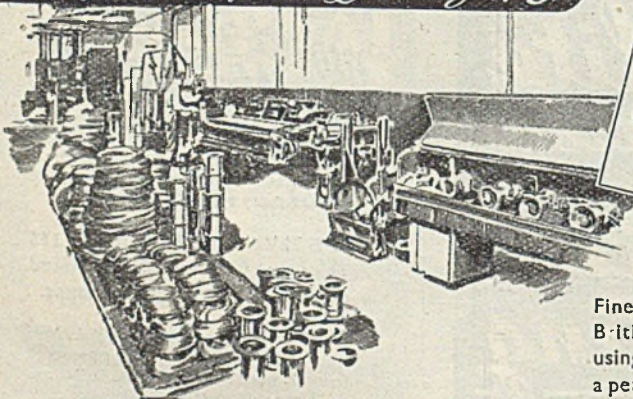


Makers of all kinds of wood and steel reels for the electric wire and cable trades.

Our speciality:—Steel flanges with very strongly beaded edges in a wide range of diameters.

Try **REELS LTD.** for **R**igid **E**fficient **E**ver-lasting **L**ight **S**trong

## *The Process of Wire Drawing (No 3)*



*Fine Wire*  
**DRAWING**

Fine copper wire is drawn on British high speed machinery using Diamond dies, thus ensuring a perfect finish and gauge, to meet the most exacting specifications.

## **R. H. SYMONDS**

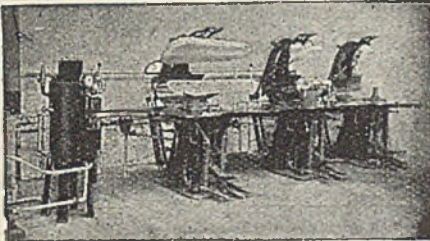


47 Victoria Street, Westminster, LONDON, S.W.1

Telephone: ABBey 2771 (Pre. Br. Ex.)

Works: Enfield, Middlesex.

★ You can SEE  
why they use  
**ELECTRODE BOILERS**



30 K.W. Boiler supplying steam for three pressing machines

Electrode boilers are the cleanest and most convenient sources of heat available. They need no boiler house, no chimney, no fuel store. There is no difficulty with fuel supplies and where supply companies have favourable rates, "B. & A." boilers show great over-all economy.

FOR STEAM SUPPLY  
FOR HEATING & HOT WATER

(6)

BASTIAN & ALLEN LTD., 11 BEDFORD SQUARE, W.C.1  
Northern Office: 62 Robertson Street, Glasgow, C.2

Progressive wholesale Electrical House in West Riding of Yorkshire seeks first class products in Electrical goods. Sole distribution of guaranteed sales undertaken. Box J.R., "The Electrician," 154, Fleet Street, London, E.C.4.

**TRUCKS**  
FOR ALL TRADES

Let us handle your enquiries  
**REVILL, CARTER & CO.**  
TRUCK BUILDERS  
OTLEY ROAD,  
SHIPLEY, YORKS.  
Telephone No: 358 Shipley



**SAVES  
UP TO  
15% FUEL**

A Leonard-Thermostatic Steam and Water mixer provides hot water at controlled temperature for washing and process.

HOT WATER MADE ONLY WHERE WANTED—  
ONLY WHEN WANTED—COMPLETE CONTROL  
OUTFLOW TEMPERATURE—NO HEAT STORAGE  
AND RADIATION LOSSES—NO HOT WATER PIPE  
LINES—NO EXPENSIVE  
EQUIPMENT—EASY TO FIT—  
EASY TO CLEAN—EASY TO  
MAINTAIN—TAKES UP  
LITTLE MORE SPACE THAN  
AN ORDINARY STOP VALVE  
—THOUSANDS IN USE.



★ WRITE FOR PAMPHLET  
QUOTING REF.: 163/1857

*Leonard-Thermostatic*  
**STEAM & WATER MIXERS (PATENTED)**

**WALKER, CROSWELL & CO. LTD**  
CHELTENHAM GLOS.

61.1857

**RADIANT ELECTRIC  
BED WARMERS**

SUPPLIES NOW AVAILABLE

Apply to your local Wholesaler

Wholesalers' enquiries should be made to:-  
**SOUND, 483-489, BARLOW MOOR RD., MANCHESTER, 2**

**£1.9.6**  
plus P.T.

**CORK**

BRITISH CORK MILLS LTD,

167, Victoria Street,  
London, S.W.1.

Phone: VICTORIA 1414-5-6  
7713

**C. Clifford & Son Ltd.**  
BIRMINGHAM



**PHOSPHOR  
BRONZE**

"SEA-CLIFF"  
Trade Mark.

**TUBES, SHEETS, RODS & WIRE**

To the latest Air Ministry, Admiralty, War Office  
and B.S. Specifications.

## MISCELLANEOUS ADVERTISEMENTS

### TENDER

COUNTY BOROUGH OF BELFAST.  
ELECTRICITY DEPARTMENT.

#### Stores.

TENDERS are invited for the supply of the undermentioned materials:—  
Form No.

3. Firebricks, Fireclay and High Temperature Binding Cement.
4. Spare Parts for Mechanical Stokers.
5. Carbon Brushes.
6. Refined Bitumen.
8. Glazed Stoneware Troughing and Covering Tiles.
9. Feeder and Section Pillars.
10. 6 600 volt Compound Filled Armoured Lead Switchgear.
11. Meters and Instrument Transformers.
12. Electricity Maximum Demand Indicators.
13. Automatic Time Switches.
14. I.T. Fuse Units, House Service Cut Outs and House Service Connector Boxes.
15. Static Transformers.
16. Vulcanised Bitumen and Paper Insulated Cables.
18. Electric Washboilers.
19. Electric Kettles.
21. Electric Cookers.
22. Bare Hard Drawn H.C. Copper Conductors and P.B.J. Insulated Cables.
23. Street Lighting Fittings, Steel and Concrete Poles and Ancillary Equipment.
24. Transformer Kiosks.
25. Overhead Line Materials.
27. Electrical Accessories and Tinned Weak Back Ferrules.
28. Bitite Strip, Prepared Tape and Rubber Tape for Joints and Joint Box Compound.
29. Rubber Insulated Cables and Flexible Cords.
30. Lamps.
31. Oilskin Coats, Tarpaulins, Rubber Jointing, etc.
32. Water Heating Equipment.
33. Switch Tripping Batteries and Charging Equipments.

Note.—Forms Nos. 29, 30 and 31 are in respect of materials which shall be supplied to any Departments of the Corporation.

Forms of Tender and further particulars may be obtained from the City Electrical Engineer and General Manager, East Bridge Street, Belfast.

Tenders, which must be on official forms only, must be enclosed in sealed envelopes, endorsed with the names and addresses of the firms tendering and marked "Tender for Stores, Electricity Department," and be lodged with the undersigned not later than 4 p.m. on FRIDAY, 21st February, 1947.

An official receipt must be obtained for each Tender delivered by hand. Tenders sent by post should be registered.

JOHN DUNLOP,  
Town Clerk.

City Hall, BELFAST.  
23rd January, 1947.

### SITUATIONS VACANT

THE CIVIL SERVICE COMMISSIONERS announce that a special competition will be held for appointments as Assistant Engineer (New Style)—Male—in the Post Office Engineering Department and Assistant Traffic Superintendent in the Telephone Department of the General Post Office. Approximately 100 vacancies in each grade will be filled by examinations spread over a period of two or three years.

Candidates must have been born on or after the 2nd August, 1915, and have attained the

age of 18 by the 1st January of the year in which they compete. Allowance will be made for service in H.M. Forces prior to 3rd September, 1939.

Men only are eligible to compete for appointment as Assistant Engineer (New Style).

The salary scales are as follows:—

Assistant Engineer (New Style):

London: £280 rising by annual increments of £20 to £580.

Provinces: £265 rising by annual increments of £20 to £560.

(Including consolidation addition.)

Assistant Traffic Superintendent:

Men.—London: £190 rising by annual increments of £18 to £465.

Provinces: £180 rising by annual increments of £18 to £455.

Women.—London: £190 rising by annual increments of £12 to £375.

Provinces: £180 rising by annual increments of £12 to £345,

to which is added a consolidation addition ranging from £78 at the minimum to £90 at the maximum for men over 21, with corresponding addition from £63 to £72 for women over 21. For men and women below the age of 21 the additions are as follows:

Age.	Men.	Women.
18	£47	£47
19	£55	£55
20	£63	£59

Male candidates may apply to compete for appointment as Assistant Engineer (New Style) and Assistant Traffic Superintendent at the same examination.

There will be prospects of promotion to higher grades.

Candidates now serving in H.M. Forces must send in their application forms in time to reach the Civil Service Commission not later than six months after the completion of their service. All other candidates must send them in by 1st April, 1947, except that for candidates who are under 18 years old on the 1st April, 1947, the latest date for sending in the form is the 1st January following their 18th birthday.

Copies of the Regulations and Forms of Application may be obtained from the Secretary, Civil Service Commission, Burlington Gardens, London, W.1, or from the Chief Officer, Civil Service Commission, at the following addresses, quoting 1679:—

(India)	10, Underhill Lane, Delhi.
(Egypt)	8, Sharia Tolumbat, Garden City, Cairo.
(Italy)	c/o. G.H.Q., C.M.F.
(Germany)	c/o. 2nd Echelon, G.H.Q., B.A.O.R.

### COUNTY COUNCIL OF DUMFRIES.

#### ASSISTANT DISTRICT ENGINEER.

THE Council invite applications for appointment of assistant district engineer. Applicants must have had a sound technical training and experience of the operation and maintenance of H.V. and L.V. overhead distribution systems and rural development work.

The salary will be in accordance with the N.J.B. Schedule, Class F, Grade 8A, at present £413 rising to £429 per annum. The appointment will be subject to the Local Government Superannuation (Scotland) Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications stating age, qualifications and experience, together with names and addresses of three persons who will furnish references, if necessary, must be forwarded to the undersigned not later than 21st February, 1947.

J. C. GRANT,  
County Clerk.

County Buildings, DUMFRIES.  
24th January, 1947.



**SITUATIONS VACANT**  
**HUDDERSFIELD CORPORATION**  
**ELECTRICITY DEPARTMENT.**

**APPOINTMENT OF CONTROL ENGINEER.**

APPLICATIONS are invited for the position of Control Engineer at the St. Andrew's Road Generating Station of the Huddersfield Corporation, at a salary in accordance with the National Joint Board Scale, Class "H," Grade 9, £402/417 per annum.

Applicants should have had practical experience in the operation of a Modern Selected Power Station, and Central Electricity Board Grid Supplies.

Applications stating age, qualifications, practical and technical experience and accompanied by at least two copies of recent testimonials should be submitted to the Borough Electrical Engineer and Manager, Market Street, Huddersfield, not later than Friday, the 14th February, 1947, and enclosed in a sealed envelope endorsed "Control Engineer."

The appointment will be subject to the Corporation's Conditions of Service and to the provisions of the Local Government Superannuation Act, 1937. The successful candidate will be required to pass a Medical Examination.

HARRY BANN,  
 Town Clerk.

Town Hall, HUDDERSFIELD.  
 23rd January, 1947.

**CITY OF MANCHESTER ELECTRICITY DEPARTMENT.**

**WANTED FOR DUTIES IN POWER STATIONS:**

**ONE COMBUSTION ENGINEER**, at a salary in accordance with Class J, Grade 9, of the N.J.B. Schedule (£425 p.a. to commence).

Applicants must have had previous experience of efficient combustion of low grade fuel in water-tube boilers fitted with mechanical stokers.

**ONE CONTROL ROOM ENGINEER**, at a salary in accordance with Class J, Grade 10a, of the N.J.B. Schedule (£335 p.a. to commence).

**ONE CONTROL ROOM ENGINEER**, at a salary in accordance with Class K, Grade 10a, of the N.J.B. Schedule (£357 p.a. to commence).

Candidates for all positions must have served a workshop apprenticeship, and have the Higher National Certificate in Electrical Engineering or equivalent. Applicants without these qualifications because of service in I.L.M. Forces will be considered.

The appointments are subject to the City Council Superannuation Scheme, and the successful candidates will be required to pass a medical examination.

Applications giving full particulars of age, technical training and experience, together with copies of recent testimonials, should be endorsed "Combustion Engineer" or "Assistant Engineer, Control Room," and addressed to Mr. R. A. S. Thwaites, Chief Engineer and Manager, Electricity Department, Town Hall, Manchester, 2; and be received not later than 10 a.m. on Monday, 24th February, 1947.

Canvassing, directly or indirectly, will disqualify.

PHILIP B. DINGLE,  
 Town Clerk.

Town Hall, MANCHESTER, 2.  
 January, 1947.

**A RMATURE Winders** required, also Charge-hand or Foreman, also Improvers for fractional motors up to 50 h.p. Standard rates, good prospects.—D.C. Engineering, Sherborne, Dorset.

**FOREMAN** required by electrical contractors, experienced in cable laying, jointing and overhead line work. Vacancy in Midlands or London district.—Box L.D.K., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

**SITUATIONS VACANT**

**IMPERIAL CHEMICAL INDUSTRIES, LTD.**, Wilton Works, require **DRAUGHTSMEN** to assist with the design and detailing of a large new works. Successful candidates will be appointed to the established staff. Preference will be given to applicants who hold the Higher National Certificate or higher qualification and have the appropriate experience, as follows:—

**DRAUGHTSMEN—CIVIL:** Design of roads, railways, drains, and water services.

**STRUCTURAL:** Design of buildings and structures, and design and detailing of reinforced concrete work.

**MECHANICAL:** Design of pipework for steam, gas and water, compressed air stations, lay-out of chemical plant, etc.

**ELECTRICAL:** (a) Design of heavy industrial power wiring and lighting installations and special motor control circuits.

(b) Design of a large distribution network, 11 K.V. and 400 V., including switchgear transformers and heavy paper insulated cables.

**DRAUGHTSMEN AND TECHNICAL CLERKS**—**ESTIMATING:** With experience on estimating, programming and progress work.

Application Forms may be obtained from the Personnel Manager, I.C.I. Ltd., Wilton Works, P.O. Box 54, Middlesbrough, Yorks. Applications must be submitted within fourteen days of the appearance of this advertisement.

**CROWN AGENTS FOR THE COLONIES.**

APPLICATIONS from qualified candidates are invited for the following post:—

**COLLIERY ELECTRICIAN** required for the Nigerian Government Colliery Department for one tour of 18 to 24 months with prospect of permanency. Commencing salary according to age and war service in scale £400 rising to £560 a year. On salary of £400 local allowance of £60 a year and separation allowance for married men between £84 and £294, according to number of dependants. Outfit allowance £60. Free passages and quarters. Candidates, not over 40 years of age, must hold a Mines Department Certificate of Competency to take charge of electrical installations on the surface or underground. They must have served an apprenticeship with an electrical manufacturing firm, have had at least six years subsequent experience in a supervisory capacity as a colliery electrician, and be familiar with the principles and practice of three phase alternating current as applied to mining work (including fairly heavy pumping installations). Applicants should state other qualifications, e.g., M.A.M.E.M.E., or A.M.I.E.E. Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1. quoting M/N/17597 on both letter and envelope.

**YOUNG Electrical Engineer**, B.Sc. honours, required for development laboratory of large electrical concern, S.W. London area. Some experience electronics essential. Apply in writing, stating age, experience and salary required, to—Personnel Manager, 45, Nightingale Lane, S.W.2.

**ASSISTANT Engineer** required by Electrical Contractors, experienced in Cable Laying, Jointing and Overhead Line Work. Vacancy in Midlands or London District.—Box L.D.P., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

**JOINTERS** required for work in Persia.—Suitable applicants would be placed on a year's contract with good salary and accommodation found.—Apply Box L.D.H., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

## SITUATIONS VACANT

**D**ESIGNER Wanted. Experienced in complete design of three phase motors up to 150 H.P. To take charge of production in small works. Yorkshire district.—Box L.D.O., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

## SALES BY AUCTION

G.



R.

BY ORDER OF THE MINISTER OF SUPPLY.  
M.O.S. DEPOT, NO. 120, GHYLL BROW,  
BARNOLDSWICK, YORKSHIRE.

F. S. AIREY, ENTWISTLE & CO. are instructed to SELL BY AUCTION on WEDNESDAY, FEBRUARY 19th, 1947, on the premises at 11 a.m.

MISCELLANEOUS SURPLUS STORES,  
TESTING APPARATUS AND GENERAL  
EQUIPMENT,  
including

5 Avery, Rockwell, and Vickers Hardness Testing Machines, 3 Crack Detectors, Orcutt Involute Measuring Machines, 3 Parkson Gear and Bend Testers, 3 Demagnetisers, Marking-out Tables, Surface Plates, Vices, Gauges and Loose Tools.

Six 5½ K.W. and Two 3 K.W. Absorption Generators, with loading resistances, 17½ K.W. Motor Generator, Amal Jet Calibrating Machine, 18 Amal Flow Meters, Tachometers, Pressures Gauges and Test Instruments.

11 Motorised Pumps, 13 Gwynn and other Pumps, 15 Semi-Rotary Pumps, 3 Meta and 1 Streamline Oil Filters, 4 De Laval Centrifugal Separators, 38 Various Tanks, 500 gals. to 50 gals., Stack, Magnetic and other Filters, 92 Engine Cages and Trolleys.

10 Paint and Paraffin Spray Booths, Wax Melting Apparatus, Paraffin Wash Cabinets, Portable Air Compressor Unit.

1 Lister and 1 Douglas Petrol and 1 Electric Battery Trucks, Yale 5-Ton Handling Truck, 10 Lister Trailers, 30 Various Trucks and Trolleys.

Phoe 1 Ton Portable Crane, 1 Ton Electric Blocks, 30 Sets Morris and Other Lifting Blocks to 2 Tons, Trolleys and Gantries, Slings and Lifting Tackle.

Engine Test Bed Units, Test Rigs, Stand Assemblies, Servicing Stages, Mounting Drums and Engine Test Equipment.

11 Platform, Counter and Computing Scales, 18 000 Cartons in various sizes, Electric Hot Plate, Propellers and Cases and Miscellaneous Stores.

On view from 10 a.m. to 4 p.m. each working day (not Saturday) seven days prior to sale.

Catalogues (price 6d.) to admit two to view and one to sale may be had on application to the AUCTIONEERS, 45, Cross Street, Manchester, 2 (Tel. Bla. 9854/5), and 15, Nelson Square, Bolton (Bolton 1534).

## FOR SALE

GLASGOW CORPORATION ELECTRICITY DEPARTMENT.

## TIME SWITCHES.

**T**HIS Department has for disposal 786 Venner Time Switches, ranging from 5 to 100 amperes, single and three-phase, hand wound, electrically wound, and oil-break types.

Tender forms can be obtained from the General Manager, Corporation Electricity Department, 75, Waterloo Street, Glasgow, C.2, with whom arrangements can be made for inspection of the switches.

Offers, clearly marked "Tender for Time Switches," should be lodged with the Town Clerk, City Chambers, Glasgow, C.1, not later than 10 a.m. on Monday, 24th February, 1947.

WILLIAM KERR,

Town Clerk.

City Chambers, GLASGOW, C.1.  
22nd January, 1947.

## FOR SALE

**P**REPAYMENT METERS. — A Supply Authority has for disposal about 300 modern prepayment meters, 5 amperes, 200/250 volts, 50 cycles, mostly change-plate type. Makers—Smith, E.A.C., Ferranti. Some are for shillings only, some for pence or shillings. The price per unit in the Smith and E.A.C. can be instantly changed over a wide range without requiring change wheels. Further particulars will be supplied on application to Box L.D.S., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

**S**OEMCO LTD., FLUORESCENT LIGHTING SPECIALISTS, have the Sole Distribution Rights of the new BI-UNI Press Button Domestic and Industrial Lighting Switch. Delivery four weeks. Apply for details—Scemco Ltd., Scemco House, 6/7, Soho Street, W.1.

**F**LUORESCENT LIGHTING.—Write for details of our amazing OUTDOOR UNIT. Guaranteed weatherproof with rubber insulated unbreakable glass covering the 1, 2 or 3 tubes. Ideal for garages, sports stadiums, wharfs, etc. Scemco, Ltd., 6/7, Soho Street, London, W.1. Tel.: Ger. 1461.

**F**LUORESCENT LIGHTING.—CHOKES, extra quality, elongated, 4 ft., 40 W, tapped 200/250 V, silent working, each unit guaranteed, measurements 1½ in. by 1½ in. by 8½ in. Price £1 5s. each, net. Carriage extra.—Write Scemco, Ltd., 6/7, Soho Street, London, W.1. Phone: GERard 1461.

**F**LUORESCENT FITTINGS.—If he is electrically wise, it's Scemco he buys. For details of Fluorescent fittings, apply: Scemco, Ltd., 6/7, Soho Street, London, W.1. Tel.: Ger. 1461.

**F**LUORESCENT LIGHTING.—Constead units for sale, dispenses with all starter gear and gives instantaneous lighting, prevents maintenance worries; each unit guaranteed.—Apply Scemco, Ltd., 6/7, Soho Street, London, W.1. Tel.: Ger. 1461.

**F**LUORESCENT LIGHTING FITTINGS.—Extensive range including Trough and Flush type fitted with "All in one" "Constead Unit," and complete with tubes.—Write Scemco, Ltd., 6/7, Soho Street, London, W.1. Phone: GER. 1461.

**S**TEAM Generating Set, Belliss and Morcom twin-cylinder engine, speed 448/495 r.p.m., complete with condenser, coupled to Siemens generator, 150 kW, 220 volt D.C., 660 amps., No. 30921; also Steam Generating Set, Allen twin-cylinder engine, speed 400 r.p.m., complete with condenser, coupled to E.C.C. generator, 100 kW, 220 volt D.C.—Edgar G. Rees, Great Western Dock, Llanelli.

**B**US-BARS: 1350, 12 ft. sections, with 6 tappings per section, of ¾ in. copper rod, completely cased in, and complete with connectors. Also TAPPING-IN FUSE BOXES for BUS-BARS. SWITCH GEAR: 2 Feeder Units complete with 13 switches as 3-660-volt, 60-amp., 7-660-volt, 150 amp., 3-660 volt, 300-amp.; 1 Main Feeder Unit, with 8-660-volt, 60 amp. Sub-Switches; 6 Main 3-phase and neutral 1000-amp. Switches; 2 Distribution Units with 8 outgoing 660-volt, 150 amp. Switches; 12-660-volt, 60-amp. Main Switches and Fuses 3-phase with cable trough; 1 Bus-Bar Unit with 3-660-volt, 150-amp. 3-phase Switch and Fuses; 14-660-volt, 150 amp. 3-phase Switch and Fuses; 10-660-volt, 300-amp. 3-phase and neutral Switch and Fuses; 3 Main Cable 300-amp. Link Boxes; 1 "Igranio" Control Unit complete with Bus-Bar Chamber 4-60 amp. and 1-150-amp. Switch and Fuses.

**F**LUORESCENT FITTINGS: 100 Twin Tube Fluorescent Fittings, complete with chokes and condensers, £6 each. **DUAL FITTINGS:** 102 Dual Fittings, Shades only, as new, 25s. each; 6 Dual Fittings, complete with chokes, condensers and lamps, £6 each. Apply: C. J. Rice, 137, Mayplace Road West, Bexley Heath, Kent. Phone: Bex. Heath 3282.

## FOR SALE

**600-W.** and **750-w.** Spiral Elements, large quantities ex stock, competitive prices, 5d. and 6d. each respectively.—Middlesex Electron Co., Ltd. (Molesey 3541).

**9 IN.** Pencil Bar Elements for Electric Fires, immediate delivery. Supplied as plain bars, wound, or complete with end fittings. Send 2s. 9d. for wired sample, or call Dicas (London) Ltd., 20, Mackenzie Street, Slough, Bucks.

**SECTIONAL** timber buildings.—Completely reconditioned and equal to new. Sizes: 6 ft. by 6 ft., 20 ft. by 12 ft., 22 ft. by 17 ft., 36 ft. by 16 ft., 49 ft. by 20 ft., 60 ft. by 16 ft., and 76 ft. by 15 ft., and others. Suitable for offices, canteens, workshops, classrooms, hostels, and bungalows. No purchase licence required. Offered subject to being unsold.—D. McMaster and Co., Mount Bures Works, 2ic, Bures, near Colchester, Essex. Tel.: Bures 351/2.

**1-H.P.** Motors, 230-250 volts, 50 cycles, split-4 phase, starting torque 225 per cent., sleeve bearings, automatic thermal protection. These motors are brand new and manufactured by English Electric. A few are available for immediate delivery at £7 10s. each net. Carriage paid for lots of 12 or more.—Waltman Electrical Co., The Mall, Chiswick, W.4 (Chiswick 4542).

**5000** GOOD strong Crates, inside measurements 29 in. by 9½ in. by 9½ in. ½ in. thick, batted all round, at 9s. 9d. each, ex works.—L. Goldaer and Sons, 14a, Rectory Square, London, E.1 (Tel.: Stepney Green 2550).

**FIRE** Elements.—Good quality, pencil type. Wound nichrome wire. 9½ in., 1 kW, 43s. dozen; 500 lots, 3s. 7d. each; 1000 lots, 3s. 6d. each; 5000 lots, 3s. 3d. each. 8 in., 750 w, 42s. dozen; 500 lots, 3s. 1d. each; 1000 lots, 3s.; 5000 lots, 2s. 9d. Quotations for other sizes. Immediate delivery all sizes. Carriage paid 500 and over, otherwise 4s. 2d. per 100 extra. Samples 5s. each.—The Welco General Supplies, Knebworth, Herts.

**"COLD NIGHTS."**—"Snug" new improved Electric Bed-Warmer; lasts a lifetime; no leaks, simple, safe and effective; complete with flex; thousands in use; sample carriage paid; price 16s., inc. P.T.—Wycomware Ltd., 39, Piccadilly, Manchester, 1.

**OSMOR** 5-valve Superhet, 3-wave band A.C. D.C. RECEIVER. Exceptionally good sensitivity and reproduction. Attractive cabinets. Early delivery. Price £18. 18s. Write for illus. leaflets.—Morgan Osborne, Ltd., Southview Road, Warlingham, Surrey.

**OSMOR** Radio Heart equals complete first-class 5-valve Superhet, positively only small condensers and resistances to find. Super-efficient components. Building instructions, £5 16s. Cabinets. Trade invited.—Morgan Osborne, Ltd., Southview Road, Upper Warlingham 2560, Surrey.

**"ADDRESSING the Public."**—A handbook devoted exclusively to the fundamentals of good public address technique and the problems of your P.A. department.—Obtainable at 3s. 6d. (post free) from the Acoustical Manufacturing Co., Ltd. (Dept. B.2), Huntingdon.

**DYNAMO & MOTOR REPAIRS LTD.,**  
Wembley Park, Middlesex.  
Telephone: Wembley 3121 (4 lines).  
Also at Phoenix Works, Belgrave Terrace,  
Soho Road, Handsworth, Birmingham.  
Telephone: Northern 0898.

**REBUILD MOTORS AND GENERATORS**  
Long 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 1000 RATINGS 'TUALLY IN STOCK**  
**HERE.**

## FOR SALE

**AUTO BULBS.** Side and Tail and Head Bulbs, prompt delivery. Wholesalers send purchase tax number for samples and price.—J. N. Somers, Ltd., 10/12, Cricklewood Broadway, London, N.W.2. (Tel.: G.L.A. 3005).

**WEE MEGGERS** 500 V, £12 5s. 6d. Record 500 V test sets, £11. New. Carriage paid.—Robins' Electrics, 222, West End Lane, N.W.6. HAM 0879.

**TRANSFORMER** for sale, "Welders" to BSS/171/1936 4 kVA 1 phase 50 Type AN. 400/230-0-90 Volts, Excellent condition. £50. Carriage Paid.—Apply J. Thorn and Sons, Ltd., Brampton Road, Bexleyheath, Kent. Bexleyheath 305.

**WE** can supply all types of Presspahn Insulating pieces to specification, and would appreciate enquiries.—Tradex Manufacturing Co. Tradex Works, Swindon.

**LEATHER FINGER STAIRS.**—Made of Chrome Hide. Very strong and hard wearing. Length 3 in. Price 4s. per doz. Prompt delivery. Sample on application.—Willson Brothers, Industrial Clothing Manufacturers, Epsom, Surrey.

**SACKS** and Bags in excellent condition for all commodities, as low as 4d. each. Write: John Braydon, Ltd.,

230, Tottenham Court Road, W.1.  
Tel. No.: Museum 6972.

**ELECTRIC MOTORS,** A.C. and D.C. We supply all types and sizes of Electrical Machinery—Slow Speed Reduction Gears can be supplied to customers' requirements with short deliveries. Send your enquiries to The Electro Power Co. Ltd. (formerly Be-Be, Eng.), 3, Retreat Close, Kenton, Middlesex. Tel.: WORDSWORTH 4923.

**VACUUM** Cleaner Spares and Accessories. Bags, bearings, belts, brushes, fans, switches, etc. Repairs, rewinding, rebristling. Sent for price list.—Reliance Vacuum Cleaner Service, 152-154, Broadway, Bexleyheath, Kent.

**ATLAS** lamps from stock, delivery in London, Surrey, Sussex and Kent; other lines include clocks, toasters, fires, irons, kettles, fans, fittings, chargers, speakers, etc.—Drubel Radio Distributors, Ltd., 39a, Stafford Road, Croydon. Croydon 1107.

**A.C./D.C.** Motors and Switchgear can be supplied from stock or at short notice. Send your requirements to John Phillips and Co. Electrics, 31, Fortune Green Road, N.W.6. Telephone: Hampstead 8132.

**TINNED STEEL ARMATURE BINDING WIRE.**—All even numbered sizes from 16 s.w.g.-22 s.w.g. supplied from stock on 7 lb., 14 lb. or 28 lb. reels.

**FREDERICK SMITH & CO. WIRE MANUFACTURERS LTD.,** CALEDONIA WORKS, HALIFAX.

**JUNCTION** Electric Irons, superior design and quality, supplied with suitable stand. Also Junction Nickel plated Torch Cases. Supplied for home trade and export. Also large selection of household electrical appliances, Fires, Radiators, other electric Irons, Toasters, Table Lamps, Torch cases, Dry batteries, etc. Please write for full list.—Brooks & Bohm, Ltd., 90, Victoria Street, London, S.W.1. Tele.: Vic. 9550/1441.

**SUPERIOR** Type Builders' Ladders now in production; also Steps, Trestles and Extension Ladders.—Phone: Shaftesbury Ladders, Ltd., 453, Katherine Road, E.7. Grangewood 3363/4.

**SELF-PRIMING ELECTRIC PUMPS.**—300 g.p.h. £14 5s.—John E. Steel, Clyde Mills, Bingley. 'Phone 1066.

**250 000 YARDS** of Cable, 1/052 V.R. 250 Volt, Grade Ref. 401. Taped Cotton Braided and compounded. Flame-proof Black (Craigpark) in 500 yards Coil or on Non-Returnable Reels. Price 37s. 6d. per 500 yards, or 70s. per 1000 yards. Offered subject to prior sale.—Wm. Hurlock, Jr., Ltd., High Street, Thames Ditton, Surrey. 'Phone: Emberbrook 4011.

## FOR SALE

**RUBBER STAMPS**—Every description. For office, shop and factory. With the usual pre-war cushion backed holders and polished handles.—W. L. Boughton, 53, Kenley Road, Merton, London, S.W.19.

**9-ELLSTON EVANS AND JACKSON**  
Electro-Magnetic Brakers, size 1.B.G., 84, foot lbs. torque, with 9 in. diameter braking device.—Oldfield Engineering Company Ltd., 96, East Ordsall Lane, Salford, 5.

**LADDERS, Trestles and Handcarts**, from Ramsay and Sons (Forfar), Ltd., Forfar.

## WANTED

**URGENTLY** required, one new or second-hand frequency changer. Specification as follows: Output 1 or 3 phase voltage within range of 100-250. Output 1-10 amp. frequency, range 25-100. Input 230 volts single phase. 440 volts 3 phase. An inverted rotary converter would be suitable if motor generator set was provided.—Write Box L.D.C., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

**REQUIRED** for export to India purchase for early delivery up to 500 dozen Edison Screw Lampholders,  $\frac{3}{8}$  in. brass, with ring type or similar.—Write Box L.D.R., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

**ONE** new Squirrel Cage A.C. Motor, 3 H.P. 950-1000 r.p.m. 3 phase. 50 cycle 400/440 volts required. Would exchange 1450 r.p.m. motor.—Write giving details and price to Suflex Ltd., Warrington Works, Randolph Avenue, London, W.9, or telephone Cunningham 7221.

**WANTED**: Second-hand Kohler lighting set, 800, 1500 or 2000 watts; Also Diesel set, 5/7½ kW 230/1750 A.C. coupled on bed.—Box L.D.N., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

**ELECTRICAL** steel sheet or laminations of reputable make, .014 in. to .020 in. thick will be purchased for cash in any quantity by Davenset Electrical Works, Leicester.

**AN** unlimited number of modern A.C. motors urgently required for essential work. Highest cash prices paid for suitable units. We also want all types of motors for conversion and rewinding. Send details to Sales Dept., A. P. Watson, 104, Upper Brook Street, Manchester, 13.

**WANTED** urgently, 1 and 3 phase MOTORS, W/S/C or totally enclosed,  $\frac{1}{2}$  h.p.,  $\frac{3}{4}$  h.p. or 1 h.p., 1425 or 2800 revs.—F. W. Kubach, 12, Sylvan Road, London, S.E.19. Phone: Livingstone 3311/2.

**A. C. Motors** all sizes and voltages. Best A. prices offered.—John Phillips and Co. Electric, 31, Fortune Green Road, W. Hampstead. Telephone: Hampstead 8132.

**LAMINATIONS**—Large types required in reasonable quantities. T's and U's. Also 75's and 4A's.—Cornercroft, Fallibroome Road, Macclesfield.

**A. C. MOTORS**, 1-100 h.p., 500-1500 r.p.m. Any make fitted with ball and roller type bearings. Must be good machines, such as you yourselves would buy. Alternatively motors for rewinding will be considered.—Oldfield Engineering Co., Ltd., 96, East Ordsall Lane, Salford, 5.

## AGENCIES

**EXCLUSIVE** retail agency available in many towns for the Musbury clock, combined electric clock and table lamp in hand made oak case of original protected design.—Full particulars from Cameron, Musbury, Axminster, Devon.

## PATENT AGENTS

**KINGS PATENT AGENCY LTD.**, B. T. King & I. Mech. E. (Patent Agent) 145A, Queen Victoria Street, London, E.C.4. **ADVICE** Handbook and Consultations free. Phone City 6161

## WORK WANTED

**JIG and Tool, Light Mechanical and Structural Design, Tracing and Detailing.**—Fraser-Hayes and Son, 7, Kenilworth Road, Cheadle Heath, Stockport.

**CAPSTAN** capacity immediately available, 6 BA to 1½ in. Brass or Steel. Large stocks of raw material in hand.—Chiswick Engineering, Ltd., 7, High Road, Chiswick, London, W.4. Chiswick 3595.

**"CLEFA"** Small Accessories. Copper Earth Clips, Upright Gimbals and other metal parts made to order. Good deliveries.—Central London Engineering (Fabrications) Ltd., 120, Old Street, E.C.1.

**VACUUM Cleaners**—Rewinders to the trade since 1930. A trial will convince you we are specialists in this class of work.—V.A.C. Ltd., 60, Cranbrook Road, Ilford, Essex. Valentine 3222.

**FOR REWINDING ELECTRIC MOTORS.** Fractional, up to 100 h.p. Transformers, Chokes, etc., contact Electrical Construction Company, Ltd., Seymour Wharf, Totnes, Devon. Phone: 3282.

**VACUUM CLEANER REWINDING SERVICE,** commutators and Bearings. Prompt delivery and full guarantee.—Thomas Anderson, 117, Bowes Street, Blyth, Northumberland. Phone: Blyth 405.

**BRISCOE PLATING CO. LTD.**, now have available capacity for silver and nickel plating and quantity production of electrical and household products in which we are specialists. Enquiries invited to 3-5, Maddox Street, London, W.1.

## BUSINESS OPPORTUNITIES

**SOEMCO LTD.**, Fluorescent Lighting Specialists, wish to contact manufacturers of electrical equipment and accessories, including Domestic and Industrial Lighting Switches, all "Novelty" and "Improved" electrical appliances. Fluorescent Tubes, Fittings and Components, both Domestic and Industrial, of particular interest. Where possible complete output will be taken and full co-operation given in exchange for sole distribution rights. Replies will be treated with strictest confidence.—Managing Director, Scemco Ltd., Scemco House, 6/7, Soho Street, London, W.1.

**REQUIRED** to purchase outright an Electrical Ceramic Manufacturing Business or, as an alternative, an opportunity to become jointly interested therein. Replies in confidence to—Bradfield, Chapman and Co., Chartered Accountants, Friar Lane, Nottingham.

## REPAIRS

**COOKERS**—We can give good deliveries of Sheet Metal Vitreous Enamelled Electric Cooker parts.—**JOHN KING & SON (ENAMELLERS), LTD., PYRO WORKS, CHESTERFIELD.** Phone: 5305

## AUCTIONEERS AND VALUERS

**RICHARDS & PARTNERS,**  
Auctioneers and Valuers of  
PLANT AND MACHINERY AND  
INDUSTRIAL PROPERTY,

Granville House, Arundel Street,  
London, W.C.2

Telephone: TEMple Bar 7471.

## NOTICES

I.M.E.A. CONVENTION, BOURNEMOUTH,  
JUNE, 1947.

THE British Electrical Development Association is invited to arrange an Exhibition in connection with the forthcoming Incorporated Municipal Electrical Association Convention at Bournemouth.

Manufacturers desirous of representation in the Exhibition are requested to notify the undersigned immediately. All applications received will be submitted to the I.M.E.A. for consideration, after which a meeting of prospective exhibitors will be convened to deal with space allocation, etc.

V. W. DALE,

General Manager and Secretary.

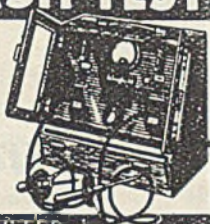
E.D.A.,  
2, Savoy Hill,  
LONDON, W.G.2.

## Portable FLASH TEST

All makers and dealers in electrical equipment, service engineers, and repairers need this portable Flash Tester.

Detects faults at 1,000 to 2,000 volts.

Send for interesting leaflet "All about Flash Testing."



RUNBAKEN · MANCHESTER · I

# YOU

should investigate  
the possibilities of the

NEW 'AERO'  
TRANSFER

This new type of transfer gives a clear, permanent impression, is completely weather-proof and will stand up to the severest test.

*Your enquiries invited*



LUDGATE HILL, BIRMINGHAM 3



SUMMING UP  
THE STARS

Admittedly, he'd have an easier job counting the different designs in the LUNDBERG range. They may not be as numerous as the stars, but there are nearly a thousand types to choose from, satisfying every kind of switch requirement from the Tumbler to the Triple-pole switch. Every one bears the traditional mark of LUNDBERG skill and craftsmanship

LUNDBERG



A  PRODUCT

A P LUNDBERG & SONS LTD. (Established 1882)  
491-493 Liverpool Road London N7.

# More power...



Part of a new housing scheme of 460 houses at Stockport now in course of erection, completely wired with *Pirelli-General* cables. Borough Engineer & Surveyor: W. F. Gardner, M.Inst.C.E., A.M.T.P.I. Electrical Contractors: W. A. Shaw & Co., Prince's St., Stockport.

## *to the housewife's elbow*

Modern light and power installations in the home bring the ease and efficiency of electricity right to the points at which it is most needed, right in fact, to the housewife's elbow. The Company have long specialised in the supply of every type of cable and flexible for house-wiring, and G.E.C. specialist engineers will gladly co-operate when planning new housing schemes.



Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.

**PIRELLI GENERAL**  
*Cables*



Registered  
Trade Mark  
Nos 566585 & 7



THE

# ELECTRICIAN

ESTABLISHED 1861

*Bouverie House - 154 Fleet Street - London EC 4*

*Telegrams: "BENBROTRIC FLEET LONDON" Telephone: CENTRAL 3212 (12 lines)*

*Editor: STANLEY G. RATTEE, A.M.I.E.E.*

*Publisher and Manager: JOHN VESTEY*

*Number 3583*

*31 JANUARY 1947*

*Vol CXXXVIII No 5*

## CONTENTS

<i>Views on Current Affairs</i> .....	341
<i>H.M.S. Vanguard</i> .....	344
<i>Radio on the Royal Cruise</i> .....	346
<i>Mechanised Car Park</i> .....	348
<i>Electricity Overseas Trade</i> .....	349
<i>Electricity and Atomic Power</i> .....	351
<i>Correspondence</i> .....	354
<i>Soil Heating for Gardeners</i> .....	356
<i>Electrical Personalities</i> .....	357
<i>Wallasey Electricity Jubilee</i> .....	359
<i>Mercury Vapour Discharge Lamps</i> ..	361
<i>Commissioners' War Report</i> .....	363
<i>Test Methods in Industry</i> .....	365
<i>Inquiries from Overseas Buyers</i> .....	367
<i>Industrial Information</i> .....	368
<i>National Supply Wages Agreement</i> ..	371
<i>Contracts Open</i> .....	372
<i>Electricity Supply</i> .....	373
<i>Coming Events</i> .....	374
<i>Company News</i> .....	375
<i>Commercial Information</i> .....	376

### MIDLANDS OFFICE:

*Daimler House, Paradise Street, Birmingham*

*Telephone: Midlands 0784-5*

### GLASGOW OFFICE:

*116, Hope Street, Glasgow, C.2*

*Telephone: Central 3970*

*The offices of THE ELECTRICIAN are closed on Saturdays in accordance with the "Five-day Week" plan adopted by Benn Brothers, Ltd.*

*SINGLE COPY (FRIDAY) - - - 6d*

*ANNUAL SUBSCRIPTION*

*HOME AND OVERSEAS 30s.*

## Export Statistics

THE overseas trade figures for the year 1946 show the hope of the Government that our export business may be increased by 75 per cent. of pre-war volume, to be a long way from being realised.

The last quarter of any year is usually regarded as the period when export trade is most active, and for this reason it was hoped that the statistics covering the last three months of 1946 would show general shipments abroad to have been substantially greater than during the middle quarter of the year. The volume of overseas trade credited to the last quarter, however, shows little increase, despite the fact that as indicated in the White Paper on production, published last week, the numbers estimated to be employed in the manufacturing industry interested in exports have been steadily increasing, until to-day the payroll is larger by 450 000 compared with just before the war.

The volume index for the fourth quarter of 1946 is provisionally estimated at 112, compared with 108 for the third quarter, but since warnings have already been given that shortages of coal, steel and other raw materials will tend to limit expansion of exports in the early months of this year, industry generally may well find it difficult to maintain even this present level of overseas trading. Fortunately, however, there are in the country's activities as a whole, sectionalised industries which are in the circumstances able to do better than others, and such an industry is electrical engineering.

Indicative of this ability to weather the rehabilitation storm of the immediate post-war years is the fact that the value of exports of electrical goods and apparatus rose throughout 1946 from £7.6 million in the first quarter to £11.5 million in the last, while the quarterly figures for electrical machinery showed an increase from 10.0 thousand tons for the first quarter to 14.6 thousand in the last.

### 1938 and Now

WHEN presenting official statistics concerning overseas trade, it is usual for comparison to be made between the current figures and those obtaining in 1938, despite the fact that trade in the latter year was clouded over by Munich, and that the normal industrial programme was upset to some extent by re-armament contracts. How misleading such comparisons may be is shown by the fact that the total value of electrical exports last year at £52 million gives a pleasing increase of £31 million when compared with 1938, but since the figures take no account of the rising cost of materials, which in many cases has grown almost out of recognition, comparison by volume would, we submit, show an appreciably lower increase on pre-war trade than the comparison by value infers.

### Cost of Raw Materials

AN indication of the effect which the rising cost of materials must be having upon our export trade when reviewed from a valuation standpoint only, is given by comparing the costs of essential materials pre-war with those obtaining to-day. Best selected copper, for instance, was in 1938 around the £40 per ton mark, whereas the figure this week is £115; again, lead at £16 per ton is now £70, and tin at £214 is now £384. While these prices obtain comparison of pre-war and present-day statistics, though interesting to some perhaps appear to us to have little meaning, and can in any case lead to a false appreciation of the position. The electrical industry is making outstanding headway in the export field, particularly in view of the attention being given to the re-equipment programme at home, but until the Board of Trade sees fit to publish

complete details of quantity shipments, it is not possible to assess progress with that accuracy to which the engineering world is accustomed. Individual units in the industry are conscious of their own efforts and because they are able to compare their results on a quantity basis can assess their overseas sales revenue in relation to output. Until the Board of Trade statistics deal with the industry as a whole in the same way, valuation comparisons between to-day and pre-war can, when unqualified by full volume comparisons, create in the minds of the unthinking a false sense of security.

### Power from Submarines

THE announcement by the Admiralty to the effect that arrangements are being made to use submarines as mobile power stations to supply the electricity needs of important Naval dockyards, calls to mind the fact that before the war, aircraft carriers were used in the United States for similar services, but in different circumstances. In the latter case the supply was needed in cities and towns which had been hit by wind storms and floods so violent that the local power generation system had been put out of commission. Any warship could, of course, be employed in this way, but submarines with their relatively large generating capacity are especially suitable, and their size makes them easier to take close to the load centre than other vessels with equivalent output.

### Saving of Coal

TO date, some 26 submarines are being used in the dockyards, mainly at Portsmouth and Devonport, and, where necessary, converters are used to match in their d.c. generators with the existing dockyard machinery. One of the largest sources of load is likely to be vessels undergoing repairs or refitting, and it should be possible to supply many of these direct from the submarines. When the Admiralty first made their announcement, there was an impression that the scheme would result in some easing of the grid load. This, however, is not altogether the case. The majority of the large dockyards possess their own coal-fired stations and are not, in general, substantial users of grid supplies. But on the assumption that the average



power of a submarine generator is in the region of 1 000 kW, the 26 vessels now in use should be able to save, admittedly at the cost of using imported fuel oil, some 2 000 tons of coal per week which would otherwise be burned in the static stations.

### Supply Wages Agreement

THE electricity supply industry was the first of the public utility services to negotiate a national agreement of employment for its technical personnel, and it has now the distinction of being the first to negotiate a national agreement covering all its manual workers. Details of the scheme are given elsewhere in this issue and the agreement takes the place of thirteen district agreements which have been operating for twenty-six years. The district councils have, since 1919, been responsible for standardising wage rates in their areas, but with the general trend of industrial negotiations in the direction of national instead of district agreements, it is, perhaps, not unnatural for the supply industry to do away with the diversity between district agreements and thus remove the basis of possible grievances arising from operatives being paid different rates for doing the same work under the same conditions. At a National Council meeting this week, Mr. E. W. BUSSEX, and Sir WILLIAM WALKER, as chairman and vice-chairman respectively, expressed their pleasure at the successful conclusion of the negotiations, and congratulated the Council on having accomplished a difficult task.

### Commissioners' War Report

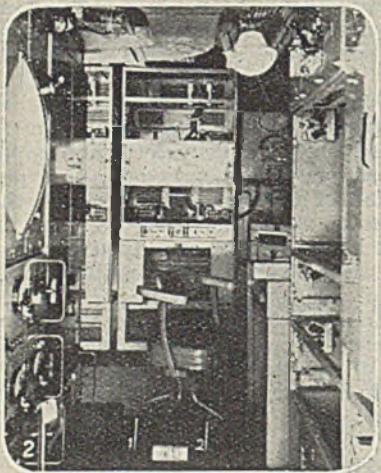
THE twentieth report of the Electricity Commissioners was published yesterday, Thursday, and, since it covers the six years, April, 1939, to March, 1945, is mainly a record of the supply industry during the war. It deals with the position of the industry prior to the outbreak of hostilities, traces the history of the industry through the war and tells how the difficulties of those times were overcome. Much of the information given has already been made available to *THE ELECTRICIAN* by the Commissioner, as for instance war damage reports, while other items have, quite understandably, been dealt with in

another form in the reports of the Central Board—but since the report follows the same general form as earlier reports drawn up by the Commissioners, it not only preserves continuity of presentation, but is a valuable review of the industry which has not hitherto been available in one volume. In view of the altered status which electricity supply will assume under nationalisation, publication of the report is timely in that it shows what has been done so far, what has prevented even further expansion, and in view of the possible dissolution of the Commission, if and when the Electricity Bill becomes law, may serve the succeeding body as a guide to the type of statistical information which the supply industry uses in preparing for the future.

### Working Party Legislation

THE Industrial Organisation Bill formally introduced in Parliament last week, and published on Monday, will enable effect to be given to the major recommendations of the working parties which have been set up by the Government to consider the better organisation of a number of industries. Those working parties which have already reported upon the industries within their terms of reference, have in most cases made strong recommendations for extensive electrification, improved lighting arrangements, and so on, and the Bill, besides implementing those recommendations provides for the establishment in any industry of Development Councils. The first schedule of the Bill embraces nineteen functions which can be assigned to those Councils, but not all of them will be undertaken by every Council. Some of the functions are admirable enough. Among them are the promotion of scientific research, improvement of design, definition of trade descriptions, training, recruitment, better working conditions and the prevention of industrial diseases. But there are others which may not be quite so innocent. Among these are the promotion of co-operative organisation for supply, co-ordinating production and the marketing of products. In any case the Bill holds out the danger of inexpert interference in the running of any industry, since its real purpose is so far obscure.

## H.M.S VANGUARD ELECTRICAL PICTURES

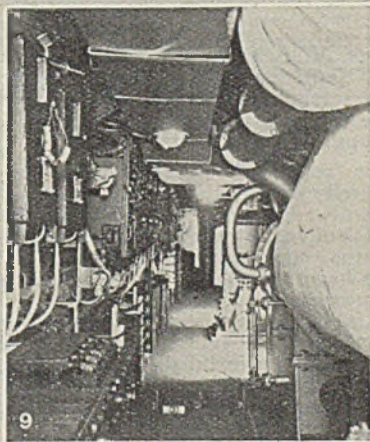
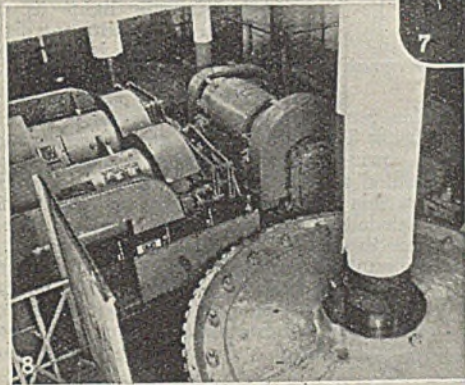
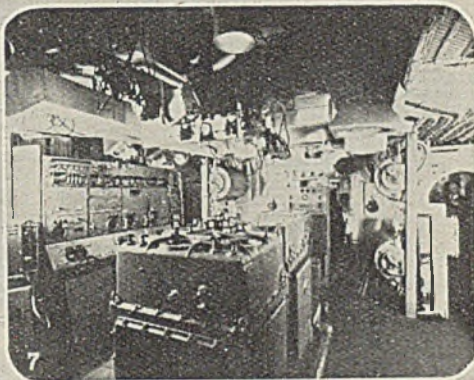
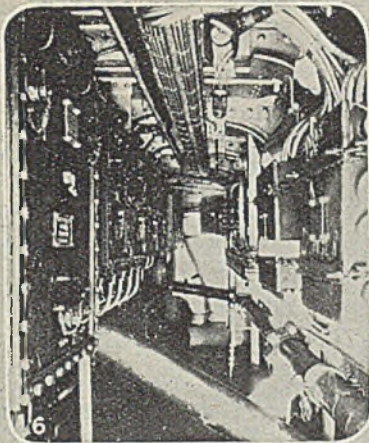


*It will be remembered that in THE ELECTRICIAN of September 13, last year, a description was published of the electrical installation of H.M.S. VANGUARD. In view of the fact that the ship will tomorrow sail for South Africa with the King and Queen aboard, the photographs reproduced herewith by arrangement with the Admiralty, are of interest.*

\* \* \*  
 (1) The latest in a line of gallant ships.  
 (2) Lower radio transmitting room. (3) Main switchboard room. (4) No. 3 breaker room. The generating plant in the ship comprises four turbo-driven and four Diesel-driven units, delivering 3 720 kW.



Following the normal British practice for large warships, a 220 V d.c. watertight ring-main system is used for distribution. This ring-main circumscribes the eight generator units and extends practically the whole length of the armoured citadel. The generator units are connected to the ring-main, through supply breakers. (6) No. 1 breaker room. (7) The computer room. (8) The forward capstan compartment. (9) No. 7 breaker room. (10) Forward gyro-compass room.



There are, in H.M.S. VANGUARD, approximately 1 400 motors, representing a connected load of 5 220 kW (7 000 H.P.), and approximately 5 500 lighting fittings whose connected load is 400 kW. For the first time in the British Navy, a cafeteria system is used for crews' messing. Electric galleys are fitted throughout, and electrical machinery is used for food lifts, dish-washing, mixing and mincing, potato peeling, and other domestic services. In accordance with usual practice, the bakery and associated machinery is also electrically-driven.

# Radio and the Royal Cruise

## Picture and Telephone Equipment in H.M.S. "Vanguard"

IN order that a fast service of news pictures should be available from H.M.S. VANGUARD to this country, during the whole of the Royal Cruise to South Africa,

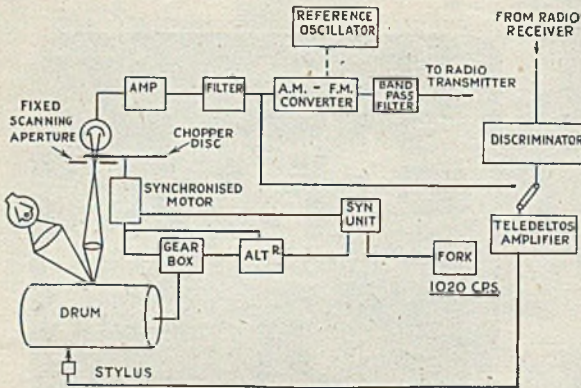


Fig. 1 — Schematic arrangement of the picture telegraphy equipment

Messrs. Muirhead and Co., Ltd., of Elmers End, Kent, have designed and produced a picture telegraphy equipment capable of transmitting a photograph 8 in. by 5 in. in approximately 12 minutes.

The requirements laid down by the Admiralty, when they gave the order, in September last year, were that the equipment had to be capable of working direct into the ship's normal radio transmitter. Tests have shown the set produced to be so successful that the makers now intend to proceed with its manufacture as a standard production for installation in other large vessels carrying suitable radio equipment.

The apparatus used in H.M.S. VANGUARD consists of two transmitter units (one of which can be used alternatively as a monitor receiver), assembled with the associated electronic equipment on three standard 19 in. racks. The system makes use of sub-carrier frequency modulation, and works straight into the normal amplitude-modulated ship's radio. Reception in this country will be carried out by the Post Office and Cable and Wireless.

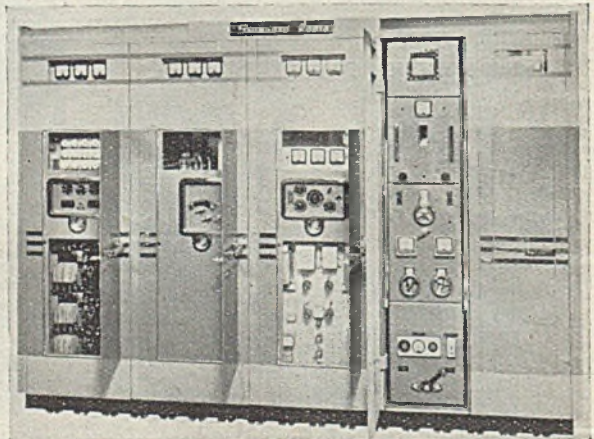
Basically, the transmitter unit is the Muirhead-Belin

type of portable apparatus, and comprises a low-voltage driving motor geared to the drum on which the material to be transmitted is clipped. The speed of the motor

is controlled by a valve-maintained tuning fork of frequency 1 020 c.p.s., and the drum itself rotates at 1 rev. per sec. The scanning spot, which traverses the picture to give a definition of 135 lines per inch, is illuminated by a small projector lamp, and an image of this spot is focused on a fixed aperture by means of an objective. Behind the aperture is the photo-electric cell, and between the objective and the cell is a chopper disc driven by the motor. This interrupts the light to the photocell and produces a signal which may easily be amplified.

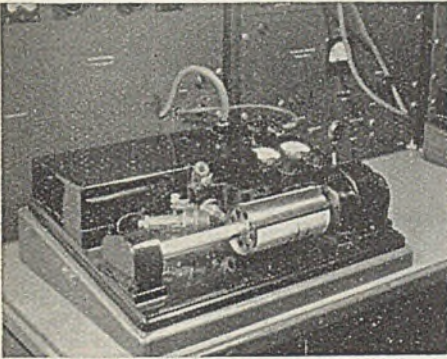
The second transmitter is arranged as a stand-by, and

for normal operation runs as a receiver using Teledeltos paper, for which purpose a spring-loaded insulated stylus has been added to it. The signal voltage is applied to this stylus, which presses against the Teledeltos paper mounted on the drum, and the signal current burns the paper to an amount proportional to the signal strength, and so produces a picture. Although not comparable in quality with the picture obtaining by photographic means, this image is quite suitable for monitoring purposes.



Long range duplex radio telephone transmitter in H.M.S. VANGUARD

All the electronic equipment, with the exception of the photocell amplifier, which is mounted on the transmitter, is assembled on the three racks, two of which are identical. The centre rack contains the equipment for reception on the monitor



*Close-up of the picture transmitting head*

receiver and, in addition, a telephone and loudspeaker.

The system of transmission may be followed by reference to the schematic diagram, Fig. 1. The picture signal from the photocell, comprising a 4 800 c.p.s. carrier modulated at 0.1 000 c.p.s., is passed, after amplification, through a high-pass filter which removes unwanted frequencies and from there to the amplitude-modulation/frequency-modulation converter. In this unit, the signal is first demodulated and filtered to remove the 4 800 c.p.s. component, and the resulting signal of 0.1 000 c.p.s. is applied to a reactance valve, which varies the frequency of the output oscillator between the limits 1 600-2 000 c.p.s. This signal, passing through a band-pass filter, goes to the radio transmitter.

Power supplies for the entire telegraphy unit are provided from a motor-generator operated from the 50 c.p.s. mains, and producing 180 V h.t. and 6 V l.t.

\* \* \*

In addition to the picture-telegraphy apparatus just described, the ship will be equipped with a long range duplex radio transmitter, to enable telephone calls to be made to any extension in Britain and also to permit transmission of radio programmes for re-transmission by the B.B.C. and South African broadcasting systems. The type used is the D.S. 10, designed by Standard Telephones and Cables, Ltd., and normally fitted to large Atlantic liners.

The first of its kind to employ air-blast valve cooling, the D.S. 10 operates on:

(a) two c.w. channels at 5 kW each, or three c.w. channels at 3 kW each, with independent keying, or; (b) two c.w. channels at 3 kW each, with common keying or; (c) one c.w. channel at 3 kW, plus one telephone channel at 3 kW. In roles (b) and (c), simultaneous transmission on two different frequencies is permitted, the range covered being 2.5 to 22 Mc/s. An electronic keying unit is incorporated, allowing operation at any keying speed up to 600 words per minute.

The transmitter has two complete r.f. units, together with a modulator and the necessary power equipment. The whole assembly is in the form of four cabinets bolted together to form one compact unit, which has proved easy to accommodate between decks.

## Stage Lighting

ATTRACTIVE demonstrations of coloured lighting effects were given at the conclusion of the monthly meeting of the Association of Supervising Electrical Engineers, at the Lighting Service Bureau, Savoy Hill, on January 23. Mr. E. E. Faraday was talking about "Delicolor Equipment" (which was the subject of an article in *THE ELECTRICIAN* of March 1, 1946), and was illustrating his lecture with a portable version of the equipment. The chair was taken by Mr. H. Nimmo, President of the Association.

Coloured lighting, Mr. Faraday began, was used on the stage to heighten dramatic effects or to provide decoration and spectacle, and the method normally employed was to place coloured gelatine filters in front of the light source and thus give the required colouring. The principles of additive mixing of colours were then described, it being well-known, the speaker said, that almost all the normally required colours could be obtained by varying intensity mixtures of any two primary colours.

When these principles were applied to stage lighting, however, difficulties appeared; for instance, the gas-filled lamp tended to become reddish at low intensities, and it was advantageous to have a source of white light available to assist in producing the paler colours.

When mixing colours for stage lighting, Mr. Faraday continued, a large responsibility rested upon the operator and it was the need for some automatic method of obtaining any required colour on any section of the stage that led to the invention of the "Delicolor" equipment.

# Mechanised Car Park

## Electrical Features for Automatic Operation

THE Baldwin-Auger mechanised car park, manufactured by the Fraser and Chalmers Engineering Works of the General Electric Co., Ltd., was demonstrated last week to Mr. L. Silkin, Minister of Town and Country Planning, Police

a typical car park comprising a number of the units described, each with its 12 h.p. motor, would probably be such as to induce supply authorities to allow on-line starting of suitable squirrel-cage machines. Such motors would have a starting current not greatly in excess of slipping motors with rotor resistance adjusted for equal performance.

The lateral traverse is effected by four  $1\frac{1}{2}$  h.p. squirrel cage motors.

With regard to control it was required: (i) to enable a particular car in a particular unit to be started on its way without it being necessary for the attendant in charge to see the car himself; (ii) to enable this motion to be initiated in the simplest way; (iii) to ensure that the operations took place in correct sequence; and (iv) to enable a number of calls for individual cars

to be made, automatic "storage" of the calls being effected.

These problems are similar to those for which automatic telephone apparatus has been used, and such telephone relays and "unselector" stepping devices are employed in the car park. Automatic telephone apparatus is designed to work on 50 V d.c., and as it was felt that a higher degree of reliability would be attained if the limit switches, which terminate each movement canceled both the contactor for the motor and the appropriate relay circuit, contactor coils were wound for the same 50 V supply. Such voltage is arranged for by the use of a suitable transformer and metal rectifiers.

### PHOTO-CELL EQUIPMENT

Photo-cell equipment is provided to ensure that no car is standing too far forward or too far back on its section of the unit. In the event of such wrong positioning, the system is arrested and a warning signal, both audible and visible, is brought into operation.

A further development, now in hand, is a photo-cell equipment to measure the cars as they arrive on the ramp, effecting an automatic sorting of large, small and medium-sized units, so that they may be segregated in appropriate parking bays.



*A length of sectioned track*

Chiefs, and heads of Government departments. A feature of the system is that a length of sectioned track carrying up to nine cars moves forward, as a whole, the length of one car section. The end section, the 10th, is thereby left without track, and the track resting on the end section of the adjacent row traverses across to fill this space. The adjacent row thus has one section without track, and that row, accordingly, moves forward. Continuation of the sequence effects a circulatory movement around a pair of parallel tracks, and enables the car on any particular section to be transferred rapidly to the end position used for drive-off.

A 12 h.p. motor provides the drive for the longitudinal track movement, the 16 ft. travel occupying 10 sec. Rapid movement is desirable for operational efficiency, but in order to avoid jerking the stationary cars, smooth acceleration on starting and a reverse action on stopping are understandably essential.

These are ensured by choice of a suitable motor and by the nature of the mechanical drive. After geared reduction a mechanical modulator imparts the desired type of motion to the track itself.

A single speed motor can thus be used effectively and a squirrel-cage motor is, in fact, employed.

It is estimated that the electrical load of

# ELECTRICAL OVERSEAS TRADE

VALUE OF EXPORTS NEARLY DOUBLED IN TWELVE MONTHS

DU**E** probably to the Christmas holidays, the value of electrical exports in December fell from the record sum of £6 026 633 in November to £5 249 481. The figure for the corresponding month in 1945 was £2 668 490, whilst the monthly average of 1938 was £1 814 114. The balance of exports over imports last month was £5 045 665. Wireless sets shipped numbered 34 670 compared with 4 766 in December, 1945, and a monthly average of 7 053 in 1938; valves numbered 1 090 373, against 149 799 in December, 1945, and the 1938 monthly average of 183 826; and electric lamps 3 189 475, contrasted with 1 804 023 in December, 1945, and 1 638 099 a month in 1938. Portable accumulators numbered 52 835 compared with 21 314 in the previous December, and the comparative figures for house service meters were 21 485 and 13 106, respectively. Other quantities given in the Board of Trade returns for the comparative months of 1946, 1945, and 1938 are: generators, 1 192 tons, 667 tons, and 858 tons; motors, 1 177 tons, 544 tons, and 927 tons; other electrical machinery, 2 036 tons, 3 695 tons and 1 935 tons; vacuum cleaners and parts, 186 tons, 27 tons, and 55 tons; welding machinery, 281 tons last month and 886 tons in December, 1945.

For the twelve months ended December

31, the total value of electrical exports was £52 863 696, and of imports £5 285 018, showing a credit balance of £47 578 678. The value of electrical shipments in 1945 was £26 929 917, and imports £21 784 109, giving a credit balance of £5 135 808. Other comparative values for the year are shown as follows: Electrical goods and apparatus, £37 391 502, as against £13 801 477 in 1945, and £13 430 405 in 1938; generators, £3 979 809, against £1 823 355 and £1 885 806, respectively; motors, £2 829 324 against £1 553 696 and £1 740 540; other electrical machinery, £6 205 279, against £8 969 113 and £4 267 066; vacuum cleaners, £1 030 314 against £71 067 and £319 941; other portable mechanical appliances electrically operated, £488 227, against £64 184 and £124 730; welding machinery, £939 241 against £637 025 in 1945; submarine cables, £758 918, against £342 430 and £207 473; telegraph and telephone wires and cables, £2 665 462 against £1 044 109 and £861 638; rubber insulated electric wires and cables, £2 905 040 against £1 509 318 and £1 410 403; electric wires and cables with insulation other than rubber, £4 425 935 against £1 509 844 and £1 839 077; wireless apparatus, £7 400 351 against £1 809 209 and £1 795 119; telegraph and telephone apparatus other than

IMPORTS	Monthly	Month ended		Year	Year ended	
	average 1938	1945	December 31 1946	1938	1945	December 31 1946
	£	£	£	£	£	£
Electric wires and cables, insulated	31 246	3 179	2 740	374 948	1 119 164	25 320
Wireless receiving sets and receiver chassis, complete, other than radio-gramophones, excluding valves	10 148	7 342	6 025	121 771	331 472	103 050
Valves, complete	10 893	1 837	8 659	130 712	825 095	154 644
All other descriptions	54 119	85 719	101 041	649 423	11 115 394	4 157 817
Telegraph and telephone apparatus other than wireless	9 243	778	1 555	110 919	732 741	36 079
Carbons, electric, complete—						
Furnace	4 054	478	37 257	48 649	7 956	64 091
Other	2 301	11 119	2 461	27 612	129 259	70 578
Electric lighting appliances, accessories and fittings, and parts thereof, not elsewhere specified—						
Bulbs, complete, ready for use	10 265	30	946	123 175	188 997	8 352
Other descriptions	38 662	425	2 867	463 949	253 948	16 602
Batteries, primary (complete, and parts other than carbons)	3 549	454	416	42 592	267 295	9 853
Electrical instruments (other than telegraphic and telephonic)	32 057	3 108	5 504	384 688	232 003	83 649
X-ray and apparatus and vacuum tubes	9 734	5 322	6 470	116 810	316 478	163 027
All other articles	42 630	10 013	10 048	511 557	3 215 980	136 111
Electric Motors	26 033	4 144	5 649	312 400	111 306	62 586
Other sorts of electrical machinery	14 455	2 091	2 288	173 459	2 494 815	46 928
Vacuum cleaners, complete	7 519	5	530	90 225	183	1 548
Other portable appliances electrically operated, including parts	17 108	3 267	1 578	205 291	85 868	24 458
Welding machinery (including welding electrodes) other than tube making	—	1 366	7 782	—	356 155	120 325
Total	324 016	140 677	203 816	3 888 180	21 784 109	5 285 018

wireless, £4 980 057, against £2 596 250 and £2 912 595. Wireless receiving sets exported numbered 344 604 compared with 16 666 in 1945 and a monthly average of 84 639 in 1938; valves, 5 341 060 contrasted with 1 811 999 in 1945 and 2 205 914 in 1938; electric lamps, 35 156 911 against 19 261 447 in 1945, and 19 657 193 in 1938; portable accumulators, 665 991 against 247 024 in 1945; batteries numbered 23 281 738 (totals for previous years are not given); house service meters,

222 038 against 61 672 in 1945, and 165 336 in 1938.

The Dominions and Colonies were among our biggest buyers, particularly British India and the Union of South Africa, cables, wires, wireless, telegraph and telephone apparatus and electrical machinery being especially in demand.

The accompanying tabulated figures show the relative values of the imports and exports for December and the full year of 1946 contrasted with the comparative periods of 1945 and 1938.

EXPORTS	Monthly average	Month ended		Year	Year ended	
	1938	1945	1946	1938	1945	1946
	£	£	£	£	£	£
Submarine telegraph and telephone wires and cables ... ..	17 289	4 079	76 963	207 473	342 430	758 918
Other telegraph and telephone wires and cables ... ..	71 803	105 940	149 420	861 638	1 044 109	2 665 462
Other electric wires and cables rubber insulated ... ..	117 533	117 786	274 546	1 410 403	1 509 318	2 905 040
With insulation other than rubber	153 256	217 420	301 156	1 839 077	1 509 844	4 425 935
Wireless apparatus ... ..	149 593	150 519	979 011	1 795 119	1 809 209	7 400 354
Of which—						
Receiving sets, and receiver chassis, complete, other than radio-gramophones, excluding valves ... ..	36 755	37 302	366 747	441 065	166 239	3 312 285
Transmitting apparatus, excluding valves ... ..	28 296	44 806	154 297	339 558	408 231	1 079 638
Valves, complete ... ..	41 272	46 827	374 243	495 270	766 540	1 774 294
Telegraph and telephone apparatus, other than wireless ... ..	242 716	308 536	312 543	2 912 595	2 596 250	4 980 057
Electric lighting appliances, accessories and fittings, and parts thereof, not elsewhere specified—						
Bulbs, complete ... ..	49 440	79 100	95 086	593 282	824 042	1 289 523
All other descriptions ... ..	48 565	72 934	184 189	582 783	545 376	2 054 553
Batteries, and/or cells, primary ...	13 572	17 138	56 139	162 862	169 121	562 827
Accumulators—						
Portable (including accumulators for motor vehicles) ...	28 874	36 907	109 332	346 485	388 754	1 344 273
Stationary ... ..	19 773	9 769	23 984	237 272	40 189	174 759
Parts and accessories ... ..	—	33 287	45 485	—	209 909	559 229
Electrical cooking and heating apparatus (including industrial)	30 664	30 667	141 871	367 964	247 541	1 271 090
Electrical instruments (other than telegraphic and telephonic)—						
Commercial (including ammeters, volt-meters, &c., and parts thereof) ... ..	15 878	26 660	72 232	190 536	347 758	652 938
House Service meters ... ..	15 791	24 790	57 616	189 946	130 807	534 714
All other descriptions ... ..	9 612	27 546	51 323	115 350	143 693	501 161
X-ray apparatus and vacuum tubes and parts thereof ... ..	4 881	22 265	42 359	58 573	168 930	688 599
Insulating materials, not elsewhere specified ... ..	19 343	43 472	113 364	232 122	336 003	1 238 872
All other articles ... ..	110 615	137 901	331 794	1 327 375	1 438 194	3 383 198
Generators ... ..	157 150	242 923	470 490	1 885 806	1 823 355	3 979 809
Motors ... ..	145 045	113 557	317 545	1 740 540	1 553 696	2 829 324
Converting machinery ... ..	—	238	30 583	—	11 583	159 464
Transformers for lighting, heating and power, including coils ...	{ 101 304 }	64 730	189 095	{ 1 215 654 }	1 232 038	1 997 964
Rectifiers for power-house use ...	3 463	2 415	31 203	41 558	54 113	136 508
Starting and controlling gear for electric motors ... ..	50 866	31 147	58 532	610 392	371 120	914 534
Switch gear and switchboards (other than telegraph and telephone) ... ..	184 533	163 771	394 186	2 214 402	2 143 953	2 777 959
Electrical machinery, not elsewhere specified ... ..	15 497	453 647	14 197	185 960	5 156 306	218 850
Vacuum cleaners and parts ... ..	26 662	22 376	151 215	319 941	71 067	1 030 314
All other portable mechanical appliances, electrically operated, not elsewhere specified, including parts thereof ... ..	10 394	9 609	57 557	124 730	64 184	488 227
Welding machinery, other than tube making machinery and welding electrodes ... ..	—	97 261	116 665	—	637 025	939 241
Total ... ..	1 814 114	2 668 490	5 249 481	21 769 388	26 929 917	52 863 696



# Electricity and Atomic Power

The "atomic age" may be said to date from December 2, 1942, when scientists working in Chicago initiated the first self-sustaining nuclear reaction, an event already referred to in THE ELECTRICIAN of January 10. The interest of electrical engineers in this development is likely to lie in the exploitation of atomic energy as a prime source of power for generation purposes, and we give below a review of the subject—necessarily shortened and conjectural—compiled from a number of published sources.

SOME time within the next twenty years, and possibly sooner, the production of electric power from nuclear energy on a commercial scale may become a fact. It is believed that the Ministry of Supply may have experimental piles under construction in this country and an American pile constructed for the development of electrical power may operate this year.

It is apparent, from the information so far published, that electric power production is believed to be a theoretical possibility; all that remains is the solution of certain problems bound up with the useful employment of the heat liberated in the nuclear reactions, the prevention of corrosion of the radioactive materials employed and the removal of impurities from the piles themselves.

In the circumstances, it is of interest to consider some of the problems of power production, and to suggest possible paths along which development may go. The distinction between the mechanics of bomb production and power generation is, however, hard to draw, and it should be emphasised that, so long as the security of information on atomic energy remains a prime strategical consideration, very few specific details of the work at present being undertaken are likely to be made available.

Before considering the construction and operation of the atomic piles which appear to be an essential factor in the utilisation of atomic power, it may be useful to review in elementary terms the mechanism of nuclear reactions.

The particles within the atomic nucleus of an element, consisting (for the purposes of this discussion) of heavy, charged protons and equally heavy, but uncharged neutrons, are held together by a "binding energy" which varies from element to element. In general, the lightest and heaviest elements are the most weakly bound; it being understood that those near the middle of the periodic table, such as silicon, cadmium, nickel, etc., possess heavy binding energies. The conversion of a lightly bound nucleus (e.g., uranium) into the nuclei of two lighter elements

would release considerable quantities of nuclear energy, which would be no longer required for stability.

The process of nuclear fission, which is peculiar among all naturally-occurring elements to the 235 isotope of uranium, arises when a neutron from some external source, enters the uranium nucleus. After a short delay, the now-unstable nucleus splits into two approximately equal parts, with the liberation of the excess binding energy and from one to three neutrons. The two resultant nuclei have a combined weight something less than that of the parent uranium, and lie about midway in the periodic table. The lost weight has been converted into energy of motion and heat, in accordance with the Einstein

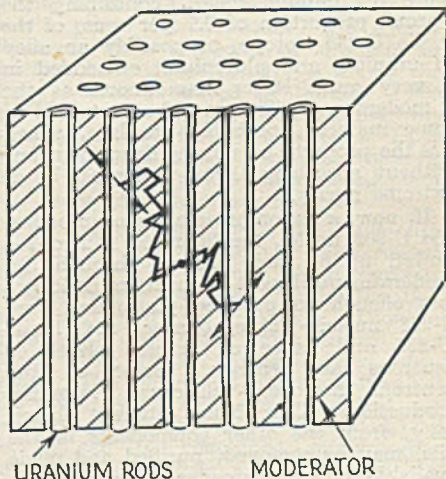


Fig. 1 (by courtesy of the "Fuel Efficiency Review")

equation,  $E=mc^2$ , the liberation of energy being the product of the lost mass multiplied by the square of the velocity of light. Energies of about 200 million electron volts are released during fission.

The 235 isotope, however, is not the only heavy element capable of nuclear alteration. U-238, the 140-times more common isotope, can absorb a neutron and, after the emission of two electrons and energy, settle down as a new radioactive element, plutonium, with an atomic

number of 94 and an atomic weight of 239. This new element, unlike U-238 but like the U-235 nucleus, is now capable of fission and the release of further neutrons and energy. It has recently been announced that thorium, by a process analogous to the production of plutonium from U-238, can be converted into a third fissile element, U-233.

A feature of all these reactions is that the speed of the neutron impinging on the nucleus is important. The conversion of U-238 into plutonium, for instance, is accomplished only by fairly fast travelling neutrons. Fission in plutonium, U-235 or U-233, however, can be produced by neutrons of a wide range of speeds, and this fact is put to use in the design of an atomic pile.

A chain reaction becomes possible since fission, in addition to releasing energy, also liberates neutrons. The available neutrons are free to enter further nuclei and cause, according to circumstances, either fission or the production of plutonium.

Atomic piles likely to be employed for large-scale electricity production, known as "primary" piles, may consist of large slugs of uranium metal, containing the normal proportion of 0.7 per cent. of the fissile U-235 isotope, or possibly an alloy of uranium and plutonium, embedded in a very much larger mass known as the "moderator." This may be composed of some material, probably graphite, which has the property of slowing down neutrons without absorbing them, and must be of extreme purity.

If, now, a fission process begins in one of the U-235 nuclei, the liberated neutrons—slowed up in their passage through the moderator until most of them are no longer fast enough to produce plutonium from U-238 nuclei—will encounter the fissile U-235 and cause a further release of neutrons and energy. Some of the neutrons, however, will cause plutonium production. This, being different chemically, from the other components in the pile, may be removed, purified and made available for use in smaller industrial piles. In an ideal system, the plutonium might be left in the pile to replace the fissile U-235 as it became used up. If mechanically possible, this latter arrangement would involve only the periodic replenishment of the raw uranium metal, all of which would eventually be consumed with, perhaps, the production of surplus plutonium for use in other reactors.

In Fig. 1 is given a diagrammatic representation of an elementary pile, showing the start of a slow chain reaction. Neutron-absorbing control rods could be lowered into the pile between the uranium rods. By circulating a gas or liquid around the

uranium, useful heat could be led away, but the manufacture of a corrosion resistant coating for the rods, with low neutron-absorption, is a difficult problem.

Among the other difficulties associated with the operation of a large-scale pile would be the removal and disposal of highly toxic radioactive wastes. This, in fact, is a consideration likely to play an important part in the siting of any primary

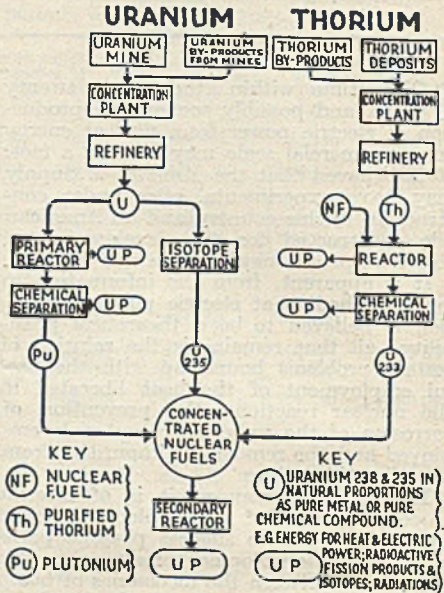


Fig. 2

pile. Suggestions have been made that the waste products could be run down the equivalent of oil wells to a depth where contamination of drinking water was impossible, or, alternatively, piped out to sea. In this country, surrounded by shallow seas and important fishing banks, the problem is likely to be particularly acute.

Much has been written of the value of the radioactive materials which can be manufactured within reactors from the powerful available neutron sources. Such manufacture is likely to be confined to the smaller sized industrial piles, using plutonium as a fuel, and the sale of "tracer" elements could be a valuable source of additional revenue. In the primary plants, however, the utilisation of every available neutron to produce self-regenerative working would be the main consideration.

Primary piles involve the establishment

of fairly large auxiliary plants for the purification of materials, etc., and these are not likely to be appreciably smaller for a pile producing, perhaps, 200 000 kW than for one rated at 1 000 000 kW. This provides a strong case for building piles as large as circumstances permit.

For more local purposes, secondary reactors may be built. These, instead of employing raw uranium, would probably be fed with plutonium—possibly “denatured” to make the production of fresh fissile material impossible—which would either be obtained from the primary piles or from large-scale separation plants operated on a national or international scale. Secondary reactors may range in size from 20 000 kW to 1 000 000 kW.

A “flow chart” prepared for the U.N. Atomic Energy Commission, illustrating the several methods by which radioactive material may be converted into electric power, is given in Fig. 2. The sequence on the left is that likely to be followed in large plants, heat energy being available both at the primary reactor and at the secondary pile employing the resulting plutonium. The centre sequence is used for the production of U-235 which may, in turn, feed secondary reactors. On the right, the thorium flow line is based on a theoretical possibility only. It is broadly similar to the primary reactor sequence for uranium, but some fissile material must be added, in small quantities, at the primary pile. Useful products (UP) may be produced at many stages.

It is visualised that in the employment of atomic piles for power production, some form of turbine, driven either by hot gas or steam, would be used. Neither the turbine nor the generator would, it is anticipated, differ much from those in use for orthodox power production to-day. The main problem, in fact, is the utilisation of the heat liberated during fission. For practical purposes, a steam temperature of more than 1 000° F. has been considered desirable, and this presents many difficult metallurgical problems.

#### HEAT EXCHANGE METHODS

The extraction of the heat from the inside of the pile could be effected by a heat exchanger in which the cooling fluid, from the pile, after circulating round the fissile material, is led out into a form of boiler. Thus, it is hoped, it should be possible to exclude the majority of dangerous radioactive substances from the turbine itself. This heat exchange fluid might be a molten metal, such as bismuth, or some other metallic liquid which would, in turn, be vapourised and condensed. An overall thermal efficiency of 40 per cent.

from calories produced to power generated, could be expected.

The problem of costs is still largely conjectural, but an American report made to the United Nations Atomic Energy Commission last September, stated that a plant producing 75 000 kW might be built in the United States for approximately £6 000 000. On the assumption that the plant would operate at 100 per cent. of capacity and that interest charges on the investment would be three per cent. the operating cost would be approximately 1d. per kWh. For comparison, the estimated costs of a coal-fueled station of similar siting and capacity are given as slightly less. Since the cost of nuclear energy is likely to decrease as more efficient methods of refining and pile construction are found, and since the cost of coal appears likely to continue to rise, it seems possible that, within a few years, an atomic power plant could become a serious competitor, commercially, to coal.

#### NUCLEAR FUEL COSTS

The expense of the raw nuclear fuel is not a prime consideration. The energy liberated when a pound of uranium or thorium is used completely, is about the same as that produced by burning 1 500 tons of coal. At the present time, the primary nuclear fuels are about 1 000 times dearer than coal, so that there is ample margin to pay for the special plant and processing which are needed.

The final consideration is the availability of uranium and thorium. The richest known sources of uranium are in deposits of pitch-blende found in Canada, the Belgian Congo and Czechoslovakia. Thorium occurs principally in India, Brazil, the Dutch East Indies, Australia and elsewhere. The output of uranium in 1939 was estimated at 1 000 tons, and this has probably been increased. There should be, it can be concluded, ample radioactive raw materials available, both in known and new deposits certain to be discovered, for at least a century of atomic development. Prof. M. L. Oliphant has recently spoken of the possibilities of obtaining nuclear energy from the transformation of the lighter elements into those higher in the periodic table, and it has been pointed out that, if it were possible to convert two hydrogen nuclei into one of helium, a process believed to take place in the sun—even more energy would be released than in uranium fission. This, however, is likely to remain speculative for some years. If it ever became a reality, the seas of the world would provide an inexhaustible supply of nuclear fuel.

# Correspondence

The Editor welcomes the free expression in these columns of genuine opinions on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression

## The Leblanc Exciter

[TO THE EDITOR]

SIR,—The writer very much appreciates the addition of the vector diagrams contributed by Mr. Yates in THE ELECTRICIAN of January 3 as an extension of an "answer" dealing with the Leblanc exciter in the issue of December 13, 1946.

Mr. Yates gives a careful explanation showing how the e.m.f. generated in the

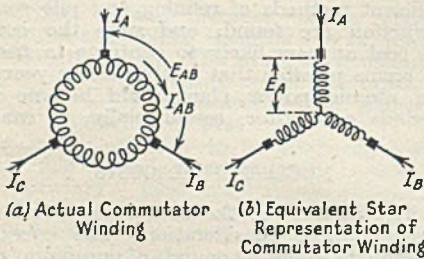


Fig. 1

conductors of the exciter leads the current in the conductors by 90° when the exciter is driven above its synchronous speed. In his vector diagram, however (Fig. 5 of his letter) he shows the e.m.f. as leading 90° ahead of the current entering the brush ( $I_2$  in Figs. 2, 3 and 5 of his letter). This is not correct since the current entering brush A is 30° displaced from the current in the conductors between brushes A and B.

It is generally convenient and usual to draw vector diagrams in terms of the phase-to-neutral voltage and when dealing with three-phase commutator machines the commutator winding, which may be regarded as a delta-connected circuit, can usefully be represented by its equivalent star as shown in Fig. 1.

The equivalent star values, in terms of the values for the winding between the brushes, i.e., the delta values, are:

$$E_A = E_{AB} \div \sqrt{3}$$

$$I_A = I_{AB} \times \sqrt{3}$$

$$Z_A = Z_{AB} \div 3$$

and it can be shown by drawing the vector diagrams that if  $E_{AB}$  leads  $I_{AB}$  by 90°, as in the Leblanc exciter, then  $E_A$  leads  $I_A$  by 90°. If the exciter e.m.f.  $E_j$  in Mr. Yates' diagram (Fig. 5 of his letter) represents

the equivalent star value of the e.m.f. then his diagram is correct.

The use of the equivalent star also makes very clear the phase angle between the m.m.fs. and the e.m.fs. of stator and commutator windings of a three-phase commutator motor. It is usual to represent a three-phase stator winding as in Fig. 2; when the current in ph. I is a maximum the resultant m.m.f. of the three-ph. winding is acting vertically, i.e. along the axis of the coils of phase I. If the commutator winding on the rotor is represented by its equivalent star winding as shown, the m.m.f. of the rotor will act along the axis of phase A when the current in phase A, i.e. entering brush A, is a maximum. The displacement in space between the two m.m.fs. is thus very clearly shown by the angle  $\alpha$ .

Similarly, if a rotating flux is moving clockwise round the air-gap it can be seen

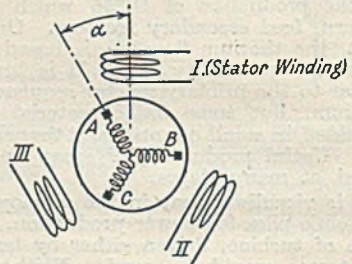


Fig. 2.—Diagrammatic representation of commutator motor

that it will be fully linked with the coils of the rotor phase A before being fully linked with the stator coils of phase I; the equivalent star e.m.f. of phase A of the rotor winding will thus lead the stator e.m.f. in phase I by an angle  $\alpha$ .

There appears also to be an error in the expression given for the size of the advance which should be

$$\frac{3.E_j I_2}{1000} \text{ kVA, not } \frac{E_2 I_2}{1000} \text{ kVA.}$$

Yours faithfully,  
E.O.T.

## "D.C." versus "A.C."

[TO THE EDITOR]

Sir,—In view of the impressive diagram, Fig. 9 of Herr Ehrensperger's Paper No. 103, read at the C.I.G.R.E., it seems almost ungracious to offer adverse criticism, but, with the praiseworthy intention, no doubt, of making the paper clear and

concise, the author has left largely to the imagination the basis on which he has put his figures together,

I reproduce, herewith, some of his curves (taken from his upper figure); and for convenience, have marked these b, c, d, e, f, g, h, j, l; a being omitted. (See Fig. below.)

It will be observed from reference to the 640 MW line, that the horizontal distances between a-b, c-d, e-f, g-h, steadily and rapidly, increase. It will also be noted that a, c, e, g, are a.c. curves and that b, d, f, h, are d.c. curves.

The inference is quite correctly drawn by the author and from his data, that the distance that can be fed, for equal cost per unit delivered, runs up very rapidly in favour of d.c. after 500 km. is reached.

But the author does not give the actual megawatt figure that was taken for the limit with transient stability, for a particular length of line. He also omits to say—but the inference is fairly plain—whether he has considered a "compensated" or a "non-compensated" line, though presumably the latter. Nor does he indicate the voltage at which he assumes the a.c. line to be working.

The paper must have been prepared the best part of a year ago; at which date probably not more than 180 000 kW would have been postulated for 400 miles and 220 kV, with "uncompensated" lines, if even that. Mr. Hoard's paper, read in August, before the A.I.E.E., showed that some 334 000 kW could be transmitted at 230 kV over 400 miles, using "compensated" lines, and the undersigned is putting forward certain proposals which he anticipates will raise the power to say, 440 000 kW (i.e., by 2.4 times).

The limit of power which Herr Ehrensperger has fixed for the d.c. system, for

400 miles, is not known (neither are the voltage nor the momentary increments postulated, nor their suddenness).

The vital question therefore arises: Is it not easy to prove that the increments a-b, c-d, e-f, g-h, rise steadily in favour of d.c. if he has taken for the transient stability limit, with a.c., a figure which is much too low?

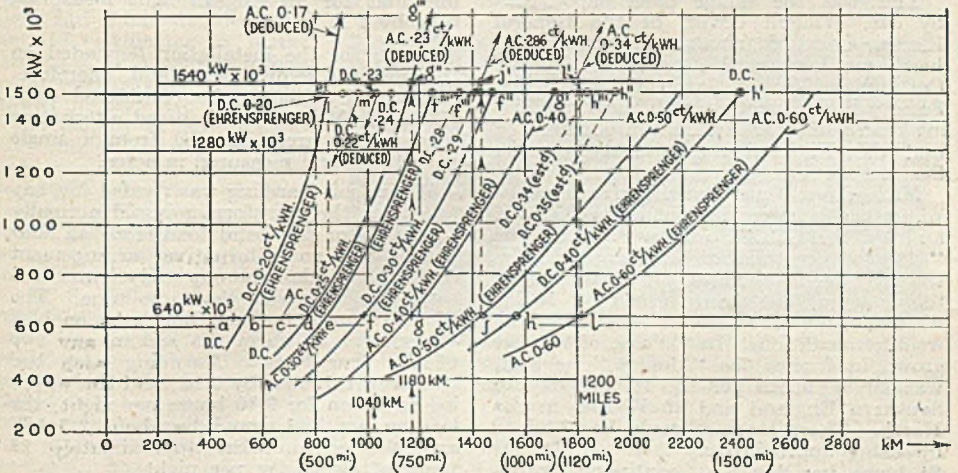
In the diagram reproduced, will be seen Herr Ehrensperger's curves of his Fig. 9 (upper figure), as stated above, from which certain deductions can be made.

Leaving his d.c. figures alone, and taking them as being correct as regards the power he can put through, consider his a.c. 0.4 ct/kWh curve marked as (g g')—see Fig. below, in particular the point (g), at 640 MW transmitted (640 is a purely arbitrary choice, and his curves have been extended slightly upwards).

If he has under-estimated the a.c. power by 60 per cent. (as is believed) then, keeping the distance unaltered at 1 180 km., we get a new point (g'), at 1 540 MW as the output for a.c., and we can draw through (g') a curve (g'' g'') similar in configuration to adjoining curves. We can then take  $\frac{1}{3.4}$  the cost per unit for the (g) curve, making it 0.166 ct/kWh.

Since the power is to be 2.4 times (ignoring the cost of "compensatory" devices, if there are any to be added, and neglecting also, for the moment, the effect of the cost of additional generators and transformers), the units delivered are 2.4 times greater, and as far, at any rate, as the line is concerned—except for the additional copper—the charge per unit delivered, so far as it is affected by the line, will be 60 per cent. lower than Herr Ehrensperger has taken.

The figure actually taken in place of his 0.40 ct/kWh is 0.23 ct/kWh which,



it will be noted, is 38 per cent. higher than if we had merely divided by 2.4.

By drawing in for a.c. working at 0.25 ct/kWh, through the point ( $g^{11}$ ), a piece of curve ( $g^{11}$   $g^1$ ), more or less parallel with ( $dg^{11}$ ), we find that, with a.c. at 1 180 km. the expense of working is the same as with d.c. at 1 040 km. In other words, a.c. can cover 140 more km. than d.c. The reverse of Herr Ehrensperger's finding.

Not only so, but even at 1 900 km. (1 200 miles) the costs are nearly alike; i.e., compare ( $l^1$ ) and ( $h^{111}$ ).

This is very different from the results published by Herr Ehrensperger, and if correct, would mean that d.c. transmission will not supercede a.c. transmission for distances up to 1 000 miles, at least.

It seems clear, therefore, that it is most important that the true limit imposed by transient stability should be taken for the most favourable conditions of compensation (i.e., with lines compensated by series capacitors), if a proper comparison is to be made between d.c. and a.c. working.

The writer is fully aware of the tremendous amount of work that is involved in making an estimate of the relative actual costs per unit in the way that Herr Ehrensperger has done (and all praise

is due to him for so capably tackling such a problem); and, in view of the above, the curves given herewith, are not put forward as being in any way authoritative but merely as a first attempt to show the effect of under-estimating the amount of power that can be passed with a.c., without losing stability.

The writer does not wish to convey the impression that he had fallen into the trap of assuming that, if the units put through the line are, say, doubled, the cost per unit will be halved. He has increased this halved value by a factor, which endeavours to take some account of those charges (e.g., interest, sinking fund on generators, etc.) which do not become halved when the units are doubled; and he may have insufficiently assessed this factor. The prime point of this letter is to learn what was the stability-limit value, etc., taken by Herr Ehrensperger, of megawatts transmitted.

It would be interesting to know how the advocates of d.c. transmission would deal with a system such as the Montana group of rolling mills in U.S.A., or even with "railway peaks."—Yours faithfully.

A. M. TAYLOR,  
Director, Economic Transmissions, Ltd.  
Birmingham.

## Soil Warming for Market Gardeners

THE use of electricity for warming the soil provides the market gardener with the means of growing crops out of season. In addition, it enables soil to be brought to the right temperature for the propagation of seeds and cuttings and for the reception of young plants which have to be transplanted.

This was the theme of a paper read by Mr. William Cover, of the General Electric Co., Ltd., at a meeting at Cottingham, on January 17, organised by the Cottingham Market Gardeners' Discussion Society in conjunction with the East Riding of Yorks War Agricultural Committee and the National Agricultural Advisory Service.

Mr. Cover mentioned investigations which had been carried out by the E.R.A. and by the G.E.C., and referred to the "dosage" method of warming whereby the soil was not maintained at a constant temperature, but was warmed by 10-15° F. and then allowed to vary with the weather conditions. In the case of lettuces grown in frames the "dosage," he said, was 40 W hours per sq. ft. per day in Southern England and 45 W hrs. in the North. Those loadings could be obtained by using approximately 2 W per ft. for 24 hours per day, i.e., continuous warm-

ing, 5 W per sq. ft. for 8 to 9 hours warming at night only, or comparable loadings for other periods. With the "dosage" mentioned the consumption per day would be 40 or 45 W hrs. times the area in sq. ft., which worked out at just over half a unit for a Dutch light measuring 4 ft. 11 ins. by 2 ft. 7 in., or one unit for an English light measuring 6 ft. by 4 ft.

Layout of the installation depended on the grower's requirements and, therefore, each inquiry had to be considered individually. Mr. Cover discussed alternative schemes for areas ranging from a single light to ground measured in acres.

Where soil warming was needed for, say four beds the transformer would normally be rated for the total load, i.e., all four beds, but an alternative arrangement could be made whereby only two beds would be in use at the same time. The use of change-over isolating links enabled the grower to warm the soil in any two of the four beds. Assuming each bed to measure 100 ft. by 5 ft., and the warming to be on for 9-10 hours per night, the loading per bed would be about 2.5 kW and the consumption approximately 25 units of electricity per night.

# • Electrical Personalities •

*We are always glad to receive from readers news of their social and business activities for publication in this page. Paragraphs should be as brief as possible.*

MR. THOMAS ATHERTON, managing director of Dorman and Smith, Ltd., and chairman and joint managing director of D.S. Plugs, Ltd., has sailed for South Africa to further the interests of the companies overseas. He expects to be away about three months.



MR. T. ATHERTON

Knox, of the Magneta Time Co., Ltd., has been elected chairman for 1947, and Mr. F. J. Benzima, of Felgate Radio, Ltd., vice-chairman.

MR. N. V. CASTLING has been appointed by A. Reyrolle and Co., Ltd., as joint southern area manager; Mr. W. H. Gofton becomes district manager for the Holmes division; and Mr. A. H. McQueen district manager at Bristol. Mr. J. R. Cowie has recovered from his recent serious operation and has resumed duty as joint southern area manager for the company.

SIR MONTAGUE HUGHMAN, chairman of W. T. Henley's Telegraph Works Co., Ltd., has handed long service certificates to further groups of employees who have completed twenty years with the company. No fewer than 1 641 employees have qualified for similar certificates since the inception of the scheme in 1928. At one of these ceremonies Sir Montague made special presentations, including books of savings certificates, to three employees—Messrs. S. E. S. Sellers, J. H. Richmond, and B. G. Dixon—to mark their completion of fifty years' service. One of the two brothers of Mr. Dixon completed fifty-two years' service before retiring in 1945, whilst the other brother, who is still with Henley's, has already completed over

forty-eight years' service, bringing the family total up to no less than one hundred and fifty years.

MR. S. H. BURCH has been appointed chairman, and Mr. H. S. Lambard managing director, of Asea Electric, Ltd.

MR. W. WORSLEY, late of the Sterling Engineering Company, has joined the staff of A. B. Metal Products, Ltd., in the capacity of chief engineer.

MR. WILFRED B. LANE, of Birmingham, has been elected a director of Wright, Bindley and Gell, Ltd., in place of Major A. Wright, who has retired.

MR. GEORGE TURNBULL, chief electrical engineer with Horden Collieries, Ltd., Co. Durham, has retired. Mr. Turnbull supervised the electrification of Blackhall and other pits.

MR. A. ROBINSON, of Bolton, has been recommended by the Walsall Electricity Committee for appointment as technical assistant in the electricity department.

DR. P. DUNSHEATH, consulting engineer, and a director of W. T. Henley's Telegraph Works Co., Ltd., who is touring Australia and New Zealand on behalf of the I.E.E., broadcast on Radio Australia on Wednesday.

PRINCESS ELIZABETH was elected an Honorary Member of the Institution of Civil Engineers at the ordinary meeting of the institution on January 21. Her Royal Highness thus becomes the first lady Honorary Member. Ladies have been con-

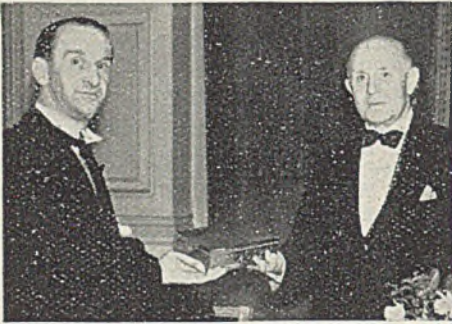


SIR MONTAGUE HUGHMAN, (fifth from left) chairman of W. T. Henley's Telegraph Works Co., Ltd., with a group of the company's contract department outdoor staff who received long-service certificates

sidered eligible for election to corporate membership under the charters in view of

the provision of the Sex Disqualification (Removal) Act, 1919, and the first lady member was elected in 1927. At present there are three corporate members and four students of whom the third lady corporate member was elected and the fourth lady student admitted on January 21.

MR. H. S. SECCOMBE, chairman and managing director of Electrical Com-



MR. H. S. SECCOMBE, chairman and managing director of *Electrical Components, Ltd.*, receiving from MR. L. WALL, Birmingham branch manager, a silver casket from the staff in commemoration of 25 years as managing director

ponents, Ltd., was presented by the staff at a dinner in connection with the managers' sales conference of the company at the Grand Hotel, Birmingham, on January 21-23, with a silver casket to commemorate the completion of 25 years as managing director. The casket was engraved with the facsimile signatures of 60 members of the staff who had been in the company's employ for periods of ten years or more. The accompanying illustration shows Mr. L. Wall, Birmingham branch manager (the oldest employee of the company) making the presentation.

MR. F. W. OSBORN has been appointed Midland branch manager in the sales division of the British Aluminium Co., Ltd., in place of Mr. C. G. Pountney, who resigned from the staff of the company on December 31.

MR. W. J. DRUMMOND, deputy chairman of the North-Western Divisional Coal Board, has accepted appointment as honorary secretary of the British National Committee of the World Power Conference in succession to the late Mr. C. Rodgers. Mr. Drummond has been a member of the British National Committee for many years.

MR. ALAN P. GOOD has resigned from the Boards of Tarran Industries and Folland Aircraft and, subject to completion

of negotiations now in an advanced stage, is resigning from the Boards of Lagonda and Darwins. Mr. Good is concentrating his main activities on the Brush Electrical Engineering Co., Ltd., to which he has recently returned as managing director with a ten years' service contract.

MR. I. A. MARRIOTT, commercial director of Associated British Oil Engines, Ltd., who, as announced recently, has joined the board of the Brush Electrical Engineering Co., Ltd., in a similar capacity, will in future direct the policy of the combined sales staffs of these two companies.

MR. A. V. MATHIAS, London, has been appointed by the Fulham Electricity Committee as progress engineer. Other appointments are: Mr. W. S. Lascelles, Hebburn, as inspector, Mr. W. J. Thomas, Hayle, and Mr. N. Leo, St. Helens, as junior technical engineers; and Mr. G. Bowen Jones, London, as publicity officer.

### Obituary

SIR THOMAS HIGHAM, Bank House, Accrington, on January 22, aged 80 years. For 41 years he presided over Accrington Electricity Committee and was chairman of the Mid-Lancashire Electricity Board for many years.

MR. E. F. J. HOLCOMBE HEWLETT, consulting electrical engineer, at Mansfield, on January 22, aged 79 years. He was educated at the Manchester Grammar and Technical Schools and Owen's College, and was apprenticed to the Edison Co. in 1885. He gained further experience with Baerlein and Co. in Manchester and Lisbon, and with Siemens Brothers. In 1893 Mr. Holcombe Hewlett was appointed town electrical engineer at Hove, and two years later he went to Australia to take up the position of engineer at the Electric Supply Works, and then joined the Mount Morgan Gold Mining Co., at Queensland. He also practised as a consulting engineer. He was responsible for the first installation of electric power in a gold mine in Australia, and introduced the first automatic booster in the Empire Mount Morgan mine in 1898. Returning to England, he became in 1902 resident engineer at Mansfield, and in the following year was appointed engineer and manager of the Mansfield electricity department. He was responsible for the erection of the electricity works there and subsequent extensions during the long period of his service with the Corporation. During the 1914-18 war he planned and carried out a special converting scheme for the supply of electricity to the Clipstone camp. He was a member of the I.E.E. and the American I.E.E., and an ex-member of the Council of the Australian Institution of Mining Engineers.



# Wallasey Electricity Jubilee

## Growth of a Successful Municipal Undertaking

ON Wednesday evening, members of the Wallasey Electricity Committee, station officials and others met at dinner to celebrate the Jubilee of the local electricity undertaking. During the day, guests were

entertained at luncheon and tea, and taken on a tour of the generating station and main sub-station. The proceedings will be reported in our next issue.

The question of a municipal undertaking for Wallasey was first considered on December 19, 1895, and the scheme was a p p r o v e d and orders

MR. W. J. FORSTER, borough electrical engineer and manager

were placed in February of the following year.

Application was made to the Local Government for a loan of £17 500 on June 18, 1896, while on July 19, the Board of Trade approved the system of supply and granted the licence.

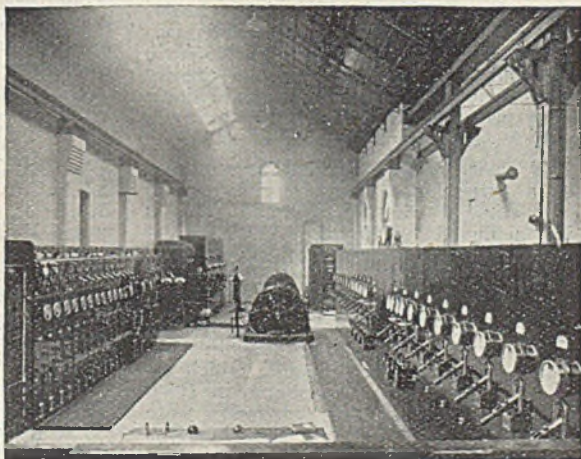
Unfortunately, there is no record of any formal opening of the undertaking, beyond the engineer's report, dated January 21, 1897, that the event would take place "on the 29th instant, after which a constant supply of electric current will be given." The original plant consisted of two 75 kW, 50 cycles, single-phase flywheel alternators, direct-coupled to two vertical compound-condensing engines running at 300 r.p.m. Steam was generated by three Lancashire boilers working at 80 lbs. pressure. In the original scheme, 11 miles of h.t. and l.t. cable were laid, transmission being at 2 kV, single-phase, and distribution at 100 V.

Records of the first year's working indicate that the capacity of the station was ample to meet requirements, the highest recorded demand being only 18 kW and the total units sold, 91 570. There were 98 consumers, paying an average price of 5.389d. per unit.

From then onward, however, demand increased rapidly, and by September, 1898, application had been made for an additional 300 kW alternator, boilers, cables, transformers, etc., totalling £10 000. At the same time, it was decided to supply energy for traction by the installation of a d.c. plant at an estimated cost of £18 500. An increase in domestic consumers resulted from arrangements made in 1903, for free wiring of houses by a private company, for which 1d. per unit above standard rates was paid. This arrangement continued until 1935, when the department made a cash settlement with the company.

By 1912, it was agreed that the station had outgrown its site, and in 1914, work was commenced on the present station at Poulton. The original installation was planned for two 3 000 kW turbo-alternators and three boilers, with a steaming capacity of 6 600 lbs. hr. Delayed by the outbreak of war, this plant was commissioned in 1917, and the original station, at Seaview Road, closed down a year later. Since then, it has been the undertaking's principal sub-station.

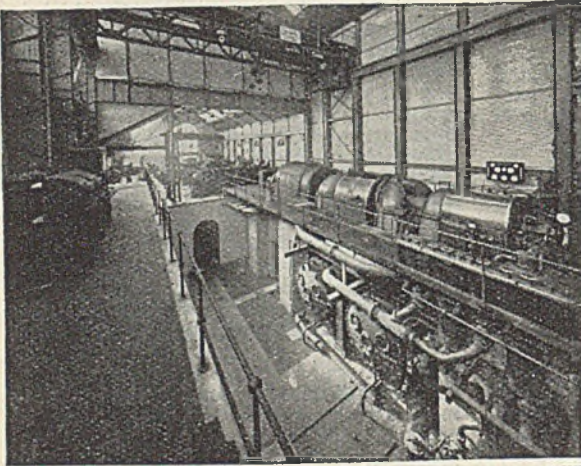
Further growth soon took place, and by 1925, the station capacity was 16 000 kW. In 1928, the last extensions to be made



Seaview sub-station as it is to day

at Wallasey, in the form of a 12 500 kW generator, two 50 000 lbs./hr. boilers and some additional buildings were added. It is notable that these two boilers, arranged for p.f. firing, were among the first in the country to be so equipped.

Under the 1926 Act, Poulton became a selected station, and to-day, the 22 500



*Interior of Poulton generating station, showing 12 500 kW turbo-alternator in foreground*

kW of installed plant, and the boilers totalling 197 000 lbs., are run on a two-shift basis under the control of the C.E.B. In 1946, approximately 37 million units were sold.

When the Poulton station was planned, generation was to be at 6.6 kV, and three-phase mains were laid, with Scott-connected transformers at the sub-station for stepping down the pressure to 2 kV single-phase, thereby making it possible to use the existing 2 kV mains. Later, additional transformers were added; distribution pressure was raised to 200 V in 1921, and it is a tribute to the quality of the early cables that some, laid down in the original scheme of 1897, to work at 100 V, are now operating at 240 V.

Last year, it was decided to superimpose a three-phase four-wire network on the existing distribution system. This is being achieved by laying 6.6 kV cables designed for an ultimate working pressure of 11 kV and transforming down at selected sub-stations to 415/240 V.

The Council adopted hire-purchase facilities for domestic equipment in 1928 and an assisted wiring scheme, which resulted in 9 000 new connections, in 1930. In 1934, new offices and showrooms were added, and there is also a branch showroom in the north-west part of the borough. The local branch of the Elec-

trical Association for Women, formed in 1935, has to-day 120 members.

During the last war, the undertaking suffered heavily from damage by bombs. In a raid on March 12, 1941, the Poulton station was severely damaged, one bomb falling at the base of the brick chimney stack. A second H.E. hit the engine room near the 12 500 kW set, and third and fourth bombs fell on the weighbridge and coal store. Despite the damage sustained, supplies were quickly restored. On another occasion, a parachute mine fell near the Seaview Road sub-station, with serious effects. Both stations still have temporary roofs, but plans are in hand for repairs on a permanent basis.

Financially, the undertaking is in a sound position. From an original capital outlay of £17 500, the department has grown until to-day, the total capital value is £948 361, with an outstanding debt of £244 949. Similarly, income has increased from £2 056 in the first year's working to a figure of £334 355 for 1945-46, whilst the average price per unit sold has fallen from 5.389d. to 1.373d. Altogether, £211 000 has been appropriated from yearly surpluses for rate relief, mated from yearly surpluses for rate relief, and besides this, the undertaking is the town's largest ratepayer.

In its 50 years, the undertaking has had five engineers and managers, one of whom, Mr. J. A. Crowther, filled the position for 18 years and his successor, Mr. B. T. Hawkins, for 24 years. The position is at present occupied by Mr. W. J. Forster, to whom we are indebted for the information given above. His deputy engineer and manager is Mr. J. H. Osborn.

## *Plastic Mouldings*

**R**EPORT Ref. B/T 40, prepared by the B.E.R.A., has been published by the B.S.I. as an "Interim Report on Suggested Methods of Testing Finished Mouldings." B.S. 1330:1946. It is hoped that this report will enable the electrical and plastics industries to obtain experience in the technique of the preparation of miniature test samples and of the various methods of test recommended, so that standard tests suitable for inclusion in specifications can in due course be evolved. Copies may be obtained from the Publications Department, 28, Victoria Street, S.W.1, price 7s. 6d., post free.

# Mercury Vapour Discharge Lamps

## Possible Demand of Future Applications on Lamp Designs

**P**ROBLEMS related to the design of lamps were dealt with in the discussion on a paper entitled "The High-Pressure Mercury-Vapour Discharge Lamp and Its Applications," by Mr. V. J. Francis and Mr. W. R. Stevens, read at a meeting of the I.E.E. Installations Section on January 23.

After a brief review of the development of high-pressure mercury-vapour lamps and their applications, the present position was considered, both as regards the understanding of the properties of the discharge itself and the applications to lighting. Some attempt was made by the authors to examine the ultimate possibilities of the discharge lamp from the point of view of efficiency and colour. Present applications were discussed, and the demand that future applications was likely to make on lamp design was considered.

MR. K. H. TUSON (Mackness and Shipley) said that a year or two before the war considerable interest began to be taken in the defence of beaches against hostile attack, and one piece of equipment required for this purpose was a small portable searchlight to illuminate a field of fire for infantry weapons. The standard equipment consisted of a carbon arc in a 12-in. projector standing on a 4-ft. tripod, with its own generating set under cover and a connecting cable. It had the slight disadvantage that the infantryman operating it, standing next to a searchlight, would not have a very long life, and therefore the use of a high-pressure mercury lamp was considered, and experiments were carried out with water-cooled and air-cooled types. The latter proved useless, because of the time required for striking, but after the war broke out the proposal for a water-cooled mercury lamp was taken up again and a great deal of work was done. The problem of portability was solved fairly successfully, but the equipment was never put into production or used to any extent, mainly owing to the lack of uniformity in production. It was found that the voltage of operation, the striking voltage, wattage and so on could not be kept constant within a batch of lamps, so that critical adjustments had to be made on each lamp, whereas an essential feature of the equipment was that it should be capable of operation by unskilled people. He would like to know what was the present manufacturing posi-

tion. To what accuracy could the lamps now be commercially produced, and were manufacturing troubles at an end? He believed that the difficulties concerned the bore of the tube and the precise amount of mercury, and that the whole equipment was still somewhat complicated from an operator's point of view.

MR. F. V. HAUSER (D. and P. Studios, Ltd.), speaking as a motion picture engineer, said that the new type of lamp described was going to have a profound effect on studio lighting. Its advantages in the way of silent operation, constancy of light output, cooler light beam, and lighter and smaller equipment were very great. It was possible that the problem of insulation would also cause a slight revolution in studio lighting practice. Up to now it had not been necessary for portable studio equipment to be earthed, but if there was any danger of the new equipment becoming live from the pulse circuit, good and comprehensive earthing would be necessary. The quartz envelope was transparent to ultra-violet radiation, but he assumed that if the equipment was properly enclosed there would be no danger. He did not agree with the authors that a studio floodlight need not be of more than 3 kW capacity; there were occasions when a source of double that brightness would be very useful.

MR. A. J. MEADOWCROFT (Siemens Bros. and Co., Ltd.) remarked that it had been the experience of the laboratories to which he was attached that with lamps of the type in question, where the arc length was comparable to the diameter of the enclosing tube, there might be considerable movement of the arc due to the strong convection currents in the mercury vapour, and this movement was a disadvantage where the lamp was used in, say, a street-lighting fitting. In the M.B. type (the quartz lamp with the narrow tube) the arc was kept steady by means of the tube itself, and in the compact-source type the electrodes, by virtue of their large size compared with the arc, shielded the arc appreciably from the effects of the convection streams.

MR. H. K. BOURNE (B.T.H. Co., Ltd.) emphasised the advantages of the new form of lamp to film lighting engineers, these advantages, as compared with the carbon arc, including cleanliness, completely silent operation, and long life with-

out requiring attention. Its disadvantages—the delay time in starting and restriking, and the question of colour—had now been overcome. The laboratory with which he was associated began work in applying the new lamps to the film industry in May, 1945, when in collaboration with Mr. Hauser they photographed at the Denham Studios some colour charts in technicolor and compared them with the high-intensity arc. They found that the rendering given by the mercury-cadmium lamp was extremely good, and in November of that year a small set was illuminated with seven 5 kW mercury-cadmium lamps. Equipment was now being made which would enable tests to be carried out during the actual production of films in the studios. At the same time tests were made at the Nettlefold Studios, where a mercury lamp was used in the actual production of a film. It was a black-and-white film, and was called "The Crowthers of Bank Dam." When it was released it would be possible to see a number of shots taken using the mercury-cadmium compact-source lamp. These lamps had also been used in colour photography for still photographs, and very good results had been obtained. In August of last year the B.B.C. used the lamps for a television broadcast, to light one of the regular programmes.

SIR CLIFFORD PATERSON expressed his pleasure that colour-correction had been kept in the forefront. There was great need for a really good, very high efficiency colour-corrected street lighting lamp, he said, and it seemed reasonable to expect, from all the thought and effort which were being devoted to the subject, an eventual solution of that problem. The paper and discussion were an earnest of very much greater things to come.

MR. G. G. ISAACS (G.E.C. Research Laboratories) remarked that the theory behind the high-pressure mercury vapour discharge was now sufficiently known to make it possible to project the requirements in order to make lamps for specific purposes, but some limitations were still imposed by the materials used, in particular for the electrodes; even tungsten was found to be a limitation in the compact-source lamp. The water-cooled lamp to some extent overcame the difficulty of the temperature of the quartz wall by cooling it with a flow of water, but that did not help on the electrode question. It had seemed at one time that there were possibilities in combining the techniques of the compact-source lamp and the water-cooled lamp; the high pressure of the water-cooled lamp enabled a large quantity of continuous spectrum to be added to the lines, and, in addition, there was the

feature of the very quick run up and restart. Unfortunately, however, it seemed evident from experiments that any large deviation from the geometry of the water-cooled lamp led to trouble in the case of the quartz, and that the 2-mm bore lamp with 2-mm thickness of quartz wall was the only useful form; i.e., one was limited to a high-voltage lamp with a linear source, because of the high temperature gradient in the quartz wall.

MR. H. R. RUFF (B.T.H. Co.) said that a good deal of work had been carried out in this country to try to get some simple means of assessing the colour-rendering properties of the compact-source lamp, combining the line spectrum with continuum. Instead of considering all the individual wavelengths throughout the visible spectrum it seemed possible to take eight bands, and by considering relative luminosities in those eight bands to obtain some idea of their colour-rendering power. Such an assessment should be helpful in assessing the use of a source for colour film work.

MR. N. H. DENHOLM (Lloyd's Register) suggested that if cold lighting was to be used it should be remembered that actors, and particularly variety artists, preferred to fry rather than to freeze, and it might be better to retain one or two carbon arcs to keep them warm.

MR. J. F. SHIPLEY (chairman of the Section) referred to the tremendous amount of hard work which must have been necessary behind the scenes in dealing with the many difficulties which arose—the difficulty of getting the right glass, of sealing the electrodes in the glass, of getting pure mercury, cadmium and zinc, and so on. He also mentioned the possible use of the lamps in question in alluvial mining, where the problem was to light the working face, which was often 30 to 50 ft. high and 100 to 200 ft. wide. In winning the ore, which was often in layers and very often contained in clay of a characteristic colour, it was desirable to light the face in a way which would bring out the characteristic colour of the clay which carried the ore, so that when working at night the dragline or bucket excavator could be used to the best advantage. The very large machines used might take 500 or even 1 000 kW for 30 or 40 seconds, and then the current would be switched off, which played havoc with the voltage regulation. High-pressure mercury vapour lamps had been tried for this work 15 years ago, but although of great advantage had had to be abandoned for that reason.

The authors then replied to the discussion.

# Commissioners' War Report

## SIX YEARS' SURVEY OF ELECTRICITY SUPPLY INDUSTRY

FOLLOWING the outbreak of war with Germany, it was considered necessary to withhold from publication all new information concerning developments in the supply industry and, in consequence, the Electricity Commissioners discontinued the issue of their usual annual reports. When security restrictions were eventually lifted, the Commissioners decided to prepare a single report embodying all the material covering the six years from April 1, 1939, to March 31, 1945. This now makes its appearance, in a 200 page volume under the title of "War Period Report of the Electricity Commissioners" (Stationery Office, 10s.).

The report begins with a review of the position of the industry prior to the war. In April, 1939, the supply industry comprised the C.E.B. and 580 authorised undertakers, affording supply, together, to about ten million consumers. There were 370 generating stations, containing in aggregate about 9 500 000 kW of plant, and including 137 selected stations (8 264 000 kW) operated under the directions of the C.E.B., with 35 non-selected stations.

The grid system, at the same time, consisted of 4 378 miles of main transmission lines, of which 2 994 miles were operated at 132 kV, and 304 transforming and switching stations with an aggregate transforming capacity of 10 442 000 kVA. The total capital expenditure of the industry at the end of 1938-39 amounted to about £648 000 000, and total sales to consumers amounted to 20 828 million units, bringing

resulting, in the early days of the war, in factories being planned without reference to available electricity supplies, led to the setting up, in April, 1940, of a small co-ordinating committee representing all the departments concerned, on which the Commissioners were represented.

Over the whole war period, sales for all purposes showed an increase of 56 per

TABLE II

Year	Units generated* (millions)
1939	26 408.71
1940	28 772.96
1941	32 360.29
1942	35 654.17
1943	36 951.27
1944	38 363.15

\* Inclusive of units generated by oil, town's gas, water power, waste heat, &c.

cent. on 1938-39 levels. Power sales rose by 86 per cent. and lighting, heating and cooking sales by 33 per cent. The increase in the maximum demand on the undertakings was accompanied by a considerable improvement in the grid load factor, which increased from 36 per cent., in 1938, to a maximum of 50 per cent., in 1942. One of the immediate effects of the war was a substantial falling off in demand, due to lighting restrictions and other factors, and it was not, in fact, until the winter of 1941-42 that the pre-war maximum demand was exceeded. Over the war period, however, units generated showed an average rate of increase of 9.5 per cent. per annum, and by 1944, the output from all sources, including water power, was 57.4 per cent. in excess of the 24 372 million units generated in 1938. In 1944 there were 345 stations in operation, the 80 largest of which had an average output of 440 million units each. Details of new plant sanctioned from 1940-45 are given in Table I.

Next, the report deals with restrictions on building and repair work, and with the various methods by which materials in short supply were controlled and allocated. The need of the aircraft aluminium industry for all available supplies of this metal resulted in an order forbidding the manufacture of steel-cored aluminium or aluminium conductors for overhead lines, although small quantities were made available for the maintenance and repair of existing lines. Copper-cadmium conductors were employed for war-time reinforcements of the grid, and proved completely successful.

From time to time during the war period, the Commissioners, in agreement

TABLE I

Year ending March 31	Generating Plant Sanctioned	Capacity of plant sanctioned kW
1940	...	721 413
1941	...	609 021
1942	...	230 380
1943	...	324 495
1944	...	5
1945	...	1 179 400
Total	...	3 064 714

in a total revenue from sales of over £90 000 000. The industry was carried on by about 122 000 employees.

Under the heading of "general policy," the report goes on to review suggestions put forward at various times to restrict consumption by rationing. The decision to abandon such schemes and concentrate instead on a sustained fuel economy campaign was taken in June, 1942, after the matter had been debated in Parliament. Rapidly expanding munitions production,

with the C.E.B., submitted to the Government their recommendations as to the additional generating plant needed to meet and safeguard the supply position in succeeding years. These programmes, however, were not always approved in their entirety, owing to competing demands upon industry, and it was recognised that the C.E.B. could not always be held responsible, if they were unable as a result of war-time policy and restrictions, to meet the whole of the demands made upon the grid in the period following the end of the war.

Despite the various difficulties in planning extensions, however, there was a net addition of 2 989 921 kW to the capacity of selected stations above 1938 levels, an increase of 36 per cent. The report makes special reference to an emergency programme framed in 1940, to minimise war risks and to deal with the rapid growth of the load in the western part of the country consequent upon the concentration of new munitions factories in that area. During the years 1941-42 to 1943-44, inclusive, energy exported from the South-East England area varied from between 280 000 kW and 292 000 kW, while energy exported into the western areas varied between 116 000 kW and 244 000 kW. Extensions to the grid to meet the shifting of load involved the construction of about 360 route miles of 132 kV transmission line, and a large number of lines were set up to provide supplies to specific war factories.

The emergency programme provided for the installation of about 180 000 kW, divided between four existing stations and two new selected stations. The greater part was completed during 1942, and all the new plant was in operation by April, 1943.

#### COAL SUPPLIES

Turning to coal supplies, the report states that the rearrangement of distribution resulted in considerable quantities of unsuitable fuel being delivered to stations, and this led to a notable decline in the general level of efficiency. The Central Board reported that on some occasions the use of such coal caused a reduction of as much as 300 000 kW in the output available on the grid system. Coal consumption increased at an annual rate of 10.9 per cent. (compared with 9.5 per cent. average increase of energy output), and over the whole period the total coal consumption amounted to 119 695 000 tons. In 1939, the average number of units generated per ton of coke or coal consumed was 1 640. By 1940 this had fallen, as a joint result of the greater spreading of load between stations, difficulties with plant maintenance and unsuitable fuel, to 1 582 units per ton.

The next section of the report describes war-time restrictions on capital expenditure and the regulations regarding charges. During the whole period, 307 authorised undertakers (222 public authorities and 85 companies) made increases in their charges to consumers but, except in three cases, these increases were within the statutory limits permitted and did not require authority from the Minister of Fuel.

#### MAN-POWER DIFFICULTIES

Referring to man-power difficulties, the report points out that many key engineers, with specialised knowledge, were absorbed by the technical branches of the Services or by the manufacturing industries and, notwithstanding the part played by the electricity supply industry in the production of all kinds of munitions, it was not classified in the same category of vital works as munitions, despite efforts by the Commissioners to bring this about.

The overall man-power of the industry, in fact, decreased by 30 542. In the same period there was an increase of 7 168 in the number of female employees. Summing up the man-power situation, the report says that the staff employed at generating stations increased in approximately the same ratio as the increase in the total amount of generating plant in commission, as the result of upgrading and the recruitment and training of less experienced personnel. Staff engaged on transmission and distribution, however, decreased by about 42 per cent.

After a review of the plans laid down in the early part of the war for air-raid precautions and fire prevention, the report deals at length with war damage suffered by the industry as a whole. The total number of generating stations affected by enemy action was 65, with an aggregate plant capacity of just over 5 600 000 kW. The monthly records compiled by the Commissioners from the commencement of enemy air attacks in September, 1940, show that 32 of these stations were subject to an incident (or more than one incident) during one month only out of the whole war period; 12 stations to incidents during each of two separate months; 13 during three months; four during four months; two during five months and two during seven months.

The report concludes with a short review of post-war needs. The estimated capital expenditure for works contemplated during the first five post-war years amount to £155 000 000 in respect of generators and some £227 000 000 for other purposes. A series of appendices give financial and other details.

# Tests Methods in Industry

## The Application of Electrical Technique

THE subject for discussion at the meeting of the I.E.E. Measurements Section on January 24, was a paper on "The Application of Electrical Technique to the Service of Some Other Industries," by Mr. H. C. Turner and Mr. G. M. Tomlin.

Before the commencement of the proceedings, the chairman, Mr. L. J. Matthew, referred to the great loss the section and the measurement industry had sustained by the sudden death earlier in the month of Mr. S. H. Richards, the immediate past chairman of the section, who was well known from his long connection with the industry, and particularly as chief examiner under the Electricity Commissioners.

The paper referred to some of the advantages of electrical methods of testing in industries other than the electrical. Some of the possible uses of electrical methods were indicated, and actual instances given. Specific reference was made to some new electronic apparatus which had proved its worth, both in the steel and the automotive industries. The use of those instruments was illustrated by figures provided by the actual users.

MR. F. E. J. OCKENDEN (Everett Edgcombe and Co.), dealing with the magnetic sorting bridge, asked whether it was certain that every form of discrepancy in the units under test would produce an individual characteristic, and that there was no danger of two sources of failure cancelling each other out in the image on the screen. The question of calibration must be, he thought, very important. In testing units in the magnetic sorting bridge, an enormous amount of metallurgical work must be done to prepare samples with known errors in the way of hardness, alloy composition and the like, in order to determine the nature of the fault. Methods of electrical testing as applied to non-electrical industries could be divided into two broad classes: those in which the primary unit gave a good deal of power, and a reading could be obtained directly on a meter, and those where a simple primary unit made a comparatively simple measurement, but where the output was too small to be read directly on a simple indicator by an unskilled operator, so that an amplifier had to be used. Such devices could be subdivided into three units: (i) the primary unit which made the measurement, (ii) the amplifying unit, and (iii) the unit which made the response visible to the operator. It might be desirable to

make the amplifier and the indicator standard, so that they could be applied to a number of primary units, depending on what was required. This would have a further advantage in regard to servicing. Most of those devices would go into industrial establishments where there was no wireless or electronics engineer, and unless local wireless firms could be trained to service them industry might be reluctant to make use of such units. He believed that the use of such devices as the authors had described was going to be very wide indeed, but there was a certain prejudice against the use of devices which could not be put right by the local engineer if anything went wrong.

MR. W. C. FAHIE (British Iron and Steel Research Association) said that all the instruments described would have applications in the iron and steel industry. The successful introduction of new measuring techniques to industry, however, required the confidence and co-operation of the users, and that included confidence in the ability to maintain the instruments, so that the too rapid introduction of new techniques, not backed by a proper service organisation, was to be deplored. Electronic instruments worked admirably if properly maintained, but they were inconspicuous and tended to be overlooked. Dealing with the magnetic sorting bridge, he suggested that the correlation between the figures obtained on the oscillograph and the physical condition of the material under test was by no means apparent, but was a matter of great importance to the steel industry. Research on this subject was being undertaken by Professor Bates at Nottingham in an effort to find a correlation between the indications given by the magnetic sorting bridge, the physical condition of the specimen, and the indications given by other tests such as the static B/H test. In the steel industry, instruments worked under adverse conditions of shock, vibration and dirt, and the authors' vibration analyser would be useful for measuring the vibration of instrument panels to enable proper insulation to be provided. The metal-thickness meter described in the paper would also be very useful, but he would like to know how the authors ensured that the readings given by it were not ambiguous. For the mechanical testing of large lumps of steel weighing anything up to 180 tons the X-ray technique would not work, and there was a great future there for the supersonic

method, but there again the trouble was not to make the instrument work, but to interpret the information obtained. For example, in an anisotropic material, which would have different elasticities in the three co-ordinate directions, there would be three modes of propagation of the elastic waves inside the material, in addition to a surface mode of transmission. All these could give rise to echoes on the cathode-ray tube, and it was sometimes very difficult to interpret them.

MR. C. W. MALLET (Institution of Automobile Engineers) emphasised that the instruments described must be regarded simply as good tools which, in the hands of people who understood them, could do a great deal of work more efficiently than had been possible in the past. If British industry was to meet competition it must have readily available, and be ready to use, the latest scientific advances. There had always been a prejudice against electrical instruments, and the average maintenance engineer seemed to be scared if he saw an electric cable; that attitude was, however, slowly dying.

DR. W. WILSON (G.E.C.) pointed out that one advantage of the magnetic sorting bridge over the direct taking of a B/H curve was that by taking a differential curve, the height of the curve was lowered considerably, and it was therefore possible to employ vertical gain and make the figure fill the screen very much better. It might be possible to use five times the vertical scale, thereby multiplying the accuracy by that factor, since the accuracy of a cathode-ray oscillogram depended upon the size. The measurement of vibration was becoming more and more important. Of the three apparatus the authors described, the first gave the exact frequency of each component and its amount, the second divided the components into "bunches" and made it possible to identify the bunch to which any particular vibration belonged, while the third measured individual components, but its range and sensitivity were less. He imagined that the second type would have an advantage over the first if prices were compared, and that the relative costs of the three would be in the ratio of 100 : 10 : 3. He was particularly interested in the supersonic apparatus, because over a year ago he procured a supersonic flaw detector, working on the principle of radiolocation, which had done wonderful work. To detect flaws in very large forgings, such as for the rotor of a turbo-alternator, 2 to 3 ft. in diameter and up to 35 ft. in length, used to take two or three weeks, but the radiolocation method did the whole test in 8 hours, and would detect flaws the size of a pin's head. He was

sorry to find that the authors in several places referred to American products without saying anything about the corresponding British productions. The supersonic flaw detector to which he referred was a British production, and he did not think that the Americans had produced anything anywhere near as good.

MR. B. WOOD said it was of great interest to anyone who had been faced with the difficulty of analysing vibration or noise to see that it could not be done objectively. In the past it had been an almost impossible task, and it was astonishing that acoustics made any advance at all in the days of Lord Rayleigh, when it was all done by ear, because not many people could be relied on to tell the difference between one note and another.

DR. A. ROSEN suggested that the authors' metal-thickness meter might be used for glass or other substances in which standing waves could be excited, and asked whether temperature would have any effect on the crystal pick-up or the calibration.

DR. S. WHITEHEAD (E.R.A.) pleaded for thought to be given to the use where possible of ordinary instruments. Recourse to amplifiers and valves and photocells, he said, had become so natural that there was a danger of their being used when something much simpler would suffice. Giving examples of the successful use of simple methods, he mentioned the case of a cable consisting of two metals, where it was desired to know how much stress there was between the strands of the different metals. That problem had been solved simply by winding a coil on the outside and using a galvanometer. Again, by using an ordinary earth tester it had been found possible to locate surface coal measures to an accuracy of plus or minus 3 in., and to determine the quality of the coal in them.

MR. G. M. TOMLIN, in reply, said it seemed fairly certain that no two differences in samples in the magnetic sorting bridge would cancel out; at any rate some two hundred factories in England were equipped with this instrument, and they had never heard of a case where the differences were equal and thus gave a straight line.

The authors apologised for giving an American reference where a very good English instrument existed, and they had no intention of claiming that America was ahead of this country in development work; but they believed that the Americans were ahead of us in accepting the use of such instruments in industry.



# Inquiries from Overseas Buyers

**O**VERSEAS readers of THE ELECTRICIAN who wish to import goods manufactured by British firms in the electrical and allied industries are invited to write to THE ELECTRICIAN, Bouverie House, 154, Fleet Street, London, E.C.4, giving details of the equipment in which they are interested and quoting bankers' references, and, where possible, the names of their British purchasing agents. Details of their requirements will then be inserted for a period in this section under a reference number, free of charge. The section appears in the last issue of each month.

**R**EPLIES to these inquiries should be enclosed in separate envelopes, bearing the reference on the top left-hand corner, the remainder of the envelope being left blank for insertion of the buyer's name and address, and should be enclosed in a covering envelope addressed to THE ELECTRICIAN at the above address. Stamps to cover Foreign or Dominion and Colonial postage must be affixed to replies.

On request, regular advertisers will be furnished with the names, addresses and, where known, the references and purchasing agents of any of those readers to whom they wish to forward catalogues or letters. Stamped addressed envelopes should accompany applications for this information.

**Electric Irons.**—1 000 heat controlled electric irons, 220 V a.c., for Teheran.—Ref. B.X. 2/3045.

**Electrical Accessories.**—Electrical accessories, table lamps, table fans, etc., for Bombay, India.—Ref. X. 2133.

**Motors and Appliances.**—Diesel engines, electric motors, electrical domestic appliances, for Delhi, India.—Ref. X. 2072.

**Motors and Pumps.**—Electric motors and pumps, for Madras, India.—Ref. X. 2152.

**Electrical Equipment.**—Electrical equipment of all kinds, for Teheran, Iran.—Ref. X. 2154.

**Electrical Fittings.**—Bakelite and brass lamp holders, switches, adaptors, etc., of various types, in large quantities for India.—Ref. B.X. 2/3044.

**Electric Motors.**—Fractional H.P. motors,  $\frac{1}{2}$  H.P. single-phase, 220-240 V a.c., impulse start, 1 450 r.p.m. for Australia.—Ref. B.X. 2/3046.

**Electric Appliances.**—Electric fans, refrigerators, heaters, vacuum cleaners and electric motors, for Delhi.—Ref. B.X. 2/3056.

**Domestic Appliances.**—Electrical household appliances and fittings of all types; in particular irons and heaters, for Greece.—Ref. B.X. 2/3057.

**Machinery and Motors.**—Diesel engines, electric motors, pumps, fans, 220 V a.c.; refrigerators and radio receivers, for Tanganyika.—Ref. B.X. 2/3059.

**Electric Motors.**—Fractional H.P. motors, radio sets, refrigerators and washing machines, for Australia.—Ref. B.X. 2/3072.

**Domestic Equipment.**—All types of electrical domestic equipment and radio receiving sets, for Brazil.—Ref. B.X. 2/3062.

**Electrical Goods.**—Electrical goods, electrical household appliances and fittings, for Colombo, Ceylon.—Ref. X. 2119.

**Equipment and Tools.**—Electrical equipment and tools, radio sets, batteries, refrigerators, Diesel engines, for Baghdad.—Ref. X. 2082.

**Cables and Appliances.**—Electric cables and appliances, electric equipment and machinery for mines, railways and industries, for Bulawayo, South Africa.—Ref. E.X. 21.

**Neon Signmaking Equipment.**—To include tube bending and forming outfit, gas filling equipment, transformers, glass tubes and gas, for Middle East on London account.—Ref. B.X. 2/3049.

**Electrical Equipment.**—Electric lighting plants, household electrical equipment of all kinds, radio sets, fans, house telephones and electrical accessories, for Kenya.—Ref. B.X. 2/3067.

**Electrical Appliances.**—Refrigerators, heaters, cookers, radio sets and spare parts, automobile radios, and general electrical equipment, for Iran.—Ref. B.X. 2/3073.

**Electrical Appliances.**—Electrical appliances and accessories, cooking and heating appliances and labour saving devices, for Rawalpindi, India.—Ref. X. 2153.

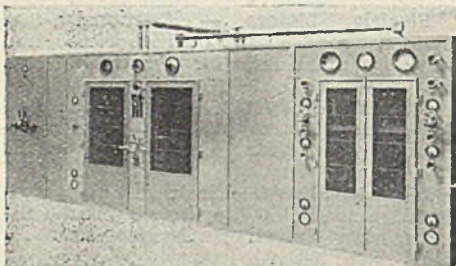
**Electric Appliances.**—Electric irons, toasters, plastic table lamps, lamp shades and stands, electric lamps, switches, lamp holder brackets, electric cookers, plugs and sockets, catalogues, for Calcutta.—Ref. E.X. 22.

**Electrical Appliances.**—Electrical appliances (fans, irons, cookers, water heaters, refrigerators, etc.), table, ceiling and wall lamps, electric cables and wires, electric household accessories, radio receivers, lamp shades, torches, batteries, etc., for Port Norris, Mauritius.—Ref. X. 2083.

# Industrial Information

## Broadcasting Equipment for Spain

Marconi's Wireless Telegraph Co., Ltd., report that their associated company, Marconi Espano'a, have obtained, in the face of strong competition, a contract worth 12 000 000 pesetas (approximately



*Marconi 100 kW short-wave broadcasting transmitter. Four of these have been ordered by the Spanish State Broadcasting Service*

£270 000) for the supply of four powerful short-wave broadcasting transmitters to the Spanish State Broadcasting Service. The transmitters, each rated at 100 kW, are to be the Marconi type TBS. 802, many of which are in operation on the B.B.C. short-wave programmes. Their manufacture, assembly, testing and installation, will be carried out by the Madrid and Chelmsford factories. The switchboards, motor generators, mercury-arc steel bulb pumpless rectifiers and high-voltage transformers, are to be of the design of the English Electric Co., Ltd.

## Electronic Manufacturers' Association

The Electronic Manufacturers' Association which was formed in 1945, held its first annual meeting at the Connaught Rooms, London, on January 22. The chairman, Major W. H. Berriedale-Johnson, in his report, said that during the last year they had achieved a large measure of success, and the fact that they were consulted by the Government departments concerned in all matters affecting the manufacturers and the industry in general, was sufficient to justify the formation of the association. Early in 1946 they presented a memorandum on research to the Board of Trade.

## Commercial Electric Cooking

The third of the series of South-east and East England area sales lecture-meetings, arranged by the E.D.A., took place at the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, and was attended

by 110 representatives, some of whom came from distant parts of the area including Lowestoft, Peterborough, Eastbourne and Bognor. The lecture was given by Mr. L. A. Carmalt of the B.E.A.M.A., who took for his subject, "Commercial Electric Cooking Development." Aspects dealt with were progress during the war, improvements and trends in design, materials and finishes, practical points in selling the load, the price of equipment and the economics of large scale cooking.

## Five-Day Week for Service Depot

The G.E.C. service depôt, Greycoat Street, London, S.W.1, is now operating a five-day week. The trade counter is open on Monday to Friday from 8.30 a.m. to 12.30 p.m. and from 1.30 p.m. to 5.30 p.m.

## H.V. Cable Demonstration

The Lord Mayor of Birmingham, Ald. A. F. Bradbeer, on January 20, opened a high voltage cable demonstration and exhibition of transmission equipment, arranged by B. I. Callender's Cables, Ltd., at Kingfairs Hall, Birmingham. The demonstration, which lasted for a week, was held for the purpose of showing to



*The Lady Mayoress and Lord Mayor of Birmingham (ALD. A. F. BRADBEER) and MR. P. V. HUNTER, director and engineer-in-chief of B. I. Callender's Cables, Ltd., at the opening of the high voltage demonstration at Kingfairs Hall*

invited electrical engineers in the Midlands the advantages, and special techniques involved in, the installation and jointing of the impregnated pressure cable. The Lord Mayor, who was welcomed by Mr. P. V. Hunter, director and engineer-in-chief of the company, referred to the use of the impregnated pressure cables at

the Hams Hall "B" power station at Birmingham, which, he stated, was probably generating electricity more efficiently than any other station in this country. There was no sign that any further economy of an extensive nature could be made in the cost of generation; if economies were to be effected, they must be effected in distribution. Through illness, Dr. L. G. Brazier, the company research laboratory manager, was unable to be present, but his paper on "The Development of the Impregnated Pressure Cable" was read by Mr. J. Temple Hazell. Mr. D. T. Holingsworth, of the research department, delivered a paper on "Pressure Cable Joints and Sealing Ends." The making of a cast plumb on a 132 kV single-core cable and the application of paper tapes to a 132 kV three-core cable joint were followed by the showing of the B.I. Calender's film, "Jointing of the 132 kV three-core impregnated pressure cable." Miss Pamela Leith, the daughter of Mr. Allen Leith, the company's Birmingham branch manager, presented a bouquet to the Lady Mayoress.

#### Change of Address

The new address of Brentford Transformers, Ltd., is Breco Works, Kidbrooke Estate, Kidbrooke, London, S.E.3 (Telephone: Lee Green 1006/8).

#### Government Surplus Stores

A sale of Government surplus stores at the Ministry of Supply disposal transit depot, Challow Station, Berkshire, will be held on Wednesday and Thursday, February 5 and 6, at 11.30 a.m. Catalogues (6d. each) are obtainable from the auctioneers Adkin, Becher and Bowen, Market Place, Wantage (telephone: Wantage 48). Electric and A.E.C. hoists are among the items offered.

#### I.P.O.E.E. Carlisle Junior Section

The newly-formed Carlisle Junior Section of the Institution of Post Office Electrical Engineers has held its first meeting. Messrs. W. D. Tweddle and C. W. Gourlay gave a paper on "Radar and W/T Aids to Air Navigation." The area engineer, Mr. A. S. Carr, also addressed the meeting and said the chief object of the institution was the furtherance of the mutual exchange of knowledge and ideas in the realms of telephony and telegraphy science.

#### New South African Company

Wild-Barfield Electric Furnaces, Ltd., announce that in collaboration with E.S. Mowat and Sons, who have been their agents in South Africa for many years, they have formed a company registered in the Union, bearing the name Wild-Barfield (South Africa) (Pty.), Ltd., with registered offices at 51, Milne Street, Durban, Natal. The new company will

be in a position to give technical assistance to industries throughout the Union and in Northern and Southern Rhodesia, and British East Africa.

#### Experimental Super-tension Cable

Residential engineers of Edmundsons Electricity Corporation, Ltd., and repre-



*Engineers viewing experimental super-tension cable installations in the h.t. laboratory at Siemens Brothers' Woolwich works*

sentatives of Ewbark and Partners, Ltd. (consultants to Messrs. Edmundsons) visited the h.t. laboratory at the Woolwich works of Siemens Brothers and Co., Ltd., recently, to see experimental super-tension cable installations. In the photograph, reproduced on this page, they are seen viewing part of the installation.

#### Proposed Merger of Interests

Some of the oil engine companies, whose products are sold by Associated British Oil Engines are controlled by the Brush Electrical Engineering Co., Ltd., and some by independent companies. It is announced that discussions have been taking place between the directors of Brush and these oil engine companies with a view to a complete merger of manufacturing interests. It is proposed to submit a scheme to the Capital Issues

Committee at an early date and subject to their consent to put proposals before the shareholders of the Brush Electrical Engineering Company.

### Social News

The pantomime "Ekco and the Beanstalk" was presented by the Social and



*A scene in the Ekco pantomime "Ekco and the Beanstalk"*

Sports Club of E. K. Cole, Ltd., in the canteen at the works, Southend-on-Sea, in the evenings of January 20, 21 and 22, before appreciative audiences of members of the club numbering 1 500. The show was entirely an Ekco production, the script having been written by Mr. Clark Ramsay, Press relations officer of the company, the cast drawn from various departments of the organisation, and the scenery dressing, lighting and staging the work of club members. In the accompanying illustration Miss Take (Mora Williams), the Giant's secretary, takes a call on the "infernal 'phone."

### Domestic Science School

The London School of Electrical Domestic Science recently came into the market and in order to ensure that the school should continue to give instruction exclusively on electrical domestic subjects as in the past, it has been purchased by the Jackson Electric Stove Co., Ltd. It will, we understand, be the policy of the company to continue to preserve a completely neutral attitude regarding instruction in the use of all manufacturers' appliances. Miss H. M. M. Minoprio will continue as a director. Messrs. S. C. Hurry and W. S. Foster, have been appointed directors, and

Mrs. M. Bain (who has been the senior instructor since the re-opening after the war) will be the principal. Students will continue to be trained for the electrical industry as has always been the object of the school.

### Help for Hospitals

Over £207 was distributed to 19 institutions from the hospitals fund of the Scottish Cables, Ltd., Renfrew.

### Metrovick Cosmos Lamps

For the first time since 1939 the Metropolitan-Vickers Electrical Co., Ltd., have issued an illustrated catalogue giving particulars and prices of Metrovick Cosmos lamps and a list of their district offices dealing with lamp sales.

### Conflctor Heater Price

As from February 1, the prices of the Eralite Conflctor-heater, insert type for building into existing fireplaces, or for insertion as flush wall fitting will be £8 10s. 6d. retail. However, all deliveries from that date will include the slabbing fitting.

### Sale of Tools

The Ministry of Supply's first important sale of engineers' tools and equipment, mainly unused, is to be held at the Town Hall, Henley-on-Thames, at 11 a.m., on Tuesday and Wednesday, February 18 and 19. Information and catalogues (6d. each)



*Some of the audience at the opening of the 47th (evening) illumination design course at the Lighting Service Bureau, 2 Savoy Hill, London, when MR. E. B. SAWYER, (standing on left), manager of the Bureau, spoke on "The Fundamental Principles of Lighting"*

are obtainable from Henry Butcher and Co., 73, Chancery Lane, W.C.2 (telephone: Holborn 8411).

### Electric Traction Jubilee

An interesting survey of the development of electric traction over the last 50 years is given in a book of 66 pages pub-

lished by the British Thomson-Houston Co., Ltd., with the primary object of attracting orders from overseas. The author is Mr. J. H. Cansdale, of the company's traction department, who has been associated for many years with the design and application of electric traction equipment and has written a number of technical papers and articles on various aspects of the subject. In the opening chapter he mentions the first British electric locomotive operated by primitive motors supplied with power from a bank of primary cells, which ran on a line between Edinburgh and Glasgow in 1839, Magnus Volk's miniature railway at Brighton, and the Giants' Causeway and Partrush Railway, Northern Ireland, opened for public service in 1883, from which small beginnings tramway and railway electrification evolved. He goes on to deal with motors and control gear, for trams, trolley 'bus, locomotives, and sub-station equipment, indicating advances and improvements achieved as the result of B. T-H. design and development.

### Shipwrights' Exhibition

The progress made in British ship construction is illustrated by over two thousand large and small models of ships and marine engineering products displayed

at the exhibition organised by the Company of Shipwrights and opened on Tuesday by the Lord Mayor of London at the Royal Horticultural Society's halls, Vincent Square, Westminster. It will be open each day, except Sunday, until and including Saturday, February 8, from 10 a.m. to 5.30 p.m. Every method of propulsion, from sail to Diesel-electric and gas turbine, is represented, and there are examples of prefabricated and all-welded construction. In some working models of ships of various types, which are lit with miniature electric lamps, the machinery layout, accommodation and other internal details are clearly indicated. There is a comprehensive display of marine radio and radar, direction finders, etc. The programme includes the reading of papers and the showing of films. Among the exhibitors are:

W. H. Allen, Sons and Co., Ltd.; the Aluminium Development Association; Babcock and Wilcox, Ltd.; Bakelite, Ltd.; Lewis Berger and Sons, Ltd.; British Insulated Callender's Cables, Ltd.; British Ropes, Ltd.; S. G. Brown, Ltd.; Cable Makers' Association; Cable and Wireless, Ltd.; Chadburns (Liverpool), Ltd.; the English Electric Co., Ltd.; Londez, Ltd.; Marconi International Marine Communication Co., Ltd.; Minimax, Ltd.; Murex Welding Processes, Ltd.; Richardsons Westgarth and Co., Ltd.; Parsons Marine Steam Turbine Co., Ltd.; Quasi-Arc Co., Ltd.

## National Supply Wages Agreement

ON January 17 an agreement was made by the National Joint Industrial Council for the electricity supply industry, standardising the wage rates and working conditions of all manual workers engaged in the industry throughout Great Britain and Northern Ireland, with the exception of those in the London area.

The agreement comes into force on the commencement of the first full pay period following February 1, and takes the place of thirteen district agreements which have been operating for 26 years. This is the final stage in the evolutionary process which has been going on since the year 1919. In that year, District Councils performed the service of standardising the wage rates and working conditions in their areas, but as the general trend of industrial negotiations for some years past has been in the direction of national instead of district agreements, the supply industry has decided to do away with district agreements, and thus remove the possibility of grievances arising from men being paid different rates for doing the same work under the same conditions. The District Councils will continue to deal with questions concerning the application of the agreement in their areas, and act generally as conciliation machinery at district level.

The national agreement is essentially a compromise between the rates and working conditions of the District Councils, and as might have been expected, the negotiations were difficult. Nevertheless, the National Council were able to secure unanimous agreement after close application to the many problems that had to be faced. The national agreement provides for a marked advance on the existing rates and conditions. The system of A and B zone rates is preserved in districts where zoning is in operation, and the new A zone rates in general range from 30d. for a fitter to 24d. for a labourer, with a margin of 7d. below those rates for B zone.

There are a few grades such as installation inspectors, switchboard and sub-station attendants, who receive rates higher than 30d.

The above figures are day rates, and the shift enhancement of 3d. per hour for all hours worked by shift workers which has been in operation for some time past is preserved. A new feature of the working conditions is the abolition of 1½ time as the minimum overtime rate, and the substitution of 1½ time.

The national rates are stabilised until October 1, 1947.

# Contracts Open

**WE** give below the latest information regarding contracts for which tenders are invited. In the case of overseas contracts, particulars are to be had from the Board of Trade, Millbank, London, S.W.1 (corner Horseferry Road), unless otherwise stated:—

**Irthlingborough**, February 1.—Supply and installation of electrical water boosting plant, comprising pressure tank, duplicate centrifugal pumps, motors, automatic starters, etc., at new water pumping station. Specification from Surveyor, Council Offices, Station Road, Irthlingborough, Northants.; deposit, £2 2s.

**Tottenham**, February 7.—Supply of electric lamps. Particulars from Acting Town Clerk, Town Hall, Tottenham, N.15.

**Richmond, Yorks.**, February 10.—Supply and laying of approximately 1 100 yds. of cable. Specification from Borough Electrical Engineer, Corporation Offices, Richmond, Yorks.

**Cheadle and Gatley**, February 10.—Supply and delivery during 12 months ending March 31, 1948, of: p.i. cables for mains and services, electric lamp bulbs, electric meters, street lighting standards and fittings. Particulars from Engineer and Manager, Electricity Department, 19, High Street, Cheadle, Dorset.

**Portsmouth**, February 12.—Supply, delivery and erection of: distribution system diagram, generating station works auxiliaries, control and indication diagram, automatic telephone equipment. Specifications from Engineer and Manager, Electricity Undertaking, 111, High Street, Portsmouth; deposit, £1 ls.

**Portsmouth**, February 12.—Supply, delivery and erection of two 230 V, 200 A.h., stationary lead-acid accumulators, each fitted with charging equipment, for switchboard and emergency lighting duties. Particulars from Engineer and Manager, Electricity Undertaking, 111, High Street, Portsmouth; deposit, £1 ls.

**Audenshaw**, February 12.—Supply and erection of pumping plant at proposed sewerage station, plant to consist of battery of five centrifugal pumps, varying in size from 3 in. to 5 in., to deal with unscreened sewage, together with motors, pipe connectors, switchgear and fittings. Specification from Consulting Engineers, Messrs. G. B. Kershaw and Kaufman, 1, Victoria Street, London, S.W.1; deposit, £5 5s.

**Southend-on-Sea**, March 13.—Supply of new electrically-operated rolling stock, composed of four seven-coach train sets complete, suitable for use on pier electric

railway, 550 V d.c. Particulars from Pier-master and Foreshore Manager, Pier Hill Buildings, Southend-on-Sea; deposit, £2 2s.

**Plympton St. Mary**, February 14.—Supply and delivery of: (a) overhead line materials; (b) street lighting equipment; (c) e.h.t. switchgear; (d) house wiring materials; (e) tools. Particulars from Clerk to the R.D.C., Council Offices, Plympton.

**Oldham**, February 15.—Purchase and removal from stores of approximately 600 1d. coin 5 A, 230 V, 50 cycles a.c. p.p. meters and 1 000 1s. coin 5 A, 230 V, 50 cycles a.c. p.p. meters, mainly consisting of Ferranti, type f.c.b., fitted with 20 A switches. Particulars from Chief Engineer and Manager, Electricity Department, Oldham.

**Birkenhead**, February 17.—Supply and delivery of electric lamps over a period of 12 months commencing April 1, 1947. Specification from Borough Electrical Engineer, Craven Street, Birkenhead.

**Hertford**, February 17.—Colne Valley Sewerage Board will invite tenders from selected firms for provision and laying, with excavation in some cases, of 5 900 yds. of 0.15 in. 3 kV, 6 250 yds. of 0.25 to 0.007 sw. in. 460 V and 5 500 yds. of 10 to 3 core 460 V cables, 1 325 yds. of 0.25 and 0.05 bare copper conductor, 10 000 yds. of 250 V wiring, and fixing of distribution switch and fuse gear, lighting fittings, lamps and lamp columns. Selected list will be limited to 12-18 names, and qualified contractors are invited to apply for inclusion. Application forms from Consulting Engineers, Messrs. Stanford Fawcett and Partners, 53, Victoria Street, London, S.W.1.

---

After 23 years at 36, Kingsway, W.C.2, the central office, and the office of the British National Committee, of the World Power Conference have removed to: 201-202, Grand Buildings, Trafalgar Square, W.C.2 (telephone Whitehall 3966). The first post-war edition of the list of "National Committees and Representatives" has been issued and copies are now obtainable from the secretary of the International Executive Council, Mr. C. H. Gray, at the above address. As the list shows, there are at present 26 national committees and seven other countries possess accredited representatives, giving a total of 33 member-countries, compared with 44 in 1939. The reduction is partly accounted for by the fact that ex-enemy countries are not at present eligible for membership.

# Electricity Supply

**Shemeld.**—Projected mains extensions will cost £12 910.

**Bradford.**—New cables and a traction sub-station will cost £15 257.

**Ilford.**—The Forest Road housing estate is to have a supply at a cost of £6 273.

**Eire.**—Plans for rural electrification during the year will begin with the Inniscara area of Cork.

**Stockton-on-Tees.**—The Town Council has applied for sanction to borrow £12 827 for electrical work.

**Hackney.**—The Electricity Committee has obtained sanction to borrow £25 000 for mains extensions.

**Cardiff.**—Estimates of £13 036 for various extensions have been approved by the Electricity Committee.

**Peterborough.**—An additional power station is to be built in Albert Place as an extension to the existing station.

**Eastbourne.**—Sanction to borrow £10 000 for mains and services and £5 000 for sub-station equipment has been obtained.

**Blackpool.**—Sanction is being sought to borrow £100 000 for mains, services and sub-stations, and £35 000 for meters.

**Gateshead.**—The Town Council has applied for sanction to borrow £104 935 for a street lighting electrification scheme.

**Seaham.**—The Urban Council has received sanction to borrow £2 000 for meters and £2 000 for mains and services.

**Fleetwood.**—The annual accounts show a net loss of £1 552. Total income amounted to £100 198, a decrease of £2 842.

**Hove.**—A 20 per cent. rebate to consumers, representing a sum of £13 948, has been recommended by the Electricity Committee.

**Scunthorpe.**—A proposal for the sale and servicing of radio sets through the electricity department is to be the subject of a report by the Electrical Engineer.

**Croydon.**—The Electricity Committee is to proceed with the second section of the power station at an estimated cost of £2 816 400, and an installed capacity of two 52 500 kW sets.

**Middlesbrough.**—A report by the Borough Electrical Engineer (Mr. H. Haigh) on the provision of electric lighting at the Stewart Park has been approved. The cost will be £3 320, which is to be included in the 1947-48 estimates.

**Woolwich.**—The Council has been recommended to re-introduce a hire-purchase

scheme for wiring and the supply of equipment to local residents. The Council would bear the cost of any installation, and recover the money over a period of seven years.

**Torquay.**—Hire charges for prepayment meters have been increased from 2s. 6d. to 4s. per quarter. The Electricity Committee is to provide supply to the Coombe Pafford estate, at a cost of £5 665, and is seeking sanction to borrow £5 000 for meters.

**Bedford.**—The Electricity Commissioners are to be asked to sanction a loan of £15 710 for extensions and alterations necessary to meet increased demands for current by local brickyards. A scheme to augment the supply to Sandy will, if approved, cost £13 733.

**Warrington.**—Three generating sets, each of 20 000 kW, and four boilers, are now operating at the Howley generating station. The Chairman of the Electricity Committee states that further plant extensions include a fourth 20 000 kW turbo-alternator and boiler.

**Tynemouth.**—The annual report of the electricity department shows a surplus of £8 402. Revenue increased by £17 522, while the consumption of current rose by 2 750 000 units. The undertaking now has a reserve fund of £102 000. Although costs have risen considerably, pre-war rates are still being charged.

**Brighton.**—A sub-station is to be built at Kings Road, at a cost of £3 534, to meet increasing demands in the vicinity of the Palace pier, and the reopening of the Aquarium and nearby hotels. Other projected schemes include street lighting in Stanford Avenue, at £4 500 and the provision of supply to Stunninghill estate, at £12 430.

**St. Pancras.**—Sub-stations for the St. Pancras Way and Cromer Street housing schemes will cost £16 000. The Electricity Committee plans to lay e.h.t. mains from Regent's Park sub-station to Percy Street, at a cost of £10 705. It has been recommended that the rental of electric kettles under the simple hire scheme should be 3d. per week.

**Walsall.**—The annual report of the undertaking for the 50th completed year of working, ending at March 31, 1946, shows that the net profit, after meeting capital charges and income tax, was £15 553, compared with £15 054 in the previous year. Appropriations for relief of rates and for

capital expenditure absorbed £7 896, leaving a surplus of £7 657. The output statistics indicate a slight drop in units sold, from 91 923 906 in 1945 to 84 221 338, this decrease being due to the cessation of supply to Lichfield City during the year. Units sold within the undertaking increased by 3.2 per cent., a small reduction in industrial sales being offset by an increase in domestic consumption. The maximum load was 28 884 kW and the load factor 36.6 per cent. There were, at the year's end, 32 061 consumers, representing a connected load of 133 929 kW. The average price obtained per unit sold was 1.040d. compared with a total cost of 1.011d. per unit.

**Auckland, N.Z.**—The annual report of the Auckland Electric Power Board, covering the year's working up to March 31, 1946, was recently received. The Board serves a licensed area of supply of approximately 325 sq. miles, with a population of 225 000, and electric power is purchased

in bulk from the New Zealand Government. Reviewing the financial position, the general manager (Mr. R. H. Bartley) reports that the accounts show, after making provision for depreciation interest and sinking funds, etc., a surplus of £102 793, which figure was reduced to £82 793 by an appropriation to the contingency reserve. Units purchased amounted to 377 188 104, and units sold 338 383 351, while the maximum load on the feeders was 84 733 kW and the load factor 50.816 per cent. The total number of consumers connected at the end of the year was 74 369, and there were 31 957 water heaters and 25 563 electric ranges. According to the analysis of output, domestic sales accounted for the largest single item of consumption. The total working costs per unit sold came to 0.4668d., to which was added capital charges amounting to 0.174d. Against this the total revenue per unit was C.7143d., leaving a balance of 0.0729d.

## Coming Events

### Friday, January 31 (To-day)

**INSTITUTE OF WELDING, E. SCOTLAND BRANCH.**—Recent Progress in Plastic Welding," Dr. J. H. Paterson.

**SCOTTISH ENGINEERING STUDENTS' ASSOCIATION.**—Edinburgh. "The Training of Engineers," T. B. Sanson. 7.15 p.m.

### Saturday, February 1

**INSTITUTE OF PHYSICS.**—Cardiff. At University College. "Some Applications of Calculating Machines," Dr. L. J. Comrie. 3 p.m.

**I.E.E., LONDON STUDENTS' SECTION.**—London. Visit to the British Broadcasting Corporation, Brookman's Park. 2.30 p.m.

**I.E.E., N. MIDLAND STUDENTS' SECTION.**—Leeds. At Fellowship House, St. Michael's Lane, Headingley. Social afternoon and evening. 3 p.m.

**ASSOCIATION OF MINING, ELECTRICAL AND MECHANICAL ENGINEERS.**—Cardiff. At the Grand Hotel, Westgate Street. Annual Dinner. 6 p.m.

### Monday, February 3

**I.E.E. MERSEY AND N. WALES CENTRE.**—Liverpool. "Industrial Applications of Electronic Techniques," H. A. Thomas. 6 p.m.

**I.E.E., N. EASTERN CENTRE.**—Newcastle-on-Tyne. "A Method of Transmitting Sound in the Vision Carrier of a Television System," D. I. Lawson, A. V. Lord and S. R. Kharbanda. 6.15 p.m.

**I.E.E., S. MIDLAND CENTRE.**—Birmingham. "Engineering Principles Applied to the Design of Domestic Water-Heating Installations of the Solid-Fuel/Electric Type," R. Grierson and Forbes Jackson. 6 p.m.

### Tuesday, February 4

**I.E.E., N. WESTERN CENTRE.**—Manchester. Installations Group. "Electrical Control of Dangerous Machinery and Processes," W. Fordham Cooper. 6 p.m.

**BRITISH KINEMATOGRAPH SOCIETY.**—Newcastle-on-Tyne. "Auditorium Requirements

in Sound-film Presentation. Part II: Acoustics," L. Knopp.

### Wednesday, February 5

**I.E.E.—London. Radio Section.** "The Calculation of Field Strengths Over a Spherical Earth," C. Domb and M. H. L. Pryce. 5.30 p.m.

**I.E.E., N. EASTERN CENTRE.**—Newcastle-on-Tyne. At the Cleveland Scientific and Technical Institute. "Industrial Applications of Electronic Techniques," H. A. Thomas. 6 p.m.

**JUNIOR INSTITUTION OF ENGINEERS.**—Birmingham. Presidential Address, "Power Stations, Past and Present," F. W. Lawton. 6.30 p.m.

**I.E.E., N. EASTERN STUDENTS' SECTION.**—Newcastle-on-Tyne. At the Mining Institute. "The Quest for Better Metals for the Engineering and Electrical Industries," Prof. Pearson. 6.45 p.m.

### Thursday, February 6

**I.E.E.—London.** "The British Grid System in War-time," J. Hacking and J. D. Peattie. 5.30 p.m.

**INSTITUTE OF WELDING.**—Tyneside. "Automatic Arc Welding in Industry," H. J. Stretton.

### Friday, February 7

**I.E.E.—London. Measurements Section.** Discussion. "What Has the Electrical Instrument Industry to Learn From Developments in Continental Practice?" Opened by F. E. J. Ockenden and G. N. Harding. 5.30 p.m.

**I.E.E., S. MIDLAND CENTRE.**—Birmingham. At the Grand Hotel. Annual Dinner and Presidential visit. 6.30 p.m.

**INSTITUTE OF WELDING.**—S. London Section. "X-Rays and Their Use in Weld Testing, With Reference Also to Gamma Rays," Dr. Barnes and Dr. S. Torrance.

**ILLUMINATING ENGINEERING SOCIETY.**—Birmingham. "Some Recent Trends in Day-lighting," W. A. Allen. 6 p.m.

**INSTITUTION OF MECHANICAL ENGINEERS.**—London. Discussion. "Basic Principles of Automatic Control Systems," Prof. A. Porter. 5.30 p.m.



# Company News

**WESTINGHOUSE BRAKE AND SIGNAL CO., LTD.**—Trdg. prft. to Sept. 30, £190 424 (£319 086); balance £209 424 (£195 886) after creditg. £166 000 (£48 500) from prev. prvsns. for E.P.T. and allwg. £147 000 (£171 700). Div. of 10%, plus bonus of 4% (same), fwd. £99 193 (£96 192) after dblg. allctn. to gen. res. at £100 000 and allwg. £20 000 (£15 000) for staff pensions.

**BROOM AND WADE.**—Trdg. prft. to September 30, £247 811 (£310 414). To deprecn. £27 908 (£24 129), pension fund £20 000 (£10 000), lvg. net prft. before taxn. £199 903 (£276 285). Inc. tax and E.P.T. absorbed £148 535 (£228 852) and after bringing fwd. £37 599 (£32 333), avail. blee. £88 967 (£79 766). After pref. div. £3 622 (£3 450), fin. ord. div. 15%, mkg. 22½% (same), gen. res. £20 000 (same), fwd. £42 730.

**ABERDARE CABLES, LTD.**—The company states that some confusion has arisen as to the recent announcement by it of its 6 per cent. interim dividend, in so far that in some quarters it has been assumed that this dividend was declared by Aberdare Cables of South Africa, permission to deal in whose shares was recently granted by the London Stock Exchange. This is not the case and the announcement referred purely to a dividend on the shares of Aberdare Cables, Ltd.

**BAGDAD LIGHT AND POWER CO., LTD.**—Presenting the report and accounts for the year ended December 31, 1945, Sir Kinahan Cornwallis (chairman) said that the accounts showed an all-round improvement. Receipts from the sale of current, meter and motor rents, etc., at £277 693, represented a satisfactory increase of £29 585 over the previous year. Generating and distribution expenses were higher, with the result that the balance carried to net revenue account was £15 198 better than in 1944. During 1945, the total units sold amounted to 20 569 376, an increase of 2 025 330. The maximum demand has reached 7 010 kW. Plant ordered in 1944, which included a 6 000 kW turbo-alternator, a 30 ton boiler and the necessary structural steelwork, was now mostly on site and in course of erection. A further extension, involving a 12 500 kW generator, had also been decided on, and orders had been placed. Every effort would be made to get the new plant in operation as early as possible.

**RADIO RENTALS, LTD.**—In his circulated statement, the Chairman (Mr. H. F. Hunt) said that the company had purchased some £80 000 worth of new radio sets in the financial year and had spent approximately £24 000 more on wages and staff expenses.

In addition, they had been able to deal with much delayed overhaul and maintenance work on their existing sets and had spent approximately another £10 000 on materials in this way. They were unable to meet the extent of the public demand, and for which they had trained staff available to give the service. They had every confidence that they would be able to expand the business to the fullest extent to which the limitations of quota restrictions and material shortages would allow. They expected in the near future to resume their rental service for television sets and would also be able to offer radio-gramophones, but in both cases, the supply was unlikely to meet the heavy demand.

**THE PLESSEY CO., LTD.**—The Chairman and Joint Managing Director (Mr. A. C. Clark), in his statement, circulated with the report and accounts, recalled that until June, 1945, their factories had been engaged solely on war production. Although much progress had been made during the year under review, it was only during the last months that they were able to feel that their factories were producing the proper range of peace-time products on an adequate scale. They had paid an interim dividend of 15 per cent., and now proposed a final dividend of 15 per cent. This would make 30 per cent. for the year and, after £25 000 had been transferred to reserve, would leave a balance to carry forward of £50 013, compared with £31 307 brought in. Their ability to expand production was limited, at present, by shortage of raw materials, but they were making the best use of the resources available. By research and development, they were keeping the company in a position to take full advantage of the future.

---

A Scottish Fuel Efficiency Exhibition is to be held in conjunction with the Conference of Light, Fuel and Power Appliance Manufacturers at Kelvin Hall, Glasgow, from March 25 to 27.

In a circular issued by the Ministry of Fuel and Power, the Chief Inspector of Mines calls attention to precautions necessary to avoid the ignition of firedamp, including a high standard of ventilation in all places in mines where electric drills are used; the frequent and thorough examination of all drilling equipment by qualified electricians; the proper care of drilling machines and their associated apparatus; and precautions in handling the remote control apparatus.

# Commercial Information

## Mortgages and Charges

NOTE.—The Companies Act of 1908 provides that every mortgage or charge shall be registered within 21 days after its creation, and that every company shall in its annual summary, specify the total amount of debt due from it in respect of mortgages or charges. The following mortgages and charges have been registered. The total debt prior to the present creation, as shown in the annual summary, is given—marked with an \*—followed by the date of the summary, but such total may have been reduced.

MICRANATIC ELECTRICAL INSTRUMENT CO., LTD., London, W.—December 17, mortgage and charge, to National Provincial Bank Ltd., securing all moneys due or to become due to the Bank; charged on Meico Works (formerly Washford Mill) and Waliworth's Bank Mill, both Congleton, with plant, fixtures, etc., also general charge. \*Nil. October 9, 1945.

TELE-RADIO INSTRUMENT CO., LTD. (formerly KINGSTON TELE-RADIO SERVICING CO. LTD.), West Moseley.—December 11, £250 debenture, to W. H. Grounseil, Charlton; general charge.

LIGHT AND SOUND INDUSTRIES, LTD., Bournemouth.—December 18, debenture, to Lloyds Bank Ltd. securing all moneys due or to become due to the Bank; general charge.

## Satisfactions

WRIGHT AND WEATRE, LTD., London, N., engineers and scientific instrument manufacturers.—Satisfaction December 20, of charge registered June 3, 1938.

N. E. P., LTD., Birmingham, manufacturers of vacuum cleaners.—Satisfaction December 30, £2 900, registered September 23, 1938.

## County Court Judgments

NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.

DODD, Joseph Leonard, 1, Fairlop Avenue, Long Road, Canvey Island, Essex, radio manufacturer. £15 11s. 8d. November 1.

PELLATT, H. J. (male), Whiteshill, near Stroud, Glouce., electrical engineer. £66 1s. 11d. November 7.

HESSE, C. M. (male), Main Road, Biggin Hill, Kent, electrician. £12 10s. 10d. November 8.

LOUNSBACK, Geo., The Hollies, Rake Lane, Clifton Junction, near Manchester, electrical engineer. £12 3s. 4d. November 13.

BURNS, Mr. P., 9a, Harrow Place, London, E.1, electrician. £15 6s. 2d. November 2.

HILLIER, Mr. M., 486, Kingsland Road, London, E.8, radio dealer. £19 1s. 6d. October 29.

EDWARDS, C. (male), 21, Trafalgar Road, Balsall Heath, Birmingham, wireless dealer. £11 17s. 6d. October 24.

MARLOW, Mr. J., 55, Thwaite Gate, Leeds, 10, electrical engineer. £16 16s. 11d. November 13.

SHEPPERD, Mr. B., New Row, Boroughbridge, Yorks., electrical engineer. £11 3s. 3d. November 13.

BLAKEBOROUGH, — (male), trading as B. AND G. RADIO, 105, Harrow Road, Leytonstone, Essex, radio mechanic. £40 2s. 8d. November 15.

MORGAN, W. L. (male), 441, Badminton Road, Yate, Glouce., electrical engineer. £59 6s. 10d. November 21.

GUDGEON, — (male), Vincent Green, Shirley, Southampton, electrical contractor. £26 9s. 2d. November 13.

LAWSON, Ernest, 8, Northam Road, Southampton, radio dealer. £63 18s. 6d. October 10.

FRYER, W. (male), 27, Lyndhurst Road, Barnehurst, Kent, electrical engineer. £12 12s. November 14.

STAZICKER, T. (male), 20, Stanleyfield Road, Preston, electrician. £28 6s. 10d. November 5.

## Metal Prices

	Monday, Price	January 21 Inc. Dec.
<b>Copper—</b>		
Best Selected (nom.)...per ton	£115 10 0	— —
Electro Wire bars ... ..	£117 0 0	— —
H.C. Wires, basils ... ..	£133 0 0	— —
Sheet ... ..	£153 10 0	— —
<b>Brass Electrical quality</b>		
1% Tin—		
Wire (Telephone) basils per ton	£154 15 0	— —
<b>Brass (60/40)—</b>		
Rod basils ... ..	1s. 0½d.	— —
Wire ... ..	1s. 5d.	— —
<b>Iron and Steel—</b>		
Pig Iron (E. Coast Hematite No. 1) ...per ton	£8 19 0	— —
Galvanised Steel Wire (Cable Armouring) basils 0.104 in ... ..	£34 5 0	— —
Mild Steel Tape (Cable Armouring) basils 0.04 (in.) ... ..	£21 15 0	— —
<b>Lead Pig—</b>		
English ... ..	£70 0 0	— —
Foreign and Colonial ... ..	£71 10 0	— —
<b>Tin—</b>		
Ingot (minimum of 99.9% purity) ... ..	£384 0 0	— —
Wire, basils ... .. per lb.	4s. 10½d.	— —
Aluminium Ingots ...per ton	£72 15 0	— —
Solder ... ..	£70 0 0	— —
Mercury (spot) ... .. per bott.	£21 0 0	— —

Prices of galvanised steel wire and steel tape supplied by C.M.A. Other metal prices supplied by R.L. Cullender's Cables Ltd. The latter prices are nominal only and do not include any allowances for tariff charges.

# IN OUR CASE

*ACCURACY AND DEPENDABILITY*

*Come first!*

COPPER • COPPER-NICKEL  
(CONSTANTIN)

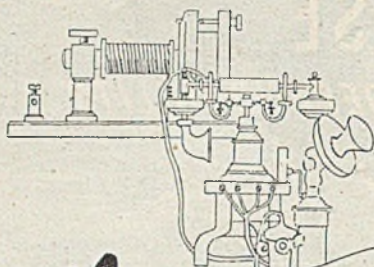
MANGANIN • NICKEL-CHROME  
(TEMANGAN)

IN ENAMEL • COTTON • SILK INSULATIONS



**TEC** *Fine*

INSULATED MEASURING INSTRUMENT WIRES



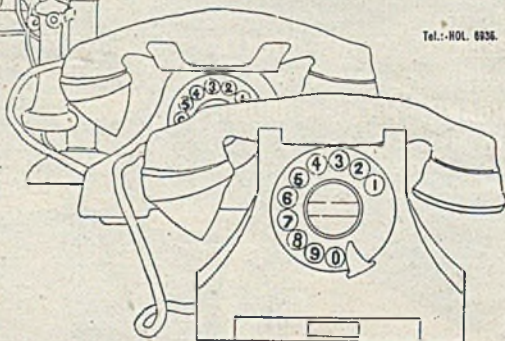
# Ericsson

TELEPHONES LTD.

56, KINGSWAY, LONDON, W.C.2

Tel.: HOL. 6936.

70  
Years  
on-



**COOKER CONTROL - DS PLUG STYLE**

**COOKER DS CONTROL**

THE DS Cooker Control Unit is a compact yet efficient switch and plug unit. It includes a 30-A double-pole switch for the cooker and the famous DS Fused Plug and Socket for the kettle. Conduit Holes are provided at top and bottom for cable entry but may be provided elsewhere to special requirements.

Announcement of D.S. Plugs Ltd., Manchester, London, Glasgow.

E 1046

# AN EXAMPLE OF **TT** ENTERPRISE

*They* **LEAK**  
*to order!*

Industrial grime and salt, with damp, will cause current leakage over the surface of any insulator. So now we have developed surface glazes that are made to leak at a pre-determined rate, thus providing a sort of safety valve — or governor — that keeps the voltage gradients stable. It's just one example of T.T. enterprise — one example of the fact that, where insulation is concerned, Taylor Tunnicliff always lead.

*If you are interested in this development please ask for more information.*

# TAYLOR TUNNICLIFF

*leaders in electrical porcelain*

**H.T. & L.T. INSULATORS, DIE PRESSINGS, LOW LOSS CERAMICS**

HEAD OFFICE: EASTWOOD, HANLEY, STAFFS. LONDON: 125 HIGH HOLBORN, W.C.1

Factories at Hanley, Stone and Longton, Staffs.

Telephone: Holborn 1951-2 and Stoke-on-Trent 5272-4

TAS/TT 52

# INVISAFLEX

INDUSTRIAL LOCAL LIGHTING UNITS

CABLE ENCLOSED



THROUGHOUT

Bench, wall or universal conduit base



ELECTRICITY SERVICES LTD. 86 CANNON ST. E.C.4

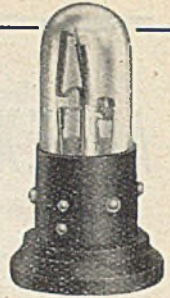


REPLACEMENT FLUORESCENT STARTER SWITCHES (THERMAL TYPE)

For use with B.T.H., Revco and Metrovick Lighting Units

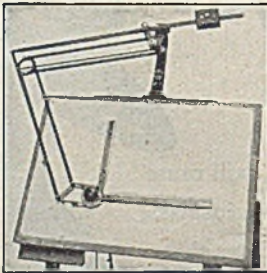
Early Delivery FLUORESCENT SPARES

Dept. E/A, 53, GOODGE STREET, LONDON, W.1



Perfect balance at any slope. Take any board. Ball Bearing. Perfect parallel movement...

No drawing office should be without "MAVITTA" DRAFTING MACHINES.



The nearest to perfection in drawing office equipment—"MAVITTA" DRAFTING MACHINES made of steel tube with adjustable ball-bearings. Main angles located automatically, intermediate angles by lock.

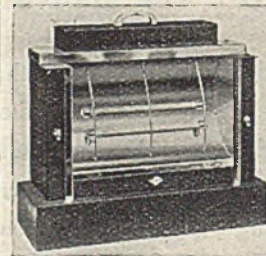
Scales have Inlaid celluloid edges and divided to order on two edges.

**THE MAVITTA DRAFTING MACHINES LTD.,**  
Anchor Works, Park Road, ASTON, BIRMINGHAM. 6.

Tel.: EAST 482 Telegrams: MAVITTA Birmingham

## BROOKS & BOHM LTD.

"Attracta" No. 1, 2-kw. reflector fire with two strong metal switches, one for each fire bar. Reflector made from polished heavy alloy combined with strong metal frame in assorted crackled colours. Easily carried from one room to another. Strong handle fitted on top.



Suitable length of 3-core flex supplied. Tubular element made from white clay which is easily replaced. Approx. size:- Height 15", width 19", depth 7". Immediate delivery 230/250 volts and other voltages supplied by special arrangement. Retail price 73s. 4d. each. Generous trade discounts.

This is only one of a multitude of other household electrical appliances available; radiators, heaters, toasters, etc.

90, Victoria St., London, S.W.1

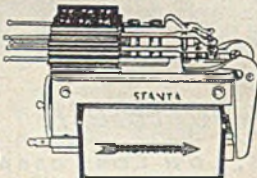
Telephone: VIC 9550/1441

Belfast Office:

Ulster Bank Chambers, 4/6, Ann Street, Belfast

# RELAYS

ASK FOR LIST A.C.R.



N.P.L. REPORT AVAILABLE

A.C.

D.C.

**INSTANTA ELECTRIC LTD**  
48 OLD CHURCH ST., CHELSEA, S.W.3 FLA 3531

## VULCANIZED FIBRE.

EBONITE, BAKELITE

Sheets, Rods, Tubes and Machined Shapes

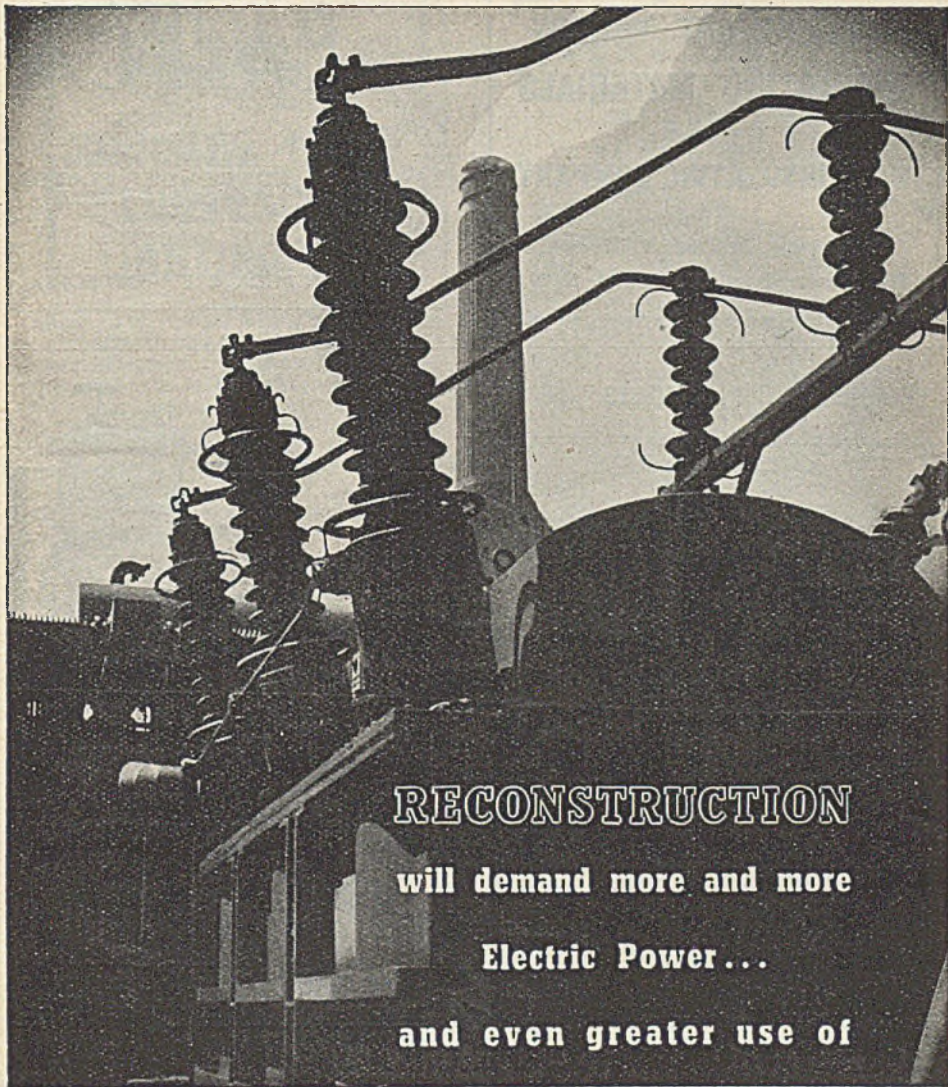
LEATHEROID Sheets, Rolls, etc.

"CLIFTEX" Insulating Tapes.

Insulating Staples, Jointing, Presspahn.

**MOSSER & MITCHELL LTD.**

60-68, Ironmonger Row, London, E.C.1.



## RECONSTRUCTION

will demand more and more

Electric Power...

and even greater use of



# ROTHMILL

## CABLE INSULATING PAPER

*Tullis Russell & Co. Ltd.*

AUCHMUTY &  
ROTHES PAPER  
MILLS, HARKINCH  
SCOTLAND

LONDON  
1 Tudor Street  
E.C.4

MANCHESTER  
372 Corn Exchange  
Buildings  
Corporation Street

BIRMINGHAM  
116  
Colmore Row

**INSTRUMENT WIRES  
INSULATING MATERIALS**

**WEST INSULATING COMPANY  
LTD.,**

**2, Abbey Orchard Street,  
Westminster, London, S.W.1**



**MICA**

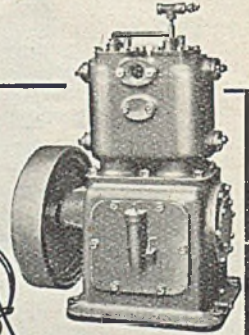
DISCS  
DIAPHRAGMS  
ELEMENT STRIPS  
CONDENSER PLATES  
STOVE PANELS  
RAW MICA  
WASHERS  
*etc.*

BRITISH MICA CO. LTD. - BEDFORD.

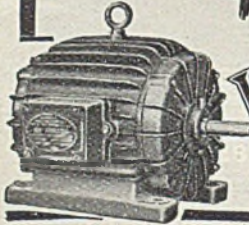
"POWERED BY HOWELLS" No. 2

**TILGHMAN'S**

**A Tilghman's  
Single Acting  
AIR COMPRESSOR**



Courtesy of  
TILGHMAN'S  
PATENT SAND  
BLAST CO. LTD.



*Powered by*  
**HOWELLS**

**HOWELLS (ELECTRIC MOTORS) LTD.**

YORK ST. - HANLEY - STOKE-ON-TRENT

Branches at LONDON : MANCHESTER : BRISTOL  
BIRMINGHAM : : : GLASGOW

dm H.E.4



**BURDETTE**

**DAY AND NIGHT      MACaulay  
FOR RELIABLE SERVICE      4555**

WE REPAIR, REWIND, AND REDESIGN A.C. AND D.C. MOTORS, ALTERNATORS  
ROTARY CONVERTERS AND CONTROLLERS.

*Nothing too Small. Nothing too Large. WE COLLECT AND DELIVER.*

**BURDETTE & CO., LTD., Stonhouse Street, Clapham, LONDON, S.W.4**

ESTABLISHED OVER 35 YEARS.







## CHOKES for FLUORESCENT LIGHTING

MEICO'S up-to-date facilities include the most modern coil producing machinery available—vacuum impregnating equipment for wax and varnish—completely automatic production test apparatus. MEICO Chokes are precisely wound—meticulously assembled—thoroughly impregnated and carefully finished. Continuous inspection and quality control ensure maximum uniformity and silence in operation.

AVAILABLE FOR PROMPT DELIVERY  
MICRAMATIC ELECTRICAL INSTRUMENT CO. LTD.

MEICO WORKS : CONGLETON : GESHIRE  
TELEPHONE : CONGLETON 607

## ELECTRICAL ACCESSORIES

EMBODYING  
MANY  
SPECIAL  
FEATURES



## ELECTRO PLASTICS

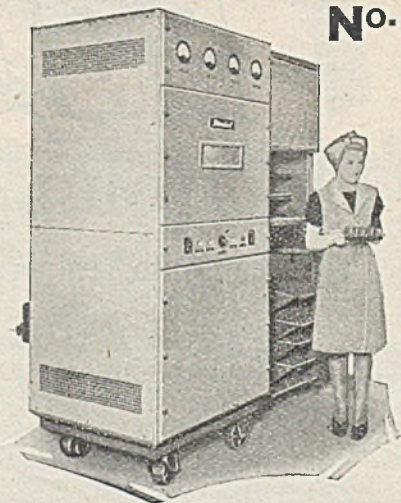
LTD

MILTON STREET · WATFORD

Telephone: Watford 3324

# Fusing Facilities

## No. 4



## Good all-through insulation

Homoge'neous (Chem.) . . . a system in which the chemical composition and physical state of any physically small portion are the same as those of any other portion. (*Chamber's Technical Dictionary*). Which aptly describes, and accounts for the remarkable strength of, SLYDLOK Fuse mouldings, the result of balanced design, fitness-for-purpose powder and a moulding technique employing H.F. pre-heating equipment, a unit of which is illustrated above. Hence one of the reasons for the outstandingly good performance of

The New

# SLYDLOK

5 to 100 amp. FUSES

*Wilcox*  
EDWARD & CO. LTD.  
SHARSTON ROAD • WYTHENSHAW  
MANCHESTER

dm EW9

*- for the Health of the People!*

**50,000**

**Electrolux *Silent* REFRIGERATORS**

are being built into Temporary Houses for the Government



*Do your*  
**PERMANENT HOUSING SCHEMES**  
*Specify*  
**Electrolux Refrigerators?**

The 50,000 Electrolux Refrigerators, being built into Temporary Prefabricated Houses for the Government, provide official recognition that a Refrigerator is a basic essential for protecting health in every home—temporary or permanent. Local authorities agree . . . They too have recognised the advantages of Electrolux; no machinery, no moving parts . . . which means freedom from vibration, low maintenance cost, dependability and, above all, absolute *silence* at all times.

Electrolux 'built-in' refrigerators—operated by Electricity—are once again in production. Deliveries will be made in 1947 for Housing Schemes.



*By Appointment*  
**Refrigerator**  
*Makers*

**ELECTROLUX LTD.**  
**LUTON, BEDS.**

**Head Office : 153/5 Regent Street, W.1**

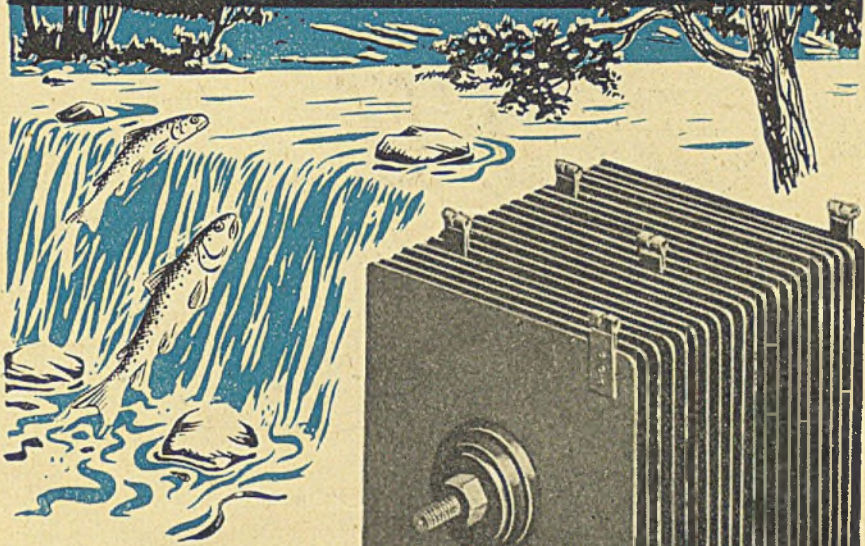
*Also Manufacturers of the famous Electrolux Suction Cleaner*



*By Appointment*  
**Suction Cleaner and**  
**Refrigerator**  
*Manufacturers*

royal

## HOW LONG DOES IT LIVE ?



### *The Salmon . . . .*

The salmon spends the greater part of its life in the sea and although it has been credited with a very long life, it rarely exceeds 8 or 9 years. Size is by no means a certain indication of age—the largest salmon being those that have spent a long time at sea, where food is more abundant, before returning to the river for spawning.

There is no problem about the life of a Westinghouse Metal Rectifier. It has established itself as the most reliable rectifier and many are still in use after 20 years' continuous service.



## METAL RECTIFIERS

**WESTINGHOUSE BRAKE & SIGNAL CO. LTD.**  
82, YORK WAY, KING'S CROSS, LONDON, N.1

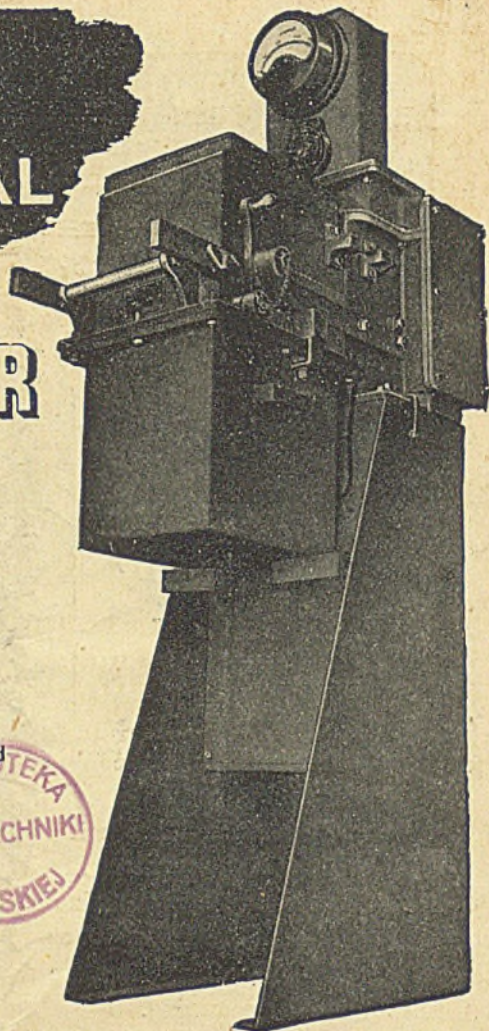
# Small INDUSTRIAL TYPE

## SWITCHGEAR S.F. II

- For use up to 3.3 kV.
- Air Insulated — Draw-out Pattern — Oil Break.
- Fully interlocked mechanically.
- Good access to internal parts.
- Supplied in unit or switchboard form

PROTECTION  
Overcurrent  
Earth-fault  
Under-voltage

INSTRUMENTS & METERS  
can be supplied to meet  
average requirements.



**METROPOLITAN  
Vickers** CO., LTD.  
ELECTRICAL  
TRAFFORD PARK ... MANCHESTER 17.



FR/42

**INCREASE PRODUCTION BY** Consulting METROVICK'S  
ILLUMINATING ENGINEERS