

ELECTRICAL REVIEW

FOUNDED
1872

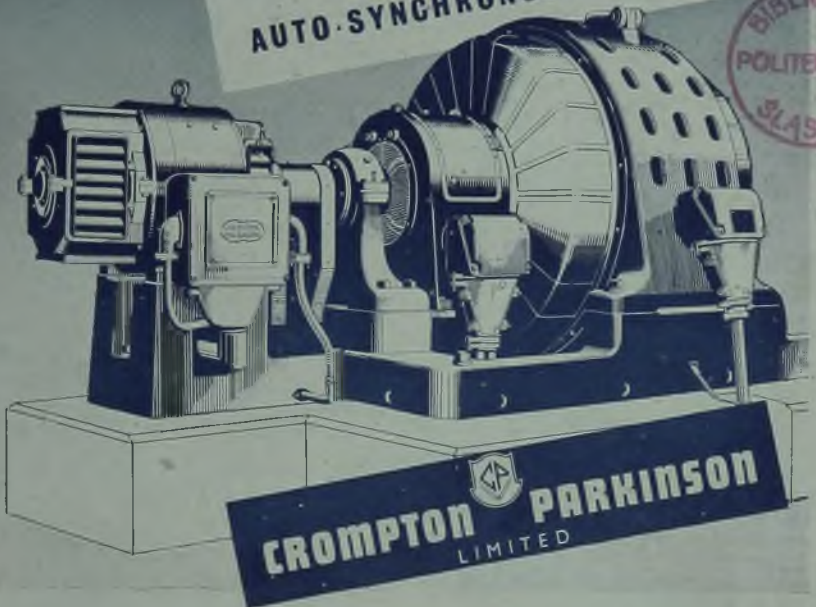
Vol. CXXXV. No. 3483

AUGUST 25, 1944

9d. WEEKLY

POWER *plus*
POWER FACTOR CORRECTION

CROMPTON
AUTO-SYNCHRONOUS MOTORS



BIBLIOTEKA
POLITECHNIKI
GLASKIEJ

INDUSTRIAL SWITCHGEAR

and TRUNKING SYSTEMS



Labour costs on site are saved by using solid copper connections throughout.



ALSO
MAKERS
OF THE

Bus Bar Tee

OVERHEAD
DISTRIBUTION
SYSTEMS



DRAKE & GORHAM LTD

STANDARD RD. · NORTH ACTON · N.W.10

Telephones: Willesden 6601-2 Telegrams: Tincomar "Harles London."

The Art of Knowing How



In the intimate "oneness" between horse and rider lies the whole art of taking fences neatly and without spills.

That is true of any successful industry.

The greater the "oneness" between Employers and Employed—the better the product takes its fences by leaps and bounds.

Horse-sense ?

WE'VE found it so !



**LEADERS IN
ELECTRIC
WATER HEATING**



HEATRAE LTD., NORWICH

PHONE : NORWICH 25131

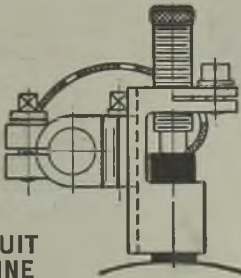
GRAMS : HEATRAE, NORWICH

"WESTMINSTER"

**Brush
Holders**

**100,000
SUPPLIED**

**MADE TO SUIT
ANY MACHINE**



Dynamos and Motors Rewound and Re-constructed. "Partridge" Pressure Detectors, "Partridge" Earthing Devices, Switchgear, Photographic Arc Lamps, Electric Welders, Medical Arc Lamps

The WESTMINSTER ENG. Co. Ltd.

Victoria Road, Willesden Junction, N.W.10

Telephone :
Willesden 1700-1

Telegrams :
"Regency, Phone, London."

THE "FACILE" TERMINAL



Send for Prices
and List of all
kinds of
Terminals

**ROSS COURTNEY & CO.
LTD.**
ASHBROOK ROAD, LONDON, N. 19

TAPPED NUTS

COCONUT SHY
3 FOR A 1⁰



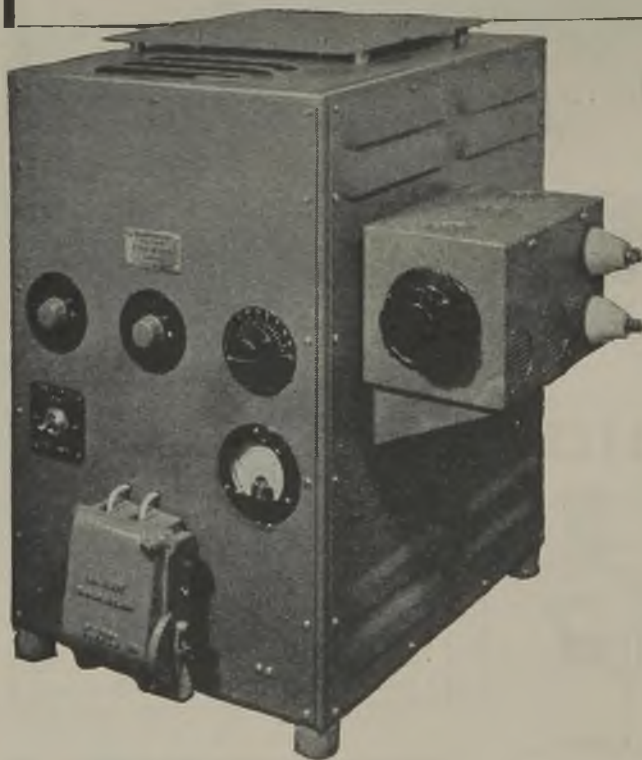
to the specific requirements of our customers

Makers of all types of repetition products from the bar in all metals



M C L and REPETITION LTD.
Pool Lane - Langley - Birmingham.

REDIFFUSION Radio Heating



This is the Rediffusion R.H.2, delivering more than 250 watts of radio frequency power. Only 18 x 15 x 12 inches, it is very simple to instal and control. The matching unit shown on the bracket may instead be coupled to the set through a 6-ft. screened cable.

A screened heating cage 12 x 12 x 12 inches can be supplied for laboratory work on moulding powders and other small specimens.

At present deliveries can only be made for high priority work, but we illustrate this as an indication of Rediffusion advance development.

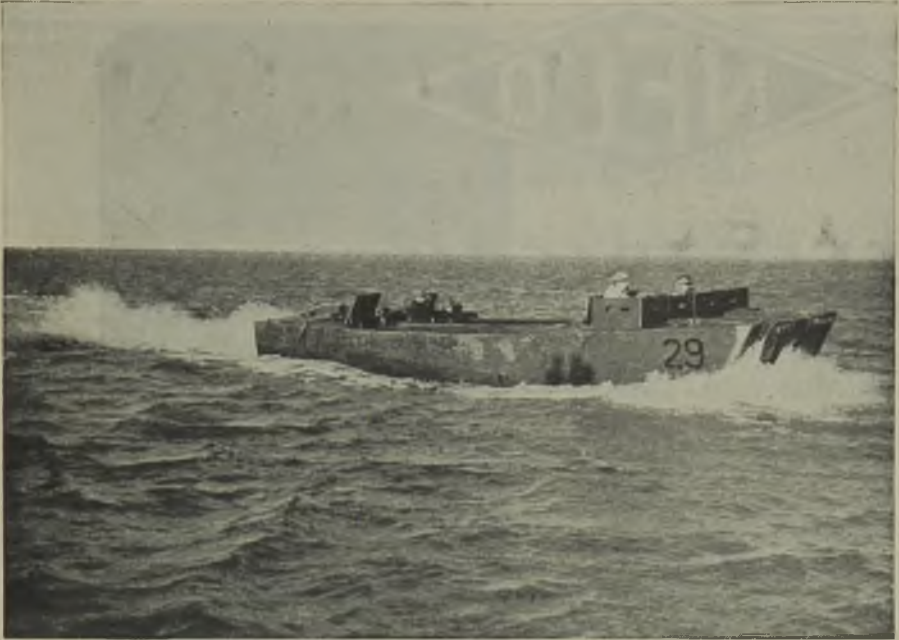
REDIFFUSION LTD

Designers and manufacturers
of Radio Communication and
Industrial Electronic Equipment



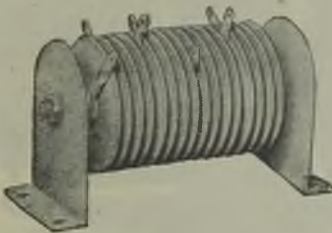
A SUBSIDIARY OF BROADCAST RELAY SERVICE LIMITED

VICTORIA STATION HOUSE • VICTORIA STREET • LONDON • S.W.1 (PHONE VICTORIA 8831)



Serving with the LANDING PARTIES

HERE is the weapon that "converts" Allied Sea Power into Land Power . . . the landing barge. The first hammer-blows that are cracking the "fortress of Europe" come from these tough little craft and their even tougher cargoes of indomitable men. Wherever the job of converting A.C. current to D.C. is necessary, STC Selenium Rectifiers should be in use. They are built to withstand engine-vibration, and the effects of damp and salt-laden air. There are no moving parts to cause trouble and no servicing is necessary.



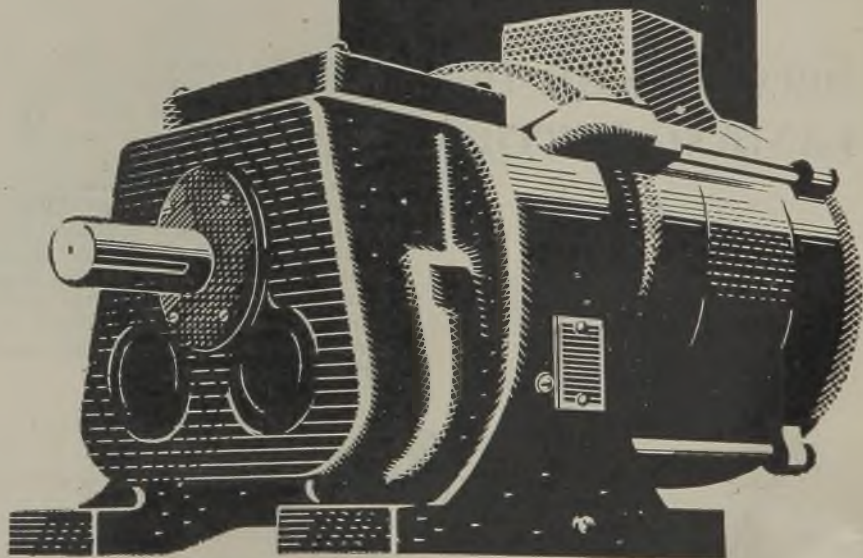
Selenium Rectifiers



ELECTRIC MOTORS

are designed in a large variety of types to ensure the best performance of the particular drive required for your machine.

Our technical department is always prepared to study special purpose requirements.



THE NORMAND ELECTRICAL CO. LTD.
NORTH STREET • CLAPHAM COMMON LONDON S W 4 TEL: MACAULAY 3211.4

STURTEVANT ELECTROSTATIC PRECIPITATORS

LARGE AND SMALL SCALE PLANTS FOR ELIMINATING DUST, FUME AND MIST

Special designs for prevention of oil haze in machine shops and removal of welding fumes, cleaning of air of atmospheric dust for optical, photographic and similar work.

Our reference W114/U will gladly supply full particulars.

STURTEVANT ENGINEERING CO. LTD.
25. WORCESTER ROAD, SUTTON, SURREY.

ENERGY FOR THE NATION'S FACTORIES, WORKS & PUBLIC SERVICES

Uninterrupted transmission of electrical energy by C.M.A. Cables in quantity greater than ever before in our history is playing a most vital part in Britain's supreme effort for victory.



C.M.A. CABLES



Reg.
Trade Mark
No. 554,383 E-1

MEMBERS OF THE C.M.A.

- | | |
|---|--|
| The Anchor Cable Co Ltd | The India Rubber, Gutta-Percha & Telegraph Works Co Ltd (The Silvertown Co.) |
| British Insulated Cables Ltd | Liverpool Electric Cable Co Ltd |
| Callender's Cable & Construction Co Ltd | The London Electric Wire Co and Smiths Ltd |
| Connolly (Blackley) Ltd | The Macintosh Cable Co Ltd |
| The Craigarth Electric Cable Co Ltd | The Metropolitan Electric Cable & Construction Co Ltd |
| Crompton Parkinson Ltd (Derby Cables Ltd) | Pirelli-General Cable Works Ltd (General Electric Co Ltd.) |
| The Enfield Cable Works Ltd | St Helens Cable & Rubber Co Ltd |
| Edison Swan Cables Ltd | Siemens Brothers & Co Ltd (Siemens Electric Lamp and Supplies Ltd.) |
| W T Glover & Co Ltd | Standard Telephone & Cables Ltd |
| Greengate & Irwell Rubber Co Ltd | Union Cable Co Ltd |
| W T Henley's Telegraph Works Co Ltd | |
| Johnson & Phillips Ltd | |

"One machine in use is worth 50 under repair..."

THE more efficiently these **Weyde** Grinders are maintained, the greater the life of all working parts and freedom from breakdown. These are the points we strongly recommend.

1. Frequently blow out all dust from stator housing and switch case
2. Frequently examine all terminal connections, at switches, plugs and sockets, and test cables for weakens or breakages.
3. Keep all nuts, bolts and screws tight
4. Dismantle, wash and repack bearings at regular intervals, also change grease to gear case, using recommended grade.
5. Avoid running a **Weyde** Grinder when the wheel is out of balance as this brings excessive wear on to the valuable bearings and gears.
6. Never carry a Grinder by its cable; never leave it lying on the floor as this causes dust and dirt to enter the housing.

IMMEDIATE: If you have any **Weyde** Tools without Maintenance Instructions, send immediately for the necessary copies. Applications should be addressed to — Publicity Department, The Consolidated Pneumatic Tool Co., Ltd., Fraserburgh, Aberdeenshire.

**CONSOLIDATED PNEUMATIC
TOOL CO. LTD.**
FRASERBURGH, ABERDEENSHIRE

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

What an opportunity!



However the home of the future is going to be built, the womenfolk are already—and rightly—making it clear that real efficiency in planning will be demanded. And that means the really all-electric home, with an abundance of such good things as

PRE-CAST
STEEL
or BRICK
—they'll
all need

PREMIER

Fine-Quality Electrical Appliances

Kettles, Irons, Fires, Toasters, Coffee Percolators, etc. . . . The finest quality for over 35 years

PREMIER ELECTRIC HEATERS LIMITED · BIRMINGHAM, 9



They span the world

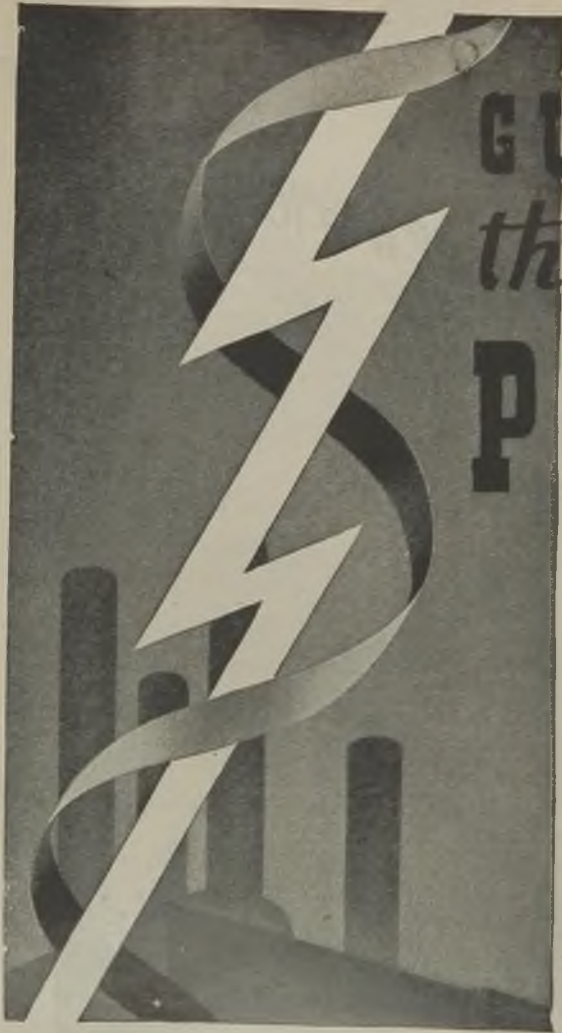
In every port, B.I. cable drums, by their regular arrival over the past fifty years, have become as well known to dockyard workers as the cables themselves are known to Engineers throughout the world for their reliability in service.

The illustration shows B.I. 33 kV. Cables being unloaded at Cape Town.

BRITISH INSULATED CABLES LTD.,

Head Office : PRESCOT, LANCS., ENGLAND.

Telephone : PRESCOT 6571.



GUARDING *the Nation's* POWER

Electric POWER is a mighty sinew of the nation's effort. It must be GUARDED against leakage.

Tullis Russell Rothmill Cable Insulating Papers are called upon by leading cable manufacturers to perform this task, and it is carried out admirably by these renowned, uniformly high-quality insulating papers.

Rothmill Papers are guaranteed free from metals and grit.

Write for details of the complete range.

ROTHMILL

CABLE INSULATING PAPER



Tullis Russell & Co. Ltd.
Auchmuty & Rothes Paper Mills, Markinch,
Scotland
LONDON MANCHESTER BIRMINGHAM
1 Tulse St. 272 Cross Exchange 118 Colmore Row
E.C.A. Bldg., Corporation St.

RECOGNIZED STANDARDS OF EXCELLENCE...



FERRANTI Meters

FM78

FERRANTI LTD., Hollinwood, Lancs. London Office: Kern House, Kingsway, W.C.2.



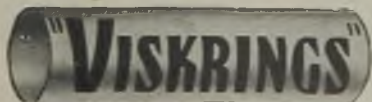
VISKRINGS CLOSE-UPS

N O . I F I X I N G . . .



Observe! A "VISKRINGS" Cable marker is taken from the jar. It is slipped over the cable. It shrinks. It's tight. Is that all? Absolutely! No machine . . . no skill required . . . no failures. No wonder the "VISKRINGS" method is so widely specified.

- NO TOOLS REQUIRED
- INDELIBLY PRINTED
- NO RUBBER USED
- SELF FIXING BY SHRINKAGE
- IMPERISHABLE, IMPERVIOUS TO OILS AND PETROLFUM
- DO NOT INCREASE DIAMETER OF CABLE



C A B L E M A R K E R S

VISCOSÉ DEVELOPMENT CO. LTD.
Woldham Road, Bromley, Kent. 'Phone: Ravensbourne 2641



THE SYMBOL OF
RELIABILITY

for High-Class
SWITCHGEAR
and STARTING GEAR
with

negligible maintenance

costs . . .



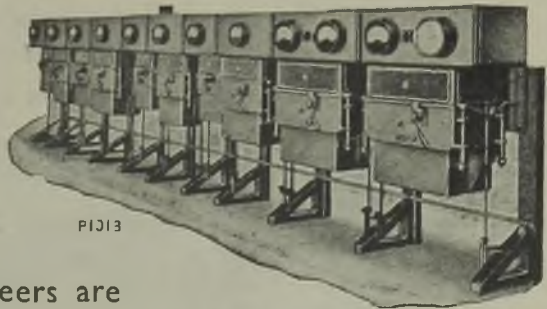
PI017

Specify

“ERSKINE HEAP”

WE ARE
SPECIALISTS

In large and
small switchgear
also small and
large starting
gear, and our engineers are



PI013

always at your service with helpful suggestions
based upon our 39 years' experience in all types of
GEAR for all classes of industry. *Send Us Your Enquiries.*

ERSKINE, HEAP & CO LTD

Head Office:
BROUGHTON, MANCHESTER 7.
Phone: DEAnsgate 4561 (4 lines).
Grams: "Electron," Manchester.

*Switchgear
Specialists*

London Office: GRAND BUILDINGS,
TRAFALGAR SQUARE, W.C.2
Phone: ABBey 2748-9
Grams: "Erskineap, Phone, London."

BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD



What has this to do with E.C.C.?
The Electric Construction Co. Ltd.

were the pioneers of many Electrical devices such as the electric dog-cart illustrated, built in 1896. Some of these inventions were handed to others for development. Many were retained by E.C.C. and made in thousands right up to the modern products in evidence to-day.



THE ELECTRIC CONSTRUCTION CO. LTD.
WOLVERHAMPTON

*Oh, the little more, and how much it is,
 . . . the little less, and what worlds away!*

So moaned the poet Browning, and as his wife, Lizzie B.B. remarked at the time — “Bob, you’ve certainly got something there.”



Thousands and thousands of bench hands echo the sad cry as they fumble vainly with drill and screwdriver and spanner, trying to reach nuts and bolts and screws that remain coyly out of reach. The Desoutter range of tools is specially made to go places — even if the places are awkward and apparently inaccessible.

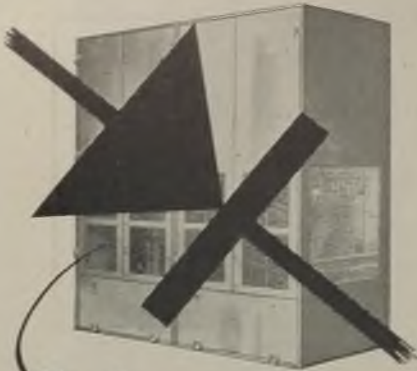


**SPECIALISTS IN LIGHTWEIGHT PNEUMATIC
 AND ELECTRIC PORTABLE TOOLS**

DESOUTTER

DESOUTTER BROS. LTD., DEPT. R, THE HYDE · HENDON · LONDON, N.W.9. 'PHONE: COLINDALE 6346-7-8-9

C. R. Casson 142



the important point

in choosing converting plant is to select equipment which gives dependable service with maximum economy at all loads, and which is

SIMPLE, RELIABLE & EASILY INSTALLED

Backed by over 30 years' rectifier experience—your best choice is

Hewittic Rectifiers

HEWITTIC ELECTRIC COMPANY LTD.
WALTON-ON-THAMES, SURREY

Telephone : Telegrams :
Walton-on-Thames 760 (8 lines). "Hewittic, Walton-on-Thames"



Something NEW in Switchgear!

Sordoviso produce a new Plug-in Contactor

Here's some news! Sordoviso Engineers have produced a new design in Switchgear featuring plugged-in relays and contactors which allow immediate accessibility to the mercury switch itself *without the need of detaching a single screw*. The coil unit (supplied with fuse and spare fuse) is *immediately accessible and interchangeable*. The main contact is in an entirely separate compartment from the coil contact, so that the *highest possible degree of insulation between the two is obtained, together with a most compact unit*. Every part of this newly-designed instrument is, in fact, immediately accessible and can be dismantled and rebuilt in a few seconds! Available in three different ratings of 5, 10 and 15 amps, with a wide range of voltages up to 500 volts A.C.

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

SORDOVISO

SORDOVISO SWITCHGEAR LTD.

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



S.P. Porcelain Covers are incorporated in many Transformer Switchgear and Cable Terminals. We make insulators for all purposes and it may be worth your while to consult us before you finalize your design.

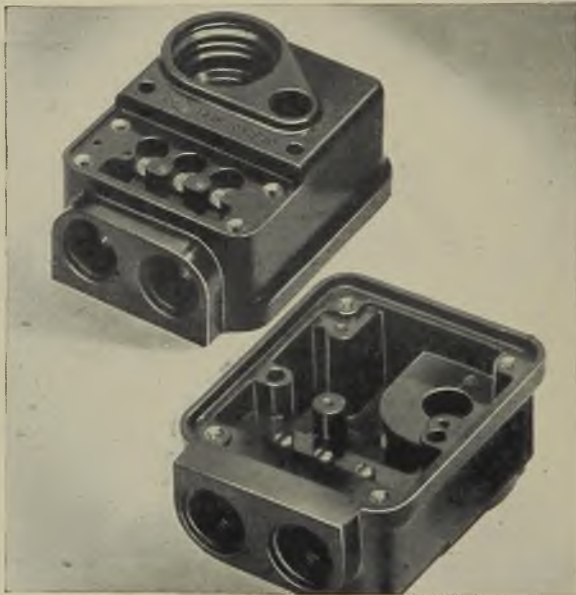
STEATITE & PORCELAIN PRODUCTS LTD.

Head Office: Stourport-on-Severn, Worcs.
Phone: Stourport 111. Grams: Steatins, Stourport

MOULDINGS

IN MANY GRADES OF
THERMO PLASTIC & THERMO SETTING
MATERIALS FOR THE
ENGINEERING & ALLIED INDUSTRIES

● Below is shown one example
of many intricate mouldings
from our varied range



Insulators Ltd

MOULDINGS OF MERIT

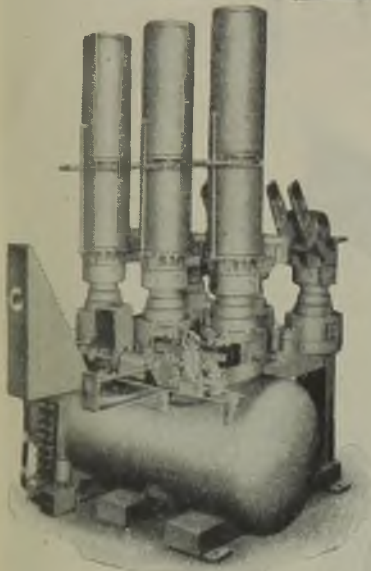
LEOPOLD RD., ANGEL RD., EDMONTON
LONDON, N.18

Phone : TOT. 1491 (4 lines)

'ENGLISH ELECTRIC'

*Air-Blast*

SWITCHGEAR



3.3kV., 1,600 amp., 250 MVA.,
Air-Blast Circuit-Breaker, indoor
type. Isolators in open position.

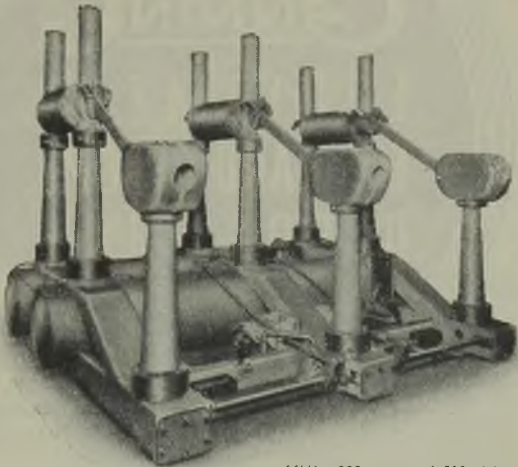
IMPORTANT FEATURES

- Elimination of oil fire hazard
- High speed operation
- Rapid arc interruption with consistent performance over entire range up to full short circuit currents
- Extremely low arc energy
- Minimum maintenance, wear, and contact erosion
- Mechanical simplicity
- Compact and space saving
- All parts easily accessible

"English Electric" Air-Blast Switchgear can be employed for all duties to which Oil-Break Switchgear is applicable and for all standard voltages from 3.3kV. to 132kV.

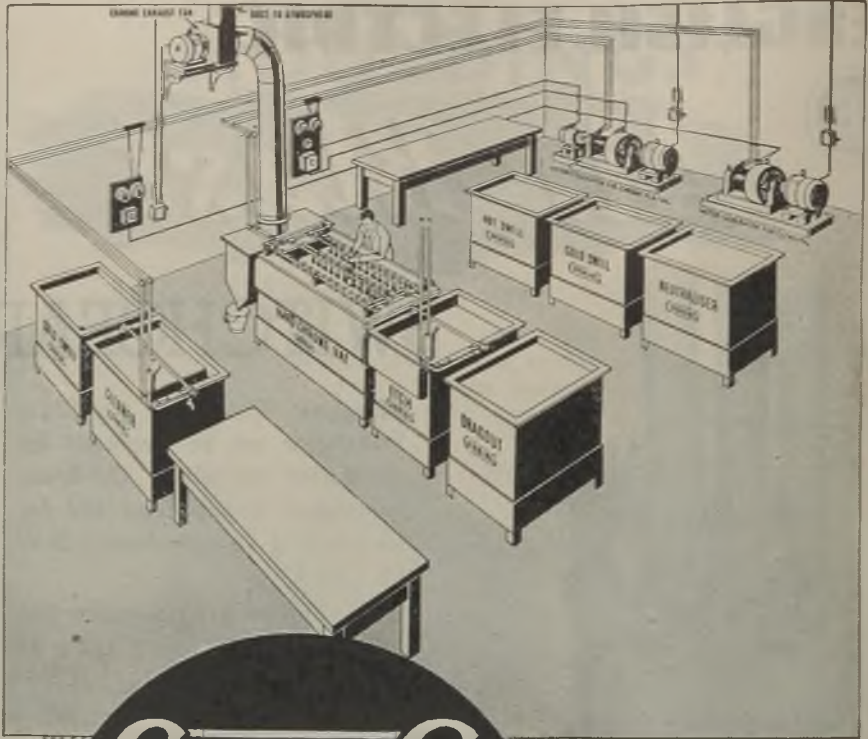
It is eminently suitable for repetitive switching such as Arc Furnace control.

Publication SG/105 sent on request



66kV., 800 amp., 1,500 MVA.,
Air-Blast Circuit-Breaker, indoor
type. Isolators in closed position.

THE ENGLISH ELECTRIC COMPANY LTD.
- STAFFORD -

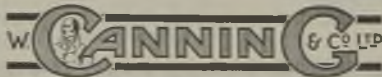


CANNING
 EQUIPMENT
 FOR HARD CHROME
 DEPOSITION

For reclaiming and building up
 Engineering products.

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

*Let us help you with your reclamation
 problems.*



GREAT HAMPTON STREET, BIRMINGHAM 18

A7'43



T*he roads of the present lie deep in the past"*

FOR every purpose demanding a dependable high standard of performance, Alton stationary batteries are installed. Behind them is a tradition of craftsmanship in battery design and manufacture and of efficient and reliable performance in service.

The established traditions associated with the name of Alton define the standard of the future and point to the choice of Alton batteries for services of vital importance.

ALTON

BATTERIES OF MERIT

THE ALTON BATTERY CO. LTD.

(Sole Suppliers of FULLER Stationary Batteries)

ALTON, HANTS.

Telephone: Alton 2267 and 2268
Telegrams: 'Battery, Alton'.





*“WELVIC”
for cable covering*

“Welvic” polyvinyl chloride composition is a tough flexible thermo-plastic developed for the sheathing and insulation of cables, and for the extrusion of sleeving. “Welvic” is resistant to oxidation, abrasion and chemical attack, is non-inflammable and possesses good electrical and mechanical properties.



IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1.

TRADITIONAL RELIABILITY



- TURBO-ALTERNATORS
- TURBINE OR MOTOR-DRIVEN
COMPRESSORS AND BLOWERS
- WATER-POWER OR ENGINE-DRIVEN
ALTERNATORS AND GENERATORS
- CONVERTING MACHINERY
- SWITCHGEAR, TRANSFORMERS, RECTIFIERS
- AUTOMATIC SUBSTATIONS
- POWER FACTOR IMPROVEMENT PLANT
- ELECTRIC WINDERS, ROLLING MILLS
- ALL KINDS OF HEAVY ELECTRIC PLANT
- MOTORS AND CONTROL GEAR
FOR ANY INDUSTRIAL APPLICATION
(large or small)
- MAGNETOS, AND ELECTRICAL
EQUIPMENT FOR AIRCRAFT
- REGENERATIVE DYNAMOMETER EQUIPMENTS
FOR ENGINE TESTING
- ELECTRIC SHIP PROPULSION
- ELECTRIC TRACTION
(Road or Rail)
- INDUSTRIAL HEATING EQUIPMENT
- CINEMA PROJECTOR EQUIPMENT
- MAZDA LAMPS, AND
MAZDALUX LIGHTING EQUIPMENT
- ELECTRON VALVES
of every description

• • •

**SPECIFY BTH
ELECTRICAL EQUIPMENT**

BTH

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



A3494

OUTDOOR METERING

for RURAL SUPPLY



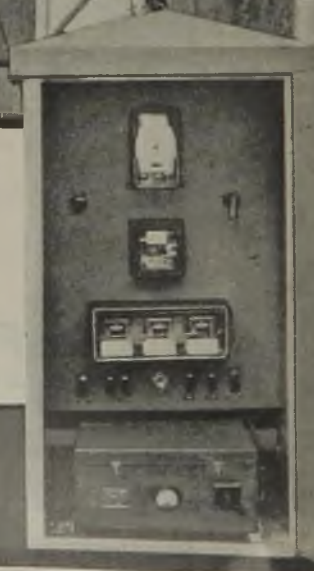
This outdoor metering equipment is connected to an 11 kV system.

A voltage transformer and two current transformers are oil-immersed in the tank shown.

The kWh meter is mounted in a weatherproof steel pillar (shown inset) for mounting near the foot of the pole, but alternatively it can be housed in a sheet-steel pole-mounted cubicle.

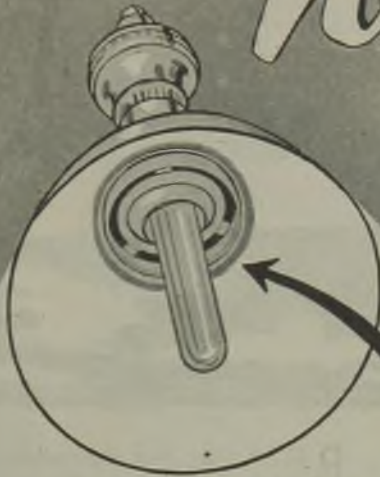
METROPOLITAN Vickers

ELECTRICAL CO. LTD.
TRAFFORD PARK ... MANCHESTER 17.



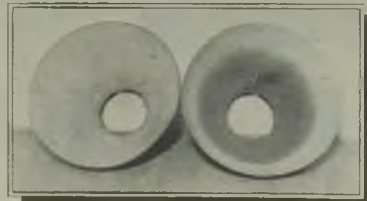
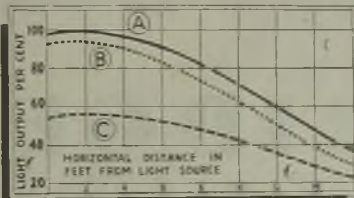
and for better lighting—COSMOS & METROVICK LAMPS

What's new?



MAXLUME REGD. 'STAYCLEAN' REFLECTORS

SUITABLE FOR TUNGSTEN AND DISCHARGE LAMPS

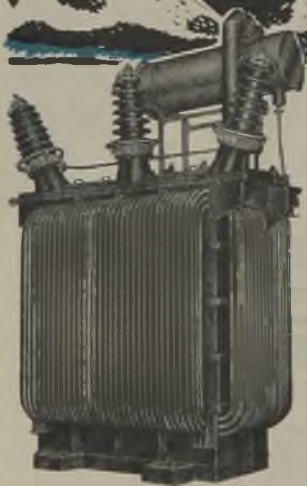


- Curve A—CLEAN REFLECTOR, 400w MV/F Lamp.
- Curve B—'STAYCLEAN' REFLECTOR with 400w MV/F Lamp after five weeks' service in foundry.
- Curve C—STANDARD REFLECTOR, exactly the same conditions as above.

This is a reproduction of an untouched photograph of a 'Stayclean' Reflector and an ordinary Reflector after being used in similar positions for one week only.

VERITYS LTD., ASTON, BIRMINGHAM 6

LONDON · BIRMINGHAM · BRISTOL · GLASGOW · MANCHESTER · NEWCASTLE · LEEDS



RELAX for one refreshing moment ; call back the memory of joys that will return—the quiet of the countryside, the bright lights of Town, the glory of white sails against the blue waters. . . .

See that sleek beauty rounding the mark buoy in a flurry of foam. Hear the laughing voices and the cry of gulls. . . .

How significant that two boats can be as like as two peas to the outward eye ; yet one, thanks to **greater skill and experience**, is always ahead.

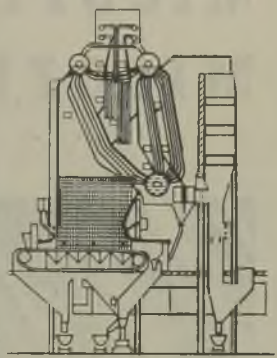
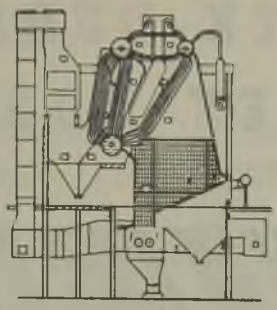
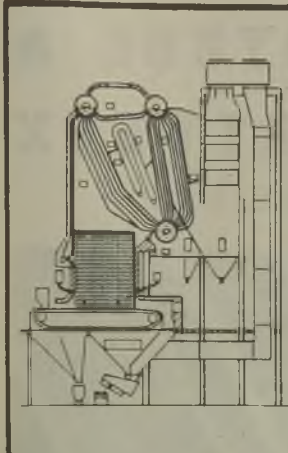
HACKBRIDGE

T R A N S F O R M E R S

always ahead

HACKBRIDGE ELECTRIC CONSTRUCTION CO., LTD.
Telephone : Walton-on-Thames 760 (8 lines).

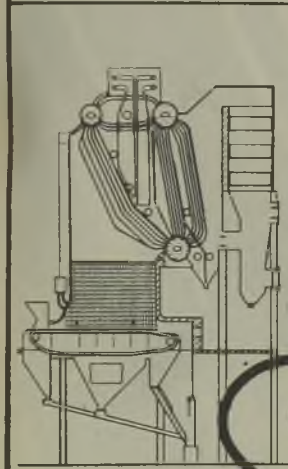
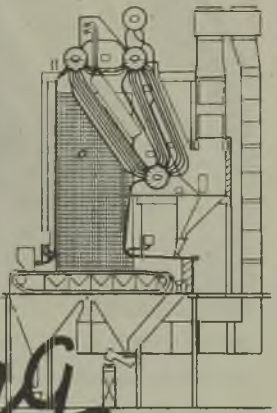
WALTON-ON-THAMES, SURREY
Telegrams : " Electric, Walton-on-Thames "



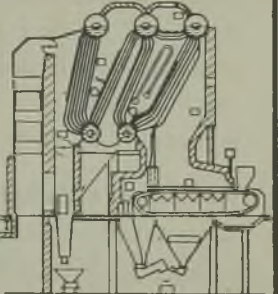
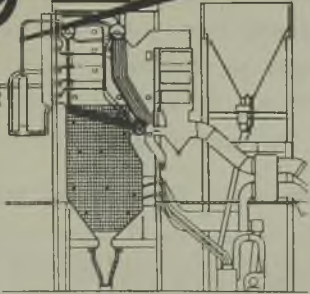
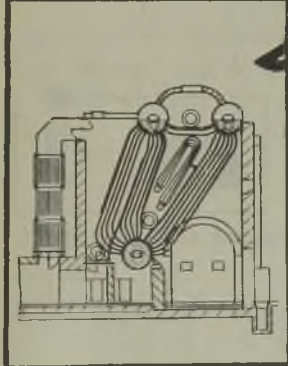
PROGRESSIVE LEADERSHIP

As the original of its type the Scirling bent tube boiler has had more imitations than any other basic design of boiler. That it is still the leading boiler of its kind is due to our continual striving for perfection in design, workmanship and service.

THE
STIRLING BOILER
CO., LTD.
32-33 FARRINGTON ST.,
LONDON, E.C.A.

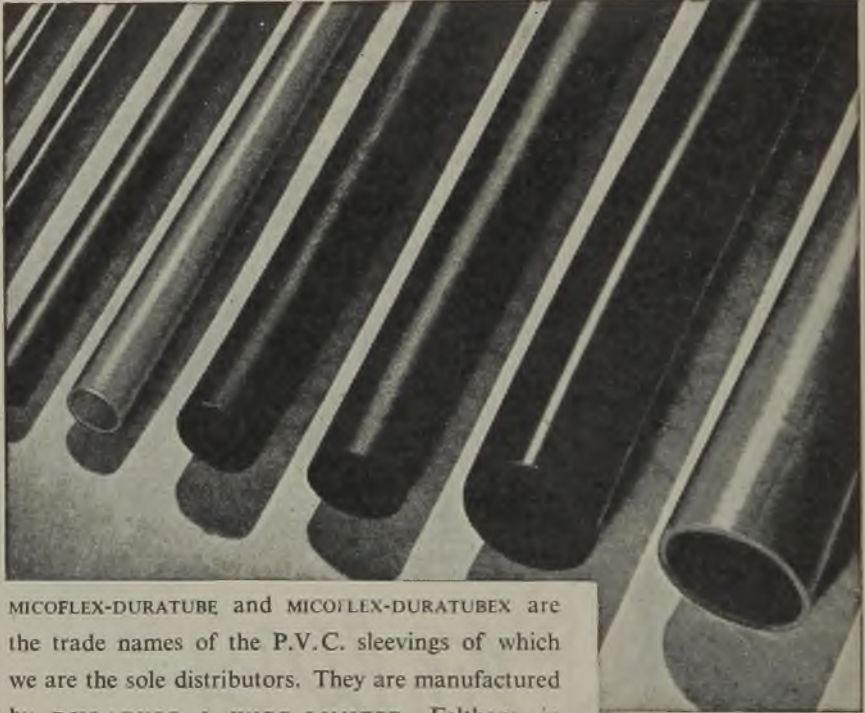


Stirling



MICOFLEX-DURATUBE & MICOFLEX-DURATUBEX

P.V.C. EXTRUDED SLEEVINGS



MICOFLEX-DURATUBE and MICOFLEX-DURATUBEX are the trade names of the P.V.C. sleeveings of which we are the sole distributors. They are manufactured by DURATUBE & WIRE LIMITED, Feltham, in various colours, in a complete range of sizes and thicknesses, and in various degrees of hardness ranging from SUPER FLEXIBLE to RIGID. Braided and reinforced types of sleeveings (MICOFLEX-DURATUBEX), which comply with various Government Specifications, are made for special applications.

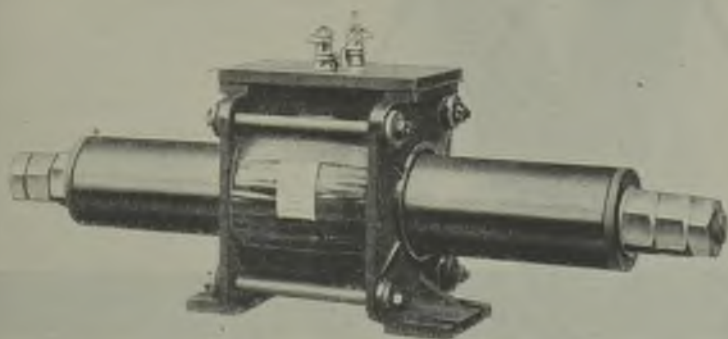
m and i

THE MICANITE & INSULATORS CO. LTD., EMPIRE WORKS, BLACKHORSE LANE, LONDON, E.17

Makers of MICANITE (Built-up Mica Insulation); Fabricated and Processed MICA; PAXOLIN (Synthetic-resin Laminated sheets, rods, tubes and cylinders); High-voltage Bushings and Terminals for indoor and outdoor use; Empire varnished Insulating Cloths and Tapes and all other forms of Electrical Insulation. Suppliers of Vulcanised Fibre Leatheroid, Presspahn, etc. Sole distributors of Micoflex-Duratube Sleeveings (P.V.C.).

FOSTER

Instrument Transformers



FOSTER TRANSFORMERS & SWITCHGEAR LTD.

(INCORPORATING FOSTER ENGINEERING COMPANY)

SOUTH WIMBLEDON LONDON S.W.19

Save FUEL -
speed
Victory



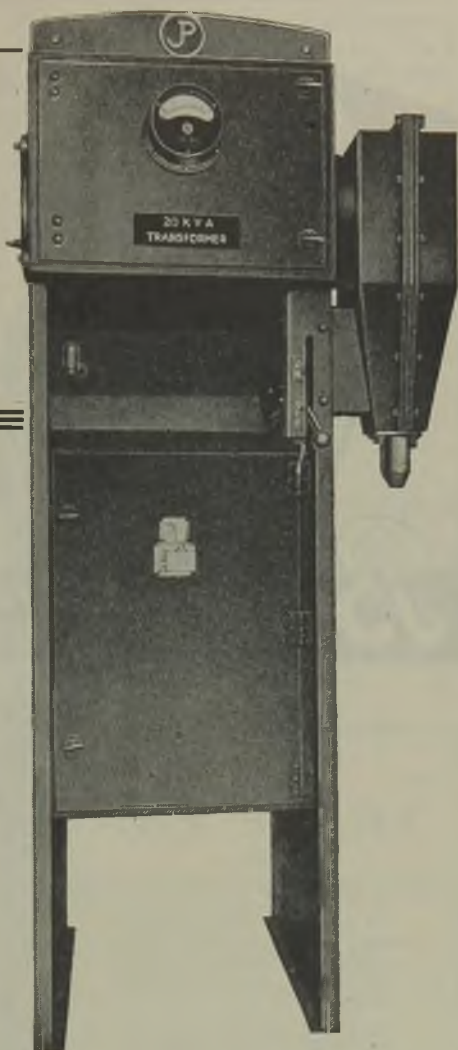
CRYSELCO
"Save light and help to Fight"

SAVE VITAL MATERIALS

TYPE L.B.S./F. Load Breaking Switch and Fuse 11 kV, 250 MVA

You can break load currents on this switch up to 11 kV. Modern H.R.C. fuses provide short-circuit protection up to 250 MVA. Suitable for the many services where all the functions of a circuit-breaker are not essential, particularly isolated transformers. Not only does it effect a saving in materials, but also in installation and maintenance costs.

Ask for Publication S.G. 41.



ANOTHER J. & P. SWITCHGEAR DEVELOPMENT

JOHNSON & PHILLIPS LTD.

CHARLTON, LONDON, S.E.7

Telephone: Greenwich 3244 (13 lines). Telegrams: "Juno," Charlton, Kent



The mark that means that "little more" in quality

Woman's Work in
War-Time —
The B.R.C.S.



It's a grand job of work

she's doing—in unusual surroundings. If, and when, the time comes to set up home she'll deserve everything that makes life easier—including a Burco, of course.

Supplies very restricted just now; but plans are made for Burco's in every home.

BURCO LTD.
ROSE GROVE,
BURNLEY



Burco ELECTRIC WASH BOILERS

The

TRANE FAN

for

VENTILATION and AIR CIRCULATION

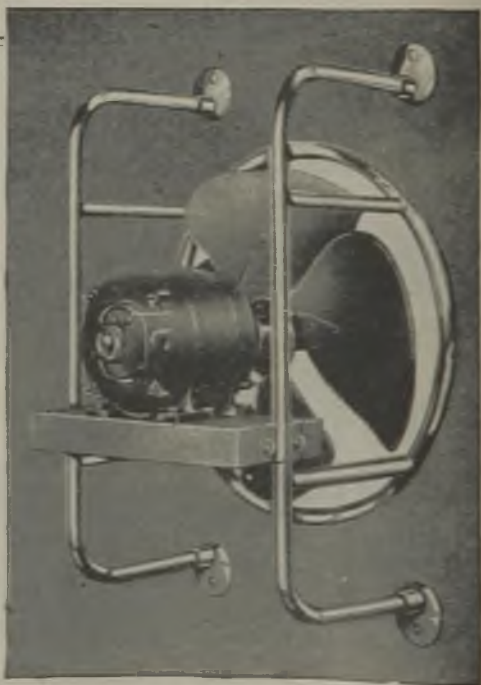
It is designed for wall mounting by means of a special light, strong tubular frame absorbing vibration and ensuring smoothest possible running.

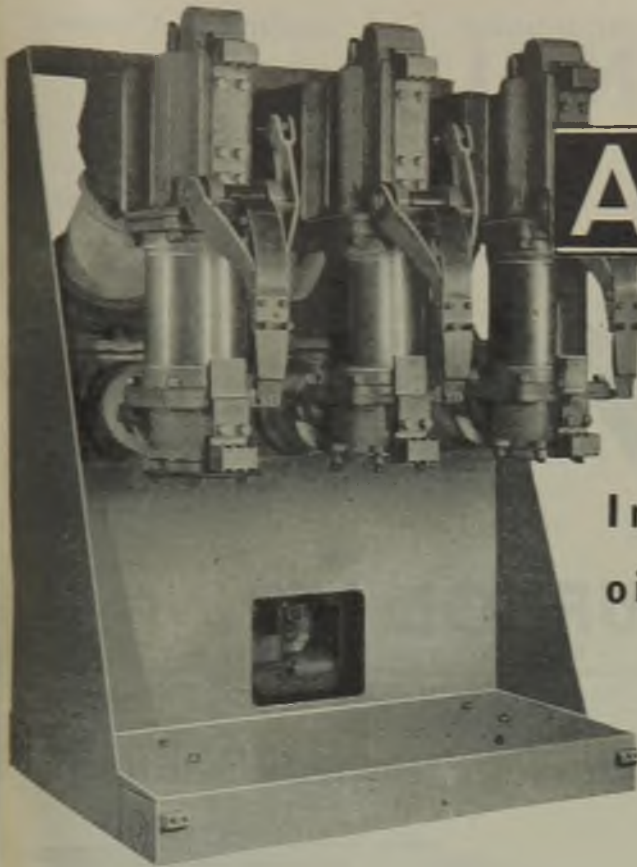
The same care, skill and experience that made the firm reputation of other Trane Air Conditioning products have produced the new fan; and the same sound guarantee of material and labour will be honoured in the same Trane way.

Write for Booklet EF 3 with details of standard models, sizes, duties and prices to:—

BRITISH TRANE CO. LTD.

52 Clerkenwell Close, London, E.C.1
Telephone: Clerkenwell 6864 & 3826





ASEA

Indoor type oil minimum circuit breaker

The above photograph shows an 11 kV indoor type oil minimum circuit breaker having a proved rupturing capacity of 500 MVA according to B.S.S.116. The oil content is only 1½ gallons per phase. The breaker can be closed either by a spring operated

or compressed air mechanism and is designed to carry 1600 amperes continuously. Similar switches with altered phase spacing but the same oil content are manufactured at our Works for 300 MVA at 6.6 kV and 500 MVA at 22 kV.

ASEA ELECTRIC LTD.

Associated with Fuller Electrical & Mfrg. Co. Ltd.

Head Office : FULBOURNE ROAD, WALTHAMSTOW, LONDON, E.17

Telephone : Larkwood 2350 (10 lines).

Telegrams : "Autosynco, Telex, London"

Hints on machining **TUFNOL**

THE ENGINEERS MATERIAL. NON-METALLIC. LIGHTWEIGHT



Fuller details of speeds and cuts are given in our "Manual on Machining Tufnol".

GRINDING. A centreless grinder or sand-paper machine is recommended for grinding circular sections of Tufnol. Run centreless grinders dry, prevent clogging and true up periodically. Use open-grained garnet or flint grinding bands for sand-papering machines, close grained bands may clog and "burn" the Tufnol. Strip Tufnol can be ground to accurate limits on vertical spindle machines fitted with grinding wheels. Finish by light application on a dry mop and apply "Tufnol Finishing Oil".

TUFNOL LTD

PERRY BARR BIRMINGHAM 22B

134

Frames and Cases for Electrical Equipment

**FEEDER PILLARS,
CUBICLE AND
TELEPHONE BOXES,
BUSBAR CHAMBERS,
CONNECTION BOXES,
INSTRUMENT PANELS**

Make War Savings
at least a BOB in the £



AIR DUCTS

LTD.

GREAT WEST ROAD, BRENTFORD

Phone : Ealing 6655. Telegraphic Address : "Airdux, Brentford"



STOCK BIN LIGHTING

The special need of all storage areas to be able to find items promptly means that your storekeepers require light directed into the bins so that they can see what is there. Benjamin Stock Bin units are designed to do this when suitably installed. Write to us for details.

BENJAMIN

FLUORESCENT—DISCHARGE—FILAMENT

The Benjamin Electric Ltd., Brantwood Works, Tottenham, London, N.17

Telegrams "Benjalect, Southtot, London,"

Telephone: Tottenham 5252 (5 lines)

VENT-AXIA
for better
Air Conditions



VENT-AXIA LTD, 9 VICTORIA STREET, LONDON, S.W.1
BRO AT GLASGOW & MANCHESTER



1897 TO 1943
46 YEARS IN THE
ELECTRICAL BUSINESS

WYLEX
MUST BE GOOD

GEORGE H. SCHOLES & Co., LTD.
MANUFACTURERS OF ELECTRICAL
PRODUCTS. WYLEX WORKS
WYTHENSHAW MANCHESTER

BRUSH LARGE TRANSFORMERS

REMOTE CONTROLLED POWER

The illustration shows a Brush 10,000 kVA transformer fitted with on-load tap changing equipment operated at a point remote from the transformer.

A large number of these remote-controlled transformers have been installed by this Company.

SIZES UP TO 30,000 k.V.A.

BRUSH
LOUGHBOROUGH
ENGLAND

Looking forward

"Anticipation is half the pleasure". Intelligent anticipation of the future requirements of your plant can go a long way towards solving the problems of industry in the post-war world. The reliability of your Ellison Switchgear is a matter you take for granted, and here and now you can decide upon one form of insurance for its continued smooth functioning when peace returns. Only the minimum interruption of your busy routine need be caused by a visit from an Ellison engineer to report upon the condition of your installation. He will give competent advice and you will have the satisfaction of knowing your gear is in good condition for the days that lie ahead. Why not arrange it now?


GEORGE ELLISON
 LIMITED
 BIRMINGHAM 22B ENGLAND



ELECTRICAL REVIEW

August 25, 1944

Contents :—

	Page
Editorial.—Terms and Definitions	253
Transformers for Russia	256
Canada's Power Output	259
Progress in South Africa	260
Heat Dissipation from Sub-stations. By T. D. Oswald, B.Sc.	261
Accumulator Makers' Association By F. C. Vine	263
Uses of Porous Metal. By J. W. Lennox	264
Trunk-Road Lighting. By F. H. Pulvermacher, A.M.I.E.E.	265
Eastbourne's Plans	266
Correspondence	267

Managing Editor :
Hugh S. Pocock, M.I.E.E.
Technical Editor :
C. O. Brettelle, M.I.E.E.
Commercial Editor :
J. H. Cosens

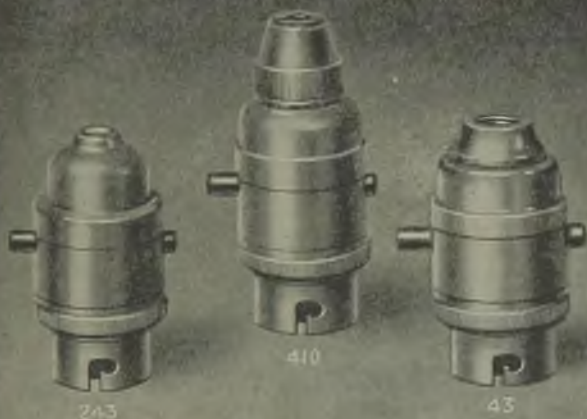
<i>Contents continued :—</i>	Page
Personal and Social	270
Commerce and Industry	272
Industrial Lighting—II. By E. D. Iliff, B.Sc. (Eng.), A.M.I.E.E.	275
Presentation to Mr. H. C. Lamb	279
Recent Introductions	280
Electricity Supply	281
Financial Section	282
New Patents	287
Contract Information	288
<i>Classified Advertisements</i>	67
<i>Index to Advertisers</i>	76

EDITORIAL, ADVERTISING & PUBLISHING OFFICES : Dorset House, Stamford St., London, S.E.1
Telegraphic Address : "Ageekay, Sedist, London." Code : ABC. Telephone No. : Waterloo 3333 (35 lines).
Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage. Entered as Second Class Matter
at the New York, U.S.A., Post Office.

Annual Subscription, Post free : British Isles, £2 7s. 8d. ; Canada, £2 3s. 4d. ; Elsewhere, £2 5s. 6d.

Cheques and Postal Orders (on Chief Office, London) to be made payable to **ELECTRICAL REVIEW LTD.**,
and crossed "Lloyds Bank."

Made to a Standard



This illustration shows W. & G. Switch Lampholders, some of many types of insulated Switch Lampholders supplied with and without porcelain interior.

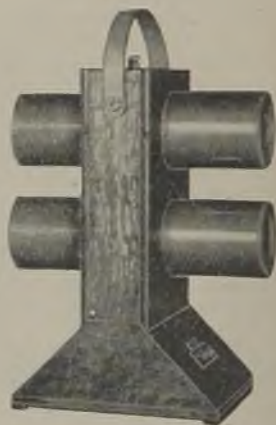
A wide and comprehensive range of electrical accessories is available to customers for National Service.

WARD & GOLDSTONE LTD. PENDLETON, MANCHESTER. 6.

ESTABLISHED OVER HALF A CENTURY

Portable "OMNI-RANGE" CURRENT TRANSFORMERS

- Currents from $\frac{1}{2}$ amp. to 2,400 amps. can be measured on a single transformer.
- Complies fully with B.S.81 for any desired class.
- Test voltages of 10 or 20 kV and secondary currents of 5 or 1 amp. are standard.
- A secondary short-circuiting switch is fitted to all models.



A Universally Applicable Current Transformer

WRITE FOR CATALOGUE
SHEET 439

EVERETT EDGCUMBE

COLINDALE WORKS
LONDON, N.W.9

Telephone: COLINDALE 6045

ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872



Vol. CXXXV. No. 3483.

AUGUST 25, 1944

9d. WEEKLY

Terms and Definitions

Importance of Correct Nomenclature

ELECTRICAL engineers have been accused by the lay public of an addiction to jargon. The dictionary definition of jargon is confused talk and the right reply to the charge ought to be that every word employed in a technical sense has its precise meaning, irrespective of its context, to all practitioners and that the idea it seeks to convey could not be stated briefly in any other way.

Unfortunately that answer would not invariably be accurate. One reason is the number of words in ordinary use to describe technical ideas and devices; another is the persistence of expressions, once in currency (possibly with authoritative sanction) but now obsolete as a result of scientific developments. The latter was the aspect emphasised in an article on "Electrical Terminology" contained in our issue of June 2nd. Although some of the examples cited may appear at first glance to possess a somewhat theoretical interest, they exercise an influence on mental processes that is none the less profound because it is not immediately obvious.

Pressure and Tension

Correct nomenclature, however, has often a direct bearing on day-by-day practical affairs. A case in point is presented by the terms used to denote potential difference (in which departures from standard are comparable with those that exist in the case of declared voltages at consumers' terminals). Voltage is often referred to indifferently as pressure or tension. Pressure already has its well

established field in mechanical engineering or it might be intended to refer to pressure cables, the dielectric of which is subject to super-atmospheric pressure. Tension also has its prior mechanical associations in addition to those connected with various items of overhead line construction and equipment. A similar objection on the ground of disparity of competitive meanings might be entered against the use of "unit" as an abbreviated form of the old Board of Trade unit of electrical energy (although officially accepted) instead of kilowatt-hour, which is favoured outside this country.

Classification of Voltages

Next we have incorrect references to the categories into which supply voltages are legally separated—low voltage up to 250, thence medium voltage up to 650 and high voltage above that. Distinction between extra-high-voltage (above 3,000 V) and high voltage is still made, but the significance of this has long ceased to exist. The common misuse of low (instead of medium) voltage to describe 400-V distribution is of practical significance, since certain statutory safety measures are prescribed for voltages above 250. Similar considerations are involved in the term phase voltage, which is frequently applied indiscriminately to voltage between lines and to voltage from line to neutral.

The examples cited are only a few of the many discrepancies which crop up in speech and writing and which appear to justify condemnation as jargon. Even if the context appears to remove any chance of

confusion, some amount of effort is entailed in mental adaptation which is something to be avoided. The process does not help clear thinking. For the lack of universal terminology the builders of the Tower of Babel came to grief, and the first attempts at standardisation should be to endeavour to ensure that the same words mean the same things to different people. In case of doubt recourse should be had to the "Glossary of Terms used in Electrical Engineering," in which the aim is clearly to use direct and as far as possible self-explanatory forms of expression and, in addition, to establish logical basic relationships between scientific concepts.

As we noted when it **Scotland Points** was issued, the report of the **the Way** the Scottish Advisory Committee on Housing expressed a very definite preference for electricity in new houses based upon extensive inquiry among those concerned. The soundness of its conclusions is receiving practical proof in the shape of decisions of Scottish local authorities. The Rutherglen Council is adopting the all-electric idea in houses which it is building at Berelands, and the Clydebank Council demonstrated a week or two ago the first of many rapidly-constructed "Duplex" houses in which adequate electrical facilities are perhaps the chief attraction, particularly a generous supply of outlets. We may hope that the rest of the houses which the Council is erecting (the total need is for over eight thousand) will be similarly equipped.

Gas organisation of the **gas Reorganisation** industry follow very closely those which have been put forward by various interests for the future of electricity supply. The term "interests" is used here with particular meaning, for each set of proposals is coloured by the views of the section responsible. Thus, as the I.M.E.A. represents municipalities it advocates the continuance and extension of public ownership (in particular local authority ownership). On the gas side local-authority gas undertakings are represented by the Association of Municipal Corporations and so naturally the Association is for public ownership. It thinks that the present "mixed" system constitutes a

barrier to voluntary rationalisation and co-operation and no improvement is likely while it continues to exist.

Joint Boards

It is suggested that municipal joint gas boards should be set up in some localities, but the British Gas Federation has already stated that the setting-up of the gas boards would be substituting "an experiment for a well-tried system of company and municipal enterprise." Here are two apparently irreconcilable points of view for the Minister of Fuel and Power to consider. In the electricity supply industry there has at least been an attempt to find some common measure of agreement. Whatever may be thought of the White Memorandum it does show a certain measure of willingness on the part of private and public interests to get together. And already the electricity supply industry is much better organised than its gas rivals.

Permanent Exhibition

Writing to the *Daily Telegraph* last week Mr. Raymond Berry referred to the inadequate facilities afforded in connection with past British Industries Fairs and said that this lack could be got over by the provision in London of a permanent exhibition (and amusement) centre in one of the parks—Regent's Park, for instance, where there appears to be plenty of available space. There is no doubt that London needs something better in the way of exhibition arrangements than exists at present and the question is one that should interest the electrical industry which would have to play a leading part in any such scheme. Mr. Berry's suggestion reminds us of the late Lord Hirst's advocacy of a permanent electrical centre in London which is another idea worth considering when post-war electrical plans are being prepared.

South African Commission

For the first time since 1931, the South African Electricity Supply Commission has to report a slight decrease in output and sales last year, owing to a lessening of the demand for bulk supplies for the mines and for direct supplies for traction and industry. There were substantial increases in municipal bulk supplies and in sales for domestic purposes and street lighting. As 1943 saw the completion of twenty-one years'

operation the report for the year contains a brief history of the Commission's activities. The importance to which it has attained is evident from the fact that it is now responsible for about two-thirds of the Union's electricity supply. Much of the credit for the progress made is due to Dr. H. J. van der Bijl, who has been chairman of the Commission since its inception and to whom his fellow Commissioners pay a tribute in an addendum to the report.

As we have mentioned **Cheap Coal** on previous occasions, an outstanding feature of power production in South Africa is the cheapness of the coal. The average cost per short ton (2,000 lb.) for the whole of the Union was less than 7s. 5d. This low figure was due largely to the fact that at the Klip station, which produces something like 37 per cent. of South Africa's electricity, and Witbank (10 per cent.) the cost of coal is (to English minds) ridiculously low—3s. 9d. and 2s. 1d. per short ton respectively. In view of Home experience it is worth noting that the price of coal at Klip has only risen by 7d. a ton since 1926, when it started, while at Witbank there has actually been a decline of 1d. since 1930. To complete the story the consumption per kWh generated should be given: in 1943 it was 1.64 lb. at Klip and 1.73 lb. at Witbank.

Tramway-point Freezing EXPERIMENTS in protecting tramway points from frost through the adoption of permanent electric heating installations on the tracks are reported to have been carried out in Nürnberg during recent severe winters. These are said to have been successful enough to justify the attention of manufacturers to the subject, while they afford the opportunity of devising improvements. Difficulties encountered include shocks occasioned by heavy traffic and hot spots as a result of the thermal insulation provided by mechanical protection. Energy consumption has been given as upwards of 3.5 kWh with 35 W per ft. of heater tube.

Continuous Heating RECONCILIATION of the apparently inconsistent views that more heat energy is required to restore the temperature of a building than to maintain it and that the supply can be

economically switched off or varied to suit atmospheric conditions was furnished by Mr. J. L. Musgrave in the paper which he read recently before the Institution of Heating and Ventilating Engineers. Where heat is applied continuously, he said, about 60 per cent. of the energy is used during the night. Low-temperature heaters, assuming adequate thermal insulation, can be switched off for three hours with a fall in temperature of only $\frac{3}{4}$ to 1 deg. F. and thermostatic control enables full advantage to be taken of any casual heating, e.g., from occupants, intermittent sunshine, lamps and fabric warmed by radiation. After that period the temperature drop is much more rapid and inner wall surfaces become cold.

Cosmic Rays FURTHER knowledge of the charged particles that enter the earth's atmosphere from outer space and take part in electrical activities could be obtained as a result of slowing them down for study at leisure. That is a possible future function of the cyclotron, which, according to *Science*, is envisaged by Professor Laurence Dodd, of the University of California. For this purpose the cyclotron would, however, have to project particles at speeds as high as those of the cosmic rays—very much higher than values at present obtainable. Another obstacle is that the path taken by cosmic rays is not now determinable and consequently the correct direction of pointing the cyclotron would be a matter of chance.

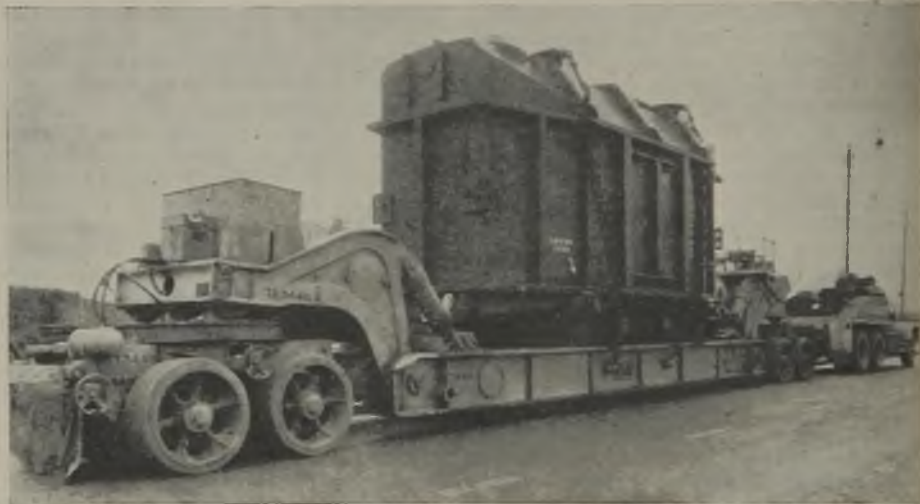
Civilian Supplies IN spite of the opposition of the Director of War Mobilisation, Mr. Donald Nelson, chairman of the United States War Production Board, is going ahead with his plans to permit manufacturers to proceed with a limited production of goods for civilian purposes. He contends that this is necessary to "take up the slack" resulting from a gradual easing off of the production of war supplies. Among the articles on the list are many which have been unobtainable for some time, including electric cookers, water heaters and vacuum cleaners. Permission to make these goods will be given on a local basis, that is, only in districts where the supply of materials and manpower is found to be surplus to war requirements.

Transformers for Russia

A 15·75/242-kV, 120,000-kVA Bank

FOLLOWING up our recent articles, prepared with the collaboration of the Ministry of Supply and many of the leading British electrical and allied equipment manufacturers, recording some of the excellent work which is being done by the manufacturers to help the U.S.S.R. in its magnificent reconstruction work, we are now able to give an account of a 120,000-kVA bank of transformers which has been produced by the British Thomson-Houston Co., Ltd., for feeding a 242-kV 50-cycle three-phase transmission system. Consisting of three single-phase transformers, the bank is believed to be the largest yet produced in

through an impedor. They also had to embody series-parallel connections to give the full rated output at either 242 kV or 121 kV, with plus and minus $2\frac{1}{2}$ per cent. and 5 per cent. tappings on each connection. They were to be insulated for the following tests: (a) an induced over-voltage test producing 485 kV to earth at the line end of the windings; (b) a separate source test of 242 kV to earth on all parts, including the neutral terminals; (c) an impulse test level in accordance with the A.S.A. Test Code of one million volts peak on a full wave of 1×50 microseconds and 1,210 kV on a "chopped" wave. An inherent reactance of not more



Two of the transformers were transported separately from the factory on a 100-ton lorry, assisted by a steam-tractor

this country. The input (low) voltage is 15,750, and the low-voltage windings are delta-connected.

Such large and special-purpose transformers created unusual interest among those who had to meet, in producing them, the Russian engineers' special requirements, the principal of which were as follows:—Each core, complete with its coils, had to be dried and shipped, without oil, in its own tank, hermetically sealed and with the permanent covers in position, and to be within the limits imposed by the existing British road and Russian rail vehicles and loading gauges. The high-voltage winding had to be star-connected, with the neutral ends insulated, and suitable for operation when earthed

than 10 per cent. at the full rated current was also called for.

The design which was evolved to meet these major requirements embraces some novel features, and probably the low height of the transformers, as built, constitutes a world record having regard to the transformer ratings. The relative low overall height fixed by the British loading gauge made it impracticable to get an inherent reactance as low as that required on a two-legged core, so it was decided to adopt a four-leg construction which was investigated experimentally some 20 years ago, but had never before been used commercially. The two outer legs enabled the depth of the yokes to be reduced, and thus permitted the provision,

within the gauge limits, of a taller "window" for the accommodation of the windings. The manufacture of these large cores, each of which weighs over 60 tons, to the specially evolved design was accom-

and by locating the tappings on these legs, it was possible to obtain a neat and symmetrical arrangement for series-parallel connections, combined with a balanced set-up of the main windings, giving great

mechanical and electrical strength.

The high-voltage coils on the main legs are of the disc type and are arranged concentrically with the low-voltage helical windings.

The manufacture of the large cores, each of which weighed over 60 tons, to the special design was accomplished without difficulty

The high-voltage windings are provided with electrostatic capacity-compensating shields to give an approximately sinusoidal initial voltage distribution under surges due to lightning and other causes, and to reduce to the minimum the subsequent internal winding voltage



plished by the B.T.H. Co. without difficulty.

Liberal ventilating ducts are provided on the centre of each main leg at right angles to the plane of the laminations. On all the legs numerous parallel ducts in the plane of the laminations are also provided, and are maintained by H-section steel spacers welded to adjacent core plates. The laminations are insulated on both sides and all the edges (after completion of shaping) by standard core-plate flash enamel, and the core is sub-divided into sections by means of asbestos sheet.

The core bolts are covered with special insulation of

stresses. On the outer legs the high- and low-voltage coils are interleaved in groups, and are both of the twin-section disc type which embodies features offering great mechanical strength and rigidity. The high-voltage coils on these outer legs contain the tappings which are connected to standard off-circuit switches arranged for external manual operation.

The tanks are of unusually strong construction to withstand the repeated handling

Consisting of three single-phase transformers, this 120,000-kVA bank is believed to be the largest so far produced in this country

asbestos bonded with synthetic resin, moulded directly on to the bolts under high pressure and high temperature.

By utilising the outside legs for the neutral end of the h.v. windings on each connection,



to which they must be inevitably subjected under war conditions during the long journey to the site by road, sea and rail. The attachments provided for lashing to prevent movement of the equipment while it was on board ship under severe weather conditions or sudden evasive action are a special feature. To permit vacuum drying on site, should this ever become necessary, the tanks are designed to withstand a 28-in. vacuum, and when they were tested under this condition in the factory they showed no dis-

The air end porcelains of the bushings, which are considerably taller than the average man, were fired in one piece

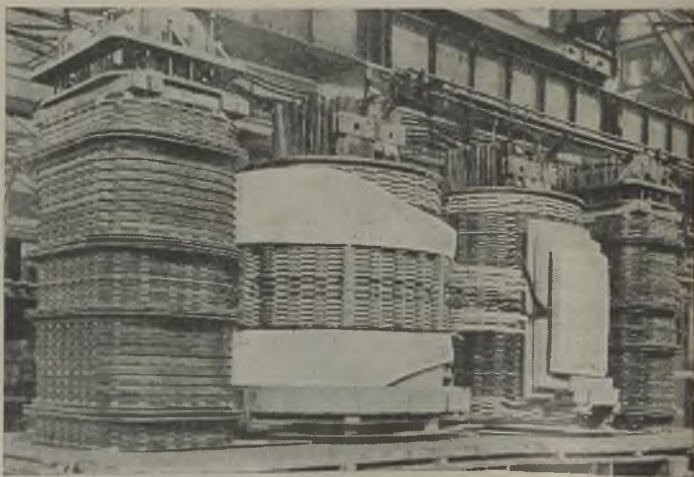
tortion. It will be noted from the illustrations, however, that a bottom gasketed joint is involved as well as the usual top joint between the tank body and the cover. An unusual requirement for such a large transformer is the rollers which permit movement either in line with or at right-angles to the long axis of the tank.

Mounted in pockets and removable for transport purposes, the high-voltage bushings are of the makers' standard oil-filled construction, but apart from their unusual physical size they embody no special features. An interesting point about their production bearing in mind their size, however, is that the air end porcelains, which are considerably taller than the average man, were fired in one piece. When mounted on the transformers they are somewhat dwarfed by the huge tanks. The 50-cycle, dry and wet, flash-over values, without arcing horns, are 690 kV and 470 kV respectively.

Each single-phase unit is provided with two coolers consisting of vertical steel headers accommodating numerous cooling tubes. The complete unit is cylindrical in shape and is mounted on a steel framework, about 10 ft. above ground level, to prevent its being buried in a heavy snowfall. Air passes upwards and downwards between the tubes. The coolers are designed to dissipate the heat losses corresponding to half the rated load, with the oil and air circulation due solely to the natural thermal head. Under full-load conditions, however, forced oil circulation and air-blast on the coolers are automatically brought into operation by an internal winding-temperature indicator.

Special arrangements permit immediate loading of the transformer after it has stood "idle" for a long time with an ambient temperature of -40 deg. C., at which temperature cooling oil is very sluggish. The oil pumps, one of which is provided for each cooler, are of the glandless type with the motor submerged in the oil. The fans are situated under the domed top covers in the centre of the cooler units.

The location of the coolers was determined by the site conditions, and it is understood that the three transformers of the group are installed at 45-ft. centres. Two separate conservators are provided and are placed above the coolers with two Buchholz relays, one in each oil connection. The high-voltage neutral and bushing are situated on the tank cover, and this arrangement, with the pocket-mounted and



The high-voltage coils on the main legs are of the disc type and are arranged concentrically with the low-voltage helical windings.

removable high-voltage bushings, affords liberal clearances throughout. The whole of the control apparatus for the oil pumps and air blowers is contained in a cubicle fixed to the low-voltage side of the transformer. This cubicle also contains two dial thermometers for indicating locally the temperatures of the oil and the windings. The installed overall dimensions of each single-phase transformer are:—Length, 37 ft. 8 in.; width, 28 ft. 2 in., and height, 25 ft. 7 in.

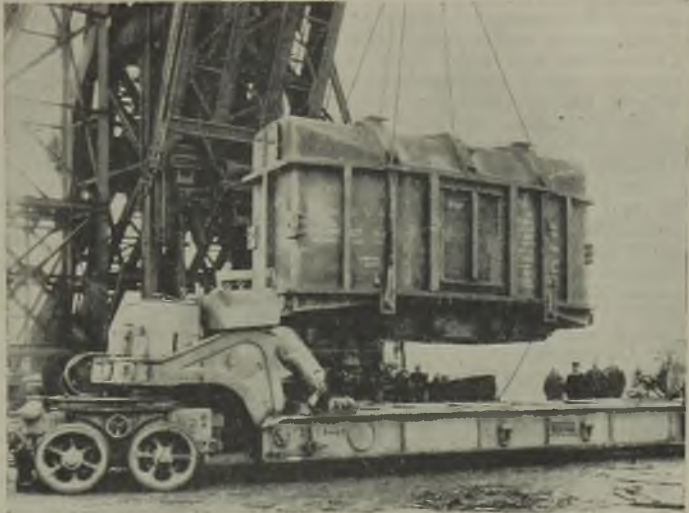
The total weight of the complete transformer bank as installed is a little short of 500 tons, while the installed weight of each single-phase transformer, complete with its oil and coolers, is 164 tons. The windings, core and clamps of each single-phase transformer weigh 76 tons, each high-voltage bushing weighs $1\frac{1}{2}$ tons, and each cooler weighs 11 tons. The efficiency at full load and unity power factor of the transformer bank on test was 99.1 per cent. The no-load exciting current on test was 5.9 per cent. of the rated full-load current. The impedance at the normal tap rated output was 8.9 per cent. When stripped for transport the overall dimensions of each transformer were 23 ft. 4 in. long, 10 ft. 8 in. wide and 30 ft. 7 in. high; the unit weighed 100 tons.

The route between the factory and the port of embarkation was specially surveyed to secure accurate data of road and bridge limitations, and the transformers were transported to a programme prearranged with police and highway authorities. The first and third transformers to leave the factory were each transported on a 100-ton Scammell lorry which was assisted by a steam tractor, while the second one was transported on a 140-ton trailer propelled by two Diesel tractors, one in front and one at the rear. This trailer was only recently commissioned and was at the time of this formidable transportation undertaking the largest and only one of its size. Shipment between the British and Russian ports was made in U.S. "Liberty" ships, one transformer per ship.

Canada's Power Output

Still on Upward Grade

THE Dominion Bureau of Statistics reports that central stations in Canada produced 3,585 million kWh in May, the highest output in any month to date and an increase of 9.4 per cent. on May, 1943. During the first five months of this year production totalled 17,204 million kWh compared with 16,312 million kWh in the corresponding period of last year. The



One of the transformers stripped for transport—a hundred-ton load

figures show that the ratio of Quebec's power production to the total for the Dominion is increasing. During the first five months of the year the province produced nearly 10,030 million kWh, representing 58.3 per cent. of the entire Canadian output. In the corresponding period of last year the proportion was 56.5 per cent. and in 1942 55 per cent.

Toronto Commissioners' Report

In their report for the year 1943 the Toronto Electric Commissioners comment on the effect of the abnormal operating conditions on load factor. For the six years immediately preceding the war the average was 48 per cent., whereas for 1943 the figure was 57 per cent. Thus over a sixth more use is at present being made of available capacity, but these artificial conditions, the Commissioners say, may be expected to disappear when the war ends and a reversion to normal load factor is to be anticipated. In 1943 the Toronto hydro-electric system sold 1,312 million kWh as against 1,321 million in the previous year. Total revenue amounted to \$13,063,476 and the net profit was \$82,494. During the year consumers received a special temporary concession by the halving of the normal charges for one accounting period; in the aggregate this amounted to \$736,000.

Progress in South Africa

Electricity Supply Commission Comes of Age

THE report just received from the South African Electricity Supply Commission marks the coming-of-age of the Commission, which was established on March 1st, 1923. An idea of the present importance of the organisation can be gathered from the fact that at December 31st last its assets amounted to nearly £31,000,000 and its total liabilities were slightly over £24,000,000. The Commission now owns seven main power stations, with a total installed capacity of 872,650 kW of generating plant (including 66,000 kW under construction in the Vaal power station), which will be increased to 1,084,150 kW by plant now on order.

The Commission's licensed area of supply in the four provinces of the Union is now over 34,000 sq. miles and it owns over 2,470 route miles of overhead lines and 100 route miles of underground cables, the total transformer capacity of the systems being more than 1.5 million kVA. Along the 1,229 track miles of electrified railway lines in the Union, the Commission owns fifty-one substations for traction purposes.

The total number of consumers of all classes supplied at December 31st was 12,285. These include the South African Railways and Harbours Administration, many municipalities taking bulk supplies and also the Victoria Falls and Transvaal Power Co., Ltd., which takes the bulk of the output of the Witbank station and the whole output of the Klip station for supply to the gold-mining and other industries along the Reef. The output of the Vaal power station will also be supplied to that company.

Sales Decrease in 1943

During its twenty-one years' existence the Commission has sold more than 35,500 million kWh and in 1942 its sales represented nearly 64 per cent. of the total sales of electricity in the Union. For the first time since 1931 the Commission records a decrease in its total output and sales of electricity. The total kWh generated in 1943 was 4,420,651,109, which was 53,998,145 kWh less than in the previous year. Sales of electricity decreased by 45,218,564 kWh to 4,275,629,854 kWh compared with the sales for 1942. Bulk supplies for mining, etc., totalled 3,257,442,242 kWh (2.03 per cent. dec.) and bulk supplies to municipalities 350,563,136 kWh (9.61 per cent. inc.), while direct supplies for traction amounted to 418,110,549 kWh (1.35 per cent. dec.), mining 53,862,125 kWh (4.31 per cent. inc.), industrial purposes 172,448,134 kWh (3.75 per cent. dec.), and domestic and street

lighting 23,203,668 kWh (8.00 per cent. inc.). Capital expenditure during the year (£1,405,430) brought the total capital expenditure at December 31st to £23,286,754. The expenditure on capital account will amount approximately to £24,600,000 on completion of all works to which the Commission is at present committed. Total revenue for 1943 amounted to £3,189,782, as compared with £3,138,147, while production costs, including interest, redemption and reserve fund charges, totalled £3,185,146 (£3,134,331). The average price per kWh sold was 0.1743d. (0.1697d.), the average revenue per kWh sold (including sundry revenue) was 0.1790d. (0.1743d.) and the average cost per kWh sold was 0.1787d. (0.1741d.).

Extensions Delayed

An additional 25,000-kW turbo-alternator set was placed in commercial operation on July 1st, 1943, and has afforded much needed relief as operating conditions were becoming very difficult. A further 25,000-kW set for this station is now being ordered. The expectations that the new Vaal Power station would be in partial operation towards the end of 1943 did not materialise as certain essential equipment was lost at sea through enemy action and the first set is not expected to be in service until towards the end of 1944. Completion of the Congella power station extensions, which were commenced early in 1939, is still being held up pending replacement of the turbine (also lost at sea last year) of the partially erected 40,000-kV set. An order for a duplicate turbo-generator set is now being placed for a further extension.

In addition to its generating and distributing duties the Commission reports to the Administrators of the several Provinces upon proposals for the institution or extension of municipal electricity schemes, stating whether the Commission can itself furnish a supply with advantage to ratepayers and consumers. While this function is purely advisory, in a number of instances it has been the means of bringing about co-ordination of electricity production and supply, although the widespread character of the towns has limited the scope for co-ordination.

An appendix to the report gives statistics relating to the production and supply of electricity in the whole of the Union in 1941-42. It shows that the total number of consumers was 369,349 (including 311,565 domestic) and the total consumption 6,767.7 million kWh (797 million domestic) of which the Transvaal accounted for 5,321.7 million. 2,560 kWh per domestic consumer was sold.

Heat Dissipation from Substations

By T. D. Oswald, B.Sc.

THE effect of excessive ambient air temperature upon substation equipment has recently come under notice by the resulting acidification of Class A transformer oil. In many cases the restriction of ventilation openings due to black-out fittings has contributed to the overheating.

Part of the heat is removed by conduction through the walls and the roof to the outside atmosphere, being proportional to the difference in temperature between the air inside and outside the building and the area of the exposed surfaces and depending on the thickness and character of the structural materials. The following are typical values in kW per deg. F. per sq. ft. of the heat transmitted through various materials: 12 in. brickwork, 1.0×10^{-4} ; 18 in. brickwork, 0.75×10^{-4} ; 4 in. concrete, 1.6×10^{-4} ; 8 in. concrete, 1.2×10^{-4} ; 1 in. pine door, 1.5×10^{-4} .

The rate of dissipation, in kW per deg. F., may be determined in any particular case,

Calculating Ventilator Areas for Naturally Cooled Buildings

orifice area sq. ft. and $p =$ pressure differential across the opening in lb. per sq. ft. In general there will be a set of inlet openings, total area A_i sq. ft., and a set of outlet openings, total area A_o sq. ft., which may be looked upon as orifices in series. In this case the flow

$$V = C 20.84 \sqrt{p} \frac{1}{\sqrt{1/A_i^2 + 1/A_o^2}}$$

cubic feet per second 2

That is, the equivalent area of a single orifice representing the effect of inlet and outlet openings in series is given by :

$$A = \sqrt{1/A_i^2 + 1/A_o^2} \text{ sq. ft.} \dots\dots\dots 3$$

For an outside temperature of T_1 deg. F. absolute, an inside temperature of T_2 deg. F. absolute and a room height of h ft., the pressure differential may be written $p =$

$$0.08 h \frac{T_2 - T_1}{T_2} \text{ lb. per sq. ft.} \dots\dots\dots 4$$

For small pressure differences the heat dissipated by ventilation, where $S =$ specific heat at constant pressure BthU per deg. F. per cu. ft., is given by $H = SV (T_2 - T_1)$ BthU per sec. 5

$$\text{Combining 1, 4 and 5, } H = 0.114 C \sqrt{hA} (T_2 - T_1)^{3/2} \text{ BthU per sec.}$$

T_2 does not vary sensibly over a normal temperature range and may be taken as 554 deg. F. absolute, corresponding to 35 deg. C.,

Item	kW per deg. F. per sq. ft.	Area, sq. ft.	kW per deg. F.
8-in. concrete roof	1.2×10^{-4}	243	0.0292
14-in. brick wall	0.9×10^{-4}	302	0.0272
1-in. pine door	1.5×10^{-4}	86	0.0129
Total			0.0693

knowing the nature of the material and the respective areas (see table). For this building the heat dissipated by conduction is 0.0693 T kW, where T is the difference in temperature between the air inside and outside the building. With a temperature difference of 35 deg. F. the power dissipated in this way is 2.4 kW.

For all practical purposes the remainder of the heat is removed by ventilation. Cold air drawn in at ventilators placed low in the walls is warmed in the building and leaves via ventilators placed in or near the roof. The heat removed by a given quantity of air is proportional to the temperature rise. With natural ventilation the air flow itself is dependent upon the rise in temperature, which produces the necessary pressure differential. The volume of air flowing through an opening may be estimated by means of the theory of flow through an orifice.

Assuming that the area of the ventilator opening is small compared with the area of the space into which it discharges, the flow may be written: $V = CA 20.84 \sqrt{p}$ cubic feet per second 1, where $C =$ coefficient of discharge, $A =$

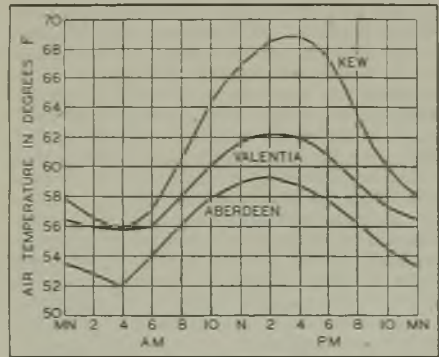


Fig. 1.—Average hourly temperature (July)

the maximum average ambient air temperature for transformers (BSS 171/1936). For buildings housing up to 1,000 kW of plant including transformers C may be taken as 0.88. Using these values the heat dissipated

by ventilation becomes $W = 0.00447 \sqrt{h} A T^{3/2}$ 6
 where h = room height in ft. A = equivalent area of a single orifice in sq. ft. T = temperature difference inside and outside substation in deg. F. W = energy dissipated in kW.

It is suggested that a satisfactory working value for the temperature difference may be

and is the distance above ceiling level of the outlet from the ventilator.

The essential formulæ have been used in drawing up a set of nomograms which simplify the calculations. For example, the figures previously given relate to a transformer room (a), in Fig. 2, 12-ft. high having 4.5-sq. ft. louvres at the bottom of the door with centre lines 2 ft. from the floor. The

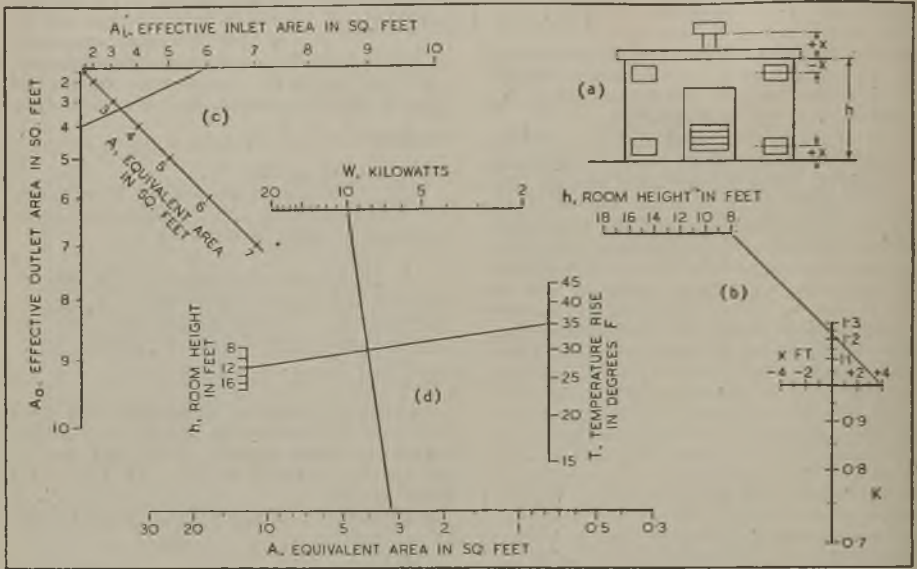


Fig. 2.—Nomograms for substation ventilation calculations

obtained by taking the average ambient air temperature of 35 deg. C. as the inside temperature and consulting the Meteorological Office's statistics of local air temperature for the outside temperature. The graph Fig. 1 shows the average hourly air temperatures for the month of July for three stations in the British Isles. From these 68.7 deg. F. in the south and 59.3 deg. F. in the north may be considered as suitable values leading to differences of 26.3 and 35.7 deg. respectively for summer conditions.

In an actual substation the inlet and outlet areas will be made up of a number of separate openings, not all of which will be situated at the extreme ceiling or floor level as is implied by the use of a single "h" in formula 6. This is best taken into account by converting the measured area of each opening into an effective area before adding them together to obtain A_1 or A_0 .

Effective area = K (measured area), where $K = \sqrt{1 + x/h}$ 7

For outlet and inlet openings in the walls x is negative and is the distance in ft. below the ceiling or above the floor respectively. For outlet, roof-type ventilators x is positive

inlet and outlet openings in the walls are 4.5 sq. ft. with their centre lines 1 ft. from the floor and ceiling respectively. There is one 12-in. dia. roof ventilator with its outlet 2 ft. above the ceiling. The door and wall openings are covered by a fine mesh, reducing their useful area by 25 per cent.

Referring to the nomogram for K , (b) in Fig. 2, a line from the horizontal scale of h to the horizontal scale of x cuts the vertical scale of K at the value corresponding to $\sqrt{1 + x/h}$. The following table is now drawn up:

	Measured area, sq. ft.	x ft.	K	Effective area sq. ft.
Inlet openings				
In walls ..	3.38	-1	.95	3.22
In doors ..	3.00	-2	.91	2.73
Total inlet				5.95 = A_1
Outlet openings				
In walls ..	3.38	-1	.95	3.22
In roof ..	.78	+2	1.08	.84
Total outlet				4.06 = A_0

The effective inlet and outlet areas are now converted into the equivalent area A of a

single orifice having the same resistance to air flow, by means of nomogram (c) in Fig. 2. Setting 5.95 on the horizontal scale of A_1 and 4.06 on the vertical scale of A_0 , a line joining these points intercepts the diagonal scale of A at 3.16 sq. ft., which is the equivalent area required.

Nomogram (d) in Fig. 2 enables the four variables of formula 6 to be handled at one operation. Draw two intersecting lines, truly at right angles, on a piece of tracing paper and place over the nomogram so that one line intersects the vertical scale of h and the vertical scale of T at the selected values. Move the sheet sideways along this

line until the line at right angles intersects the horizontal equivalent area scale at the correct value. With these three values correctly intersected the latter line now cuts the horizontal scale of kW at the kilowatts dissipated by ventilation.

In the example given $h = 12$ ft., $A = 3.16$ sq. ft. and T is taken as 35 deg. F. The power dissipated by ventilation is seen to be 10 kW. Adding this to the heat dissipated by conduction through the walls and roof, the total losses dissipated with a 35 deg. F. difference are 12.4 kW. This figure may not be exceeded if the interior ambient air temperature rise is not to exceed that specified.

Organisations of the Industry—X

Accumulator Makers' Association

WHILE the Accumulator Makers' Association was established in 1912, its roots go back into the nineteenth century. The stationary-battery manufacturing industry was born in 1881 when secondary batteries, invented in 1859, were first brought within the realms of practicability. The manufacturers who formed the Association had all been engaged in the industry from its infancy and were thus able to contribute to the pool of general knowledge experience gained in some thirty years of battery manufacture.



By F. C. Vine,
Secretary

The Association was started because its founders realised that the time had arrived when individualism must be replaced by intelligent and enlightened co-operation. It was to provide a means of ensuring such co-operation and a body in which to vest the requisite authority that the A.M.A., as it is now familiarly known, was brought into being.

Like most similar associations the A.M.A. devoted its earlier activities towards the establishment of a common and equitable selling policy. It stabilised discounts to electrical contractors, engine makers, manufacturers of all kinds of electrical equipment, and indeed, to all classes of buyers. Standard conditions of sale were drawn up. These and a host of similar reforms were introduced and maintained until, in course of time, they became, by long usage, the established custom of the industry.

To give full effect to the stabilised trading conditions, regulation of technical matters was equally necessary and important, as it would have been invidious to impose strict trading conditions without giving, at the same time, obvious reciprocal protection to

the buyer. The A.M.A., therefore, gave close and constant attention to the policy of standardisation.

The rating of plate capacities, final voltages and voltages at intermediate and variable rates of discharge had for long been determined by the research, experiment and practical experience of individual members. These were now standardised. Stationary batteries for all purposes and their components were dealt with as occasion arose until all members, without any sacrifice of the individual characteristics

of their own products, could guarantee to their customers a standard quality of performance, coupled with equal and equitable conditions of purchase. This work was an unconscious anticipation of the excellent work of the B.S.I. which has drawn freely upon A.M.A. experience in the preparation of battery specifications.

In pursuit of objects of purely domestic importance, the A.M.A. inevitably came into close contact with bodies representing other organised trades. It had always co-operated very closely with B.E.A.M.A. and had been represented on its Council for many years. During this long association, negotiations covering almost every phase of commercial activity have been successfully concluded. Both the English and Scottish Contractors' Associations have collaborated with the A.M.A. for many years and are still its loyal allies.

All such collaboration between these Associations concerned with various branches of the electrical industry, undoubtedly prepared the way for the formation of the Electrical Fair Trading Council and the

promulgation of its policy. In accepting that policy, the A.M.A. accepted the principle of autonomous sectional control under one central authority, while the Fair Trading Council endorsed the A.M.A. policy by its inclusion in their own.

Storage batteries are not only articles of general commerce, but are essential components in equipment used by many public services. During the war of 1914-1918, the Government learned the advantage of dealing with organised industry. The various buying departments were quick to perpetuate the close collaboration inaugurated and practised during the war. They have ever since drawn freely upon the manufacturing experience of A.M.A. members for data to prepare and improve their specifications so that the essential conditions of technical efficiency and economy might be met.

If the A.M.A. had done no more than regulate its home trade, it would have accomplished much, but its influence has spread abroad throughout and beyond the Empire. The A.M.A. members and overseas agents have jointly stimulated interest in battery-using equipments, resulting in a considerable increase in export business.

Although the A.M.A. is concerned, as regards standardisation, only with stationary batteries, it now concerns itself with matters of all kinds which affect the accumulator industry as a whole. When the Motor

Traders' Association desired protection for the starter battery trade it was not difficult to apply A.M.A. principles through an appropriate association to that section of the industry and the British Starter Battery Association was formed in 1933 and has since acquired considerable prestige. It was quickly followed by the Portable Accumulator Makers' Association performing a similar service for the radio battery trade.

By pooling experience and co-operating in preventive and curative measures, A.M.A. members have eliminated the dread scourge of lead poisoning from their workpeople. They were not content with mere compliance with statutory requirements, but have gone further and provided ameliorative conditions of labour and facilities for the enjoyment of leisure.

The present war has made many urgent and imperative calls upon the versatility, ingenuity and adaptability of the industry. The storage battery is an integral part of many war appliances, and as these have extended in number, range and scope, the battery has had to be designed or adapted to ensure complete co-ordination of electrical and mechanical effort in infinitely variable conditions of use. The continuous research work of the industry over many years had prepared it for this severe test and enabled it to tackle and solve these technical war problems not only competently, but readily.

Uses of Porous Metal

By J. W. Lennox (Sintered Products, Ltd.)

POROUS metals may have applications in the electrical field which have yet to be discovered. Their increased surface area compared with that of solid material is considerable and their porous nature enables them readily to absorb other substances and liquids.

A wide variety of diffusing, distributing and filtering materials are employed in industry, but it is curious that in this country little use has hitherto been made of porous components made of metal. These new materials have a considerable diversity of applications in engineering as well as the electrical trades and they have already been employed as flame arrestors on flame-proof electrical apparatus, for air filtration, diffusing and distributing high-pressure gases, separating liquids, filtering fuel oil and distributing de-icing fluid.

The alloy used is a 90/10 bronze, but development work is being done with other metals and alloys. The bronze is at present manufactured in the form of sheets up to 8 in. x 4 in. x 5/16 in., discs up to 6 in. in diameter and 1/4 in. thick and also conical capsules up to 2 1/2 in. in diameter. Larger sizes and a wide variety of shapes can readily be produced to meet special requirements. Total porosity can be varied from 10 to approximately 60 per cent. and is uniformly distributed and interconnected. Maximum size of pores can be adjusted to suit circumstances and can vary from 0.00094 in. to about 0.02 in.

The tensile strength of a 50 per cent. porosity fine-pored bronze has been found to be 3.3 tons per sq. in. with an elongation of 3 per cent. Hardness determination is difficult owing to the tendency of the loaded indenter to close up the pores, but as determined by standard methods it is indicated as a Brinell hardness of 20 for a bronze of 50 per cent. porosity. Bend tests with 1/4 in. thick material in various grades of porosity show that the material will form over a 1/4 in. radius to angles of up to 50 deg.

A measure of permeability to various liquids can be obtained from the following:—

Liquid	Porosity, per cent.	Max. pore size	Pressure lb./sq. in.	Flow in pints per min./sq. ft.
Petrol	48	0.005"	0.324	16.78
	38	0.0025"	0.567	9.89
Oil (Shell J. D. 2)	50	0.015"	0.88	8.6

The electrical resistance of copper with 45 per cent. porosity is about the same as that of pure nickel, namely 9 microhms per cm. cube.

Porous bearings that are impregnated with oil, or grease, which is gently released by frictional warmth in service, are already in use. Other applications, utilising the high specific surface of this type of material, may suggest themselves to readers.

Trunk-Road Lighting

Requirements for an Economical Scheme

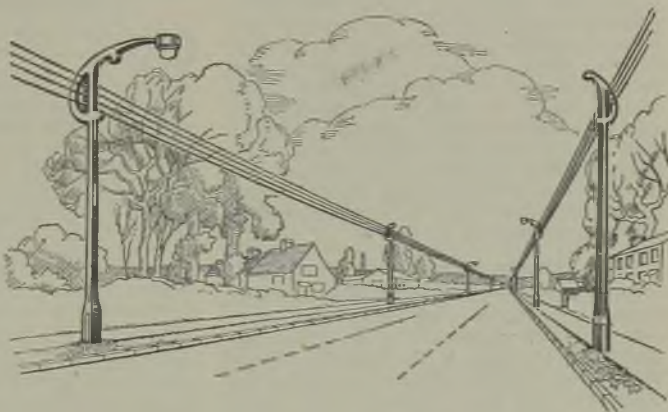
By F. H. Pulvermacher, A.M.I.E.E.

AMONG the schemes for the ordering of the post-war world I have not yet found one dealing with the illumination of our trunk roads in their entirety, as distinct from the portions of them that run through urban areas. The nearest approach to the subject seems to have been at the Association of Public Lighting Engineers' Conference last September, when Mr. E. C. Lennox pointed out that the present policy of competitive street lighting for the least expenditure had prejudiced the lighting of roads between towns, and suggested that the Ministry of Transport should be responsible for both the roadway and its illumination.

Of the 180,500 miles of road in Great Britain, approximately 27,550 are graded as Class 1 and 17,630 as Class 2, the residue being little or never used by through traffic. The cost of maintaining and improving this system amounted to £68,000,000 for 1936-37. County Councils are responsible for all classified roads outside the area of metropolitan and county boroughs, whilst the borough and urban authorities are responsible for those within their areas, excluding county roads. In 1937 the Ministry of Transport assumed control of 4,500 miles of Class 1 roads known as trunk roads and is responsible for their care and improvement. It is the illumination of these that is here considered—the actual mileage involved would probably be about 4,000, since a portion of them run through areas where the amount of night use is insignificant. Also, since a further 25 per cent. is probably already illuminated by the existing lighting authority, as distinct from the highway authority, the final mileage may be taken as 3,000. To prepare a competent scheme for the lighting of such an expanse of roadway would require very detailed work, consequently only tentative suggestions can be advanced.

The Report of the Ministry of Transport's Departmental Committee on Street Lighting (1937) recommended that an average spacing

of 150 ft. should not be exceeded between lamps on main roads with a maximum of 180 ft., the spacing closing up on corners. On this basis a total of approximately 105,000 standards would be required for the lighting of our main roads in their passage from town to town. It will be generally agreed that the lamp itself should be of either the mercury- or sodium-vapour type, the choice probably depending to a large extent upon the personal preference of those responsible for the distinctive colouring of either of the two systems. Whichever method is adopted it should be adhered to throughout the length of the road under review, preferably for a whole region. This



Suggested four-wire system of trunk-road lighting

condition should apply also to the equipment in both type and design so that the present plethora of different patterns might be avoided.

The lantern will, of course, be of the directive type, although I am of the opinion that fittings with a sharp cut-off are not so suited for open roads, since their tunnel effect suggests built-up areas, whereas the illumination of trees and the like gives a form of beacon lighting visible from a distance, which is helpful in view of the relative high speeds of vehicles using the roads. The siting of the lantern would conform with that given in the Ministry of Transport's Report, *i.e.*, a mounting height of 25 ft. and an overhang from the kerb not exceeding 6 ft., with the lamps staggered along the route except on bends and corners, where they should be placed on the outer

perimeter of the bend. Where the road has dual carriageways, each way is treated separately, but a post with two arms, one for each track, can be utilised, though where the dividing strip is narrow a single lamp for both ways will serve.

Distribution calls for special consideration, since by far the greater portion of the trunk roads will be devoid of low-voltage mains. Since the distributor would be purely for public lighting, no limits are imposed by sharing the conductors with other classes of consumers or by having an extra conductor of small dimensions, and a three-phase, four-wire system can be fully utilised. Assuming a spacing of 150 ft., 400-W mercury-vapour lamps and a 0.06 sq. in. four-wire distributor, then, since lamps on the same side of the road are spaced at 300 ft. and as only every third lamp is connected to any one conductor, the distance from the point of supply will be two miles before the volt drop exceeds 21, which can be compensated for by suitable grading of lamps along the route. As the feed at the point of supply is from both ends, such points would require spacing at distances of not less than four miles, the load at each point being 60 kW. These feeding points could probably be adjusted to coincide with existing points of 400-V supplies to villages and the like along the major portion of the road, although in some cases, such as over the Cheviots, a high-voltage feeder running parallel with the road and supplying special substations would be necessary.

Overhead Supply System

From an economic standpoint an overhead system is preferable, especially since every other point of suspension of the conductors could be embodied in the lighting column itself. This method entails correlating the design of the lamp standard and intermediate support, the means of attachment of the conductors to the lamp column being an integral part of the design and not an apparent afterthought. Such a layout is shown in the accompanying sketch. Should concrete columns be used, all metal attachments must be rustproof.

Regarding costs, the only figures extant are those of five years ago, and these certainly bear no relation to what will be the post-war price. Assuming, however, a figure of £25 for each lamp complete with auxiliaries, then, for the 105,000 envisaged, we get an expenditure of £2,500,000 in round figures. For 6,000 miles of distributor along the 3,000 miles of road the cost would be, at £500 per mile, £3,000,000, making a total capital cost of £5,500,000. Assuming 400-W lamps with dusk-dawn lighting, an annual consumption of 175,000,000 kWh is arrived at, which at a flat rate of 1d. per kWh amounts to over £700,000 per annum. Lamp renewals

would come to about another £400,000, whilst labour would be some £300,000, making the total annual running cost over £1,400,000. Adding interest and sinking fund charges, possibly another £400,000, the total cost of lighting trunk roads would approach £2,000,000 each year.

This expenditure, though seemingly large, would show at least as good a return in its way, by making possible safer and faster driving, as the £68,000,000 spent on maintaining the trunk roads in 1936-37. The number of accidents at night should be materially reduced, and on a cash basis alone this saving would go far towards meeting the cost. There would also be the advantages of quicker deliveries, less fatigue of personnel and the facilitating of night travel, as one would have an ever constant indication as to whether one was on a main road or not. The carrying out of such a plan would also provide employment after the war.

Eastbourne's Plans

CONTEMPLATED post-war plans for the Eastbourne undertaking outlined in a report by Mr. N. Boydell, borough electrical engineer, include the establishment of new offices and showrooms (£87,000); extension of Cavendish Bridge depot (£17,000); removal of transformers to new site (£1,000); a second switch house (£7,000 for buildings only); ring mains between Pevensy Bay and Eastbourne and between the East Dean, Friston, Jevington areas and the Wannock, Lower Willingdon areas (£7,600); enlargement of substations (£6,150); centralised remote control of street lighting, etc. (£25,000); street lighting extensions (£7,000); and parade lighting improvements, including changing colour floodlighting. The institution of an attractive scheme is visualised for the hire-purchase of cookers, water heaters, washing machines and wash-boilers as an alternative to or substitute for the present simple hire system. It is estimated that £48,000 will be spent on apparatus for this purpose in the first five post-war years.

In addition, it is anticipated that £16,000 will be spent in the same period on free wiring for domestic premises and £3,400 on the assisted wiring (lighting) scheme. Replacement of old meters will cost £15,000 and new meters from £3,000 to £3,850 a year.

Replying to the Electricity Commissioners' questionnaire, Mr. Boydell puts the total revenue expenditure for the first five post-war years at £83,000 and capital expenditure at £355,700. If compulsory standardisation were introduced the cost to Eastbourne would be £150,000 for standardising voltage only or £500,000 for standardising the system including voltage. Most of the distribution system is at present single-phase, 200 V.

Blackpool Street Lighting. — Following the successful introduction of the "moonlight" street lighting system at Liverpool, the Emergency Committee has instructed the town clerk to prepare a report with costs and suggestions as to the best system to operate in Blackpool.

CORRESPONDENCE

*Letters should bear the writers' names and addresses, not necessarily for publication.
Responsibility cannot be accepted for correspondents' opinions.*

Control Systems

SINCE Mr. Daines in his article in your issue of August 4th on relays *versus* time switch control, seems to feel that he has a mission to the industry, then my company in continuance of its forty-year old policy of trying to present true argument only, would like to help him, and anybody who might be interested in his story, to get the facts a little clearer.

First, there is the boggy of flexibility of control. What does it amount to and how can it be applied? Do supply authorities really set out to sell electricity to consumers on the basis that at uncertain and unspecified times it may be inconvenient to give a supply and that at such times, of which no due notice will be given, they propose to utilise a flexible relay to switch them off? On what basis would the shift engineer decide which particular range of presumably tuned relays he was going to pull off or would he just adopt the simpler expedient of cutting them all off? If it is not so much a question of remote cutting off as one of switching over to a high rate meter, I cannot conceive a contract which would fail to state the times at which this high or, conversely, low rate would apply. No, I prefer to go on believing that the supply authority does know to within reasonable commercial limits what are and what are not its normal peak periods. The time factor is fundamental and flexibility does not come into prominence at all.

Floodlighting, shop window lighting, street lighting, these also are basically linked to a previously calculable time-table and in the case of a street lighting contract, this does most often form the basis of the supply authority's quotation to the lighting authority. Where does flexibility come in here? Is it for switching off and, if so, under what conditions would this unexpectedly be required? The only answer which readily occurs to me is in the case of war, but I am not aware that any considerable relaxation of street lighting regulations is allowed in the few cases where this flexibility exists during the present war and it would be a rash man who attempted to prophesy the conditions of any future war. Is greater flexibility required than that provided by a solar dial fitted to a time switch? If so, under what conditions; a thick fog or an overcast late afternoon? What engineer faced with the incidence of industrial and domestic load overlapping on these occasions, wants another one thousand or five thousand

100-W lamps slapped on to his peak and, once again, what would be the basis of contract for such irregular lighting supply where the supply authority was not the lighting authority? Is flexibility necessary to adequate thermal storage water heating in excess of that provided by a time switch-cum-thermostat control?

Mr. Daines suggests that three switching operations a day present difficulties to a time switch. That may have been true of some once upon a time; there are at least 15,000, I believe, in New Zealand alone that have got along pretty well for many years now. He further suggests that much potential revenue might be lost in winter without this flexibility but I do not believe this is so. If an installation is properly designed for its purpose, it should not use more and could not use less, if the installation were to be efficient and it should not be installed if it were not.

Now let us examine the pros and cons which Mr. Daines puts forward. His first point is size—4½ in. by 8½ in. by 4⅞ in. (? weatherproof box) for a 5-A size relay. If small physical dimensions are claimed by him as an advantage, then a 10-A solar-dialled synchronous motor-driven time switch meets this point with its dimensions of 3½ in. by 4⅞ in. by 3⅞ in. (excluding external fixing lugs if required). His next point is price. He does not make it quite clear whether his figure of £3 15s. is a pre-war figure and gross or net. He also forgets to add in the cost of the transmitter or controlling plant at the station end. But, in any case, the time switch referred to above, either pre-war, post-war, gross or net, wins comfortably.

And does Mr. Daines seriously suggest that existing distributors—off which a very great deal of street lighting is tapped—can be disinterred, switch wires added, and reinstated at 1s. per yard; or is he only interested in confining his system to brand new self-contained non-extending networks and, therefore, inclined to leave the more difficult conditions of existing networks to time switches, since they can manage them so easily?

As for that relay he envisages with no moving parts and exclusive non-corrosive metal content, non-lubricated bearings and a complete oblivion to dirt and atmospheric conditions, well I would certainly give him best if that were the case. But one should be careful about maintenance claims; theoretical conjecture being one thing and practice another. It is a fact, of course, that very

often the major cost of cleaning and adjusting a contact is in sending out to fetch it in, which would be common to both arrangements. What else is there of a regular nature of which Mr. Daines knows? Furthermore, I should imagine that with all this flexible popping in and out which Mr. Daines enjoys so much, I should almost expect his apparatus to be a worse sufferer in that respect than a time switch.

Another point in Mr. Daines' confusion is his reference to electrically-wound time switches having a continuous rating of 2 W giving a total on a 1,000-switch installation of 17,520 kWh per annum. Actually the winding consumption occurs three times per day only, totalling approximately 6 Wh or, on a 1,000 switch installation, 2,190 kWh per annum. Quite different! Perhaps he means synchronous motor-driven switches and not electrically-wound clocks. If so, he should not be misleading. In that case, he is more nearly right in his computation but, as I have already pointed out, there are other financial advantages, particularly on capital cost, easily outweighing the cost of 15,000 or so street lighting units which, in fairness, must be conceded to the time switch credit side.

No, Mr. Daines, there may one day be something that has all-round advantages over time switches—progress is inevitable and desirable if it is progress—but change should be the result of something more tangible than wishful thinking.

New Malden, Surrey. **LESLIE C. SHARP,**
Sales Director,
Venner Time Switches, Ltd.

IN his article entitled "Control Systems" in the *Electrical Review* of August 4th Mr. S. A. Daines covered the subject of "Rythmatic" control, its cost compared with time switches and certain applications. But he omitted to point out the initial cost of the motor-generator and central control gear which, if proportioned to each individual relay, will increase the cost above £3 15s. There is also the question of the appreciable floor space occupied by the motor-generator and ancillary apparatus. The relay can be housed in the base of the lamp standard but, even with a large door opening of 20 in. by 6 in., it will be a tight squeeze when the installation is for gaseous discharge lighting.

The switching operation of a street lamp is usually simple, consisting of one "on" and one "off" in 24 hours and such simplicity might not warrant the installation of a centrally controlled system. However, such an arrangement as the "Rythmatic" permits the control of several types of load and street lighting is one of its applications.

The popularising of this method of load control will make many undertakers ambitious to use it to lower the "peak." In

practice that application will not be as simple as enthusiasts imagine. The chief trouble will occur in recognising a "peak": certain loads may be switched off on a dark and cold day, or use may be made of an alarm in a maximum demand indicator, or the routine of switching off during certain hours for the winter days may be adopted. The chief care is to ensure that there shall not be any noticeable decrease in service to the consumer.

Despite the criticisms I have made of Mr. Daines' article, I am in favour of centrally controlled superimposed signalling currents, as I think there are several important directions of application within the supply industry, and, now that the main technical difficulties appear to have been overcome, there should be a ready sale for those systems that have flexibility of operation.

Newton-le-Willows, Lancs. **J. C. BEARD.**

An Odious Comparison?

READING through the description of the Cambridge kitchen which appeared in your issue of August 11th, I note that Poplar receives a share of publicity of a discrediting nature, and consequently am prompted to pen these few words of protest and enlightenment for your readers.

The idea of the Poplar kitchen was conceived in the dark days of the London "blitz," and has been humorously referred to as the "Blitz Baby." It appears that in an effort to break into the headlines, the Cambridge Company has "snatched" this particular baby, changed its dress, rechristened it the "Cambridge Kitchen," acclaims it to be its progeny and boosts it as its prodigy. Why was it thought good publicity to invite comparison between the "Poplar" and "Cambridge" units by erecting a "Poplar" unit as well? Why take this trouble to compare the cygnet with the swan?

I am amazed that, knowing the acute shortage of material and labour, the Cambridge Company should have asked the manufacturers of the "Poplar" unit to supply them with a hand-made and admittedly roughly finished example for exhibition purposes. Cambridge must be extremely fortunate in having the time, material and redundant labour to produce a kitchen which by strange coincidence incorporates the fundamental characteristics of design associated with the "Poplar" kitchen. Would it not have been more in keeping with the cultural finesse one associates with Cambridge if the true purpose of the exhibition had been revealed to the manufacturers, thereby permitting a "Poplar" unit to be constructed worthy of comparison with any existing prototype?

Why is it that the Cambridge Company is claiming the advantage of cheaper production

when at this stage of development all costing can only be hypothetical? What justification is there of this claim to cheapness? Let us diagnose the Cambridge combination: it is made in six parts, three of which are the products of manufacturers and available to all; these are the combined washing machine, Hotpoint sink and water-heater unit; English Electric cooker; and Prestcold refrigerator. The remaining three units are storage spaces. The hypothetical cost of these would be £35, £10, £10 and £15 respectively, a total of £70. Add to this sum the cost of fan, clock, Unity heaters, lighting fittings, erection on site, electrical installation, company charges, and the final cost is at least £100. Readers of the technical and national Press will compare this most unfavourably with the hypothetical cost of the "Poplar" unit.

However, it is not my intention to start a "slanging match" regarding the relative merits of the two conceptions of kitchen design; all domestic development should have one common purpose—the betterment of conditions for the post-war consumer, and not for the aggrandisement of any particular person, undertaking or company promoting such development. It was for the benefit of the poorer type of consumer that I first introduced the "Poplar" kitchen, with its inherent characteristics of unit construction, ventilation, table-height appliances, etc. That was as far back as May, 1943. Hence my feeling of irritation is excusable when others introduce premature comparisons, although "Imitation is the sincerest form of flattery."

Poplar, E.14.

R. ILLINGWORTH,
*Borough Electrical Engineer
and General Manager.*

Consumers' Service Arrangements

VARIOUS ideas are being put forward regarding installations in post-war houses. May I suggest a standard main switch which would fit the supply authority's service board neatly, and enclose all cables. It could be a compact double-pole switch with earth leakage trip, enclosing an earth terminal, common neutral terminal, and the following fuses which would serve the demands of the type of house intended:—Two 30-A (one for cooker and one for water heating); two 30-A for two heating circuits; and two 10-A for lighting and 5-A plugs, on two circuits.

It is intended the consumer's main earth terminal should be at the main switch, wired direct. Plug points could be provided with outlets for both 15-A and 5-A combined. They could be made compact and with special protected contacts not needing switches (another type would lead to complications).

Four-core cable could be used for these:—One common neutral (7/·029), one heating (7/·029), one earth wire (7/·029) and one for

5-A plug (3/·029). Lighting would be provided for as usual. There would be special junction boxes for looping.

An understood standard supply service board and consumer's main, enclosing all cables, would be neat and sufficient for cooking or water heating demands. A neat label would remind consumers that it supplied cooker and water heaters as required.

Tingley, nr. Wakefield. NORMAN GREEN.

"Universal" Farm Motors

IN the issue of the *Electrical Review* dated August 11th (page 185), I note the query appearing below one of the photographs "Has the Continental-type 'universal' motor found a counterpart in this country?" I should have thought that this question need not have been asked. My company has for years manufactured electric tools with "universal" motors up to 1 HP., and the mincing machine appearing in your illustration does in fact seem to be driven by an electric drilling machine adapted for the purpose. There are surely a number of firms in this country producing geared universal motors in a wide range of sizes.

But apart from all this, and to consider the needs of the farmer and the agricultural producer, is not the main trouble the small number of agricultural establishments that have electricity "on tap"? What is being done to ensure that about 85 per cent. of the farms in the British Isles do have electricity available? You may be sure that the British manufacturer will go all out to encourage the demand, and to meet it, once the arrangements are made to reduce the mesh of our present network of electricity supply so that all farms can be caught in the net.

There really should be no need for farmers to convert electric drills for driving their odd bits of mechanical equipment!

London, W.5.

H. RICHARDS,
Managing Director.
S. Wolf & Co., Ltd.

[The word "universal" was used in the sense that the motor was applicable to all sorts of jobs. We think that the writer's "universal" refers to the usability of the tool motors on either AC or DC.—Editors, *Electrical Review.*]

Admission to I.E.E. Meetings

THE Council of the Institution of Electrical Engineers has decided to continue for the coming session the scheme for making the technical meetings of the Institution accessible to non-members, who on payment of a fee of 10s. will receive notices of meetings and invitation cards. The possession of invitation cards will not confer upon holders any status within the framework of the Institution, nor will they have the right to join in the discussions without special permission from the chair. Those interested should apply to the Secretary of the Institution for further details and form of application.

PERSONAL and SOCIAL

News of Men and Women of the Industry

Mr. R. J. Morris, a director of Edison Swan Cables, Ltd., has been elected a director of the Edison Swan Electric Co., Ltd., and **Mr. G. A. Cheetham**, managing director of Ferguson Pailin, Ltd., is joining the boards of the Edison Swan Electric Co., Ltd., and Edison Swan Cables, Ltd.

Mr. W. A. Roy, superintendent of one of the outlying factories of the Metropolitan-Vickers Electrical Co., Ltd., has recently been elected chairman for the 1944-5 session of the Manchester branch of the Institute of Welding. Mr. Roy has been on the committee of the branch for the last seven years and was vice-chairman last year.

Sir Oliver Simmonds, M.P., has just returned from Australia which, as head of the Simmonds group of companies, he has been visiting at the request of the Commonwealth Government.

Alderman A. Sturgess has been appointed a member of the Negotiating Committee of the National Joint Board of Employers and Members of Staff (Electricity Supply Industry) in place of the late Councillor Cassels. This committee handles all the detail work such as investigations, disputes, etc.

Mr. H. E. Cordell, chief engineer to the Manchester Corporation Transport Department, is retiring at the end of this month. He will be succeeded by **Mr. F. Y. Frazer**. **Mr. G. L. Atkinson** will become rolling stock superintendent, and **Mr. W. Frith** and **Mr. W. Cordingley** works superintendent and assistant works superintendent respectively.

Mr. N. J. Young has received presentations from the staffs of both the transport and electricity undertakings of the Newport Corporation on his retirement from the general managership. He served with the Corporation for thirty-two years.

For the third successive year, good weather conditions attended the "Holiday-at-Home" programme which was organised for the English Electric Company's employees at the Bradford Works, during the annual shut-down week, July 19th to August 7th. Once again the organising committee, comprising members of the works and staff, provided a varied and interesting programme which catered for all tastes ranging from boxing and wrestling contests to sheep dog trials and a baby show. Sports and many other items were arranged for the children and to give a "seaside atmosphere" to the company's Phoenix Park sports ground, a sand beach with paddling pool was constructed. In addition there were the ever popular donkey rides, roundabouts, etc.

So successful was the programme that on at least two days upwards of 5,000 people were

present on the ground, and the festivities concluded with a grand gala dance in the club ballroom on Bank-Holiday Monday. The whole of the arrangements were supervised by the stewards and members of the organising executive committee, under the chairmanship of **Mr. H. L. Firth**.

Mr. E. T. Norris, chief designer to Ferranti, Ltd., is to speak on "The Moving-Coil Voltage Regulator" at the opening meeting of the session of the Women's Engineering Society. This will take place on September 5th at the Engineers' Club, Manchester (6.30 p.m.).

Stirling Town Council is advertising for an electrical engineer to succeed **Mr. W. R. Murray**, who has just retired. It was stated at a recent Council meeting that the salary would be £537 per annum on appointment, £584 in the second year of service, and £632 thereafter.

We regret to hear that on medical advice **Mr. E. F. Holland**, M.I.E.E., engineer and general manager of the Hutt Valley Power Board, New Zealand, is resigning. He will, however, continue to act as consultant to his successor, for whom the Board will shortly advertise in various parts of the world. During the last fifteen years the number of consumers served by the undertaking has risen from 8,247 to 18,137, the kWh sold annually from 10.7 to 75.6 million and the total revenue from £74,552 to £220,379. At the same time the revenue per kWh sold has declined by 57.9 per cent to 0.699d.

Mr. Felix Sharpe, chief engineer and manager in India to Merz & McLellan, tells us that he is in England "for a three weeks' hectic visit" in connection with some of the extensive work which his firm has in hand in India. He does not expect to have time to look up all of his many friends here. Mr. Sharpe has sent us an account (dealt with on another page) of an All-India Technical Conference on Post-War Electrical Development held early this year.

Mr. Denis M. Robinson, B.Sc.(Eng.), Ph.D., was recently appointed to the chair of electrical engineering at the University of Birmingham.

In recognition of her presidency of Blackburn Branch of the Electrical Association for Women since its inception nine years ago, **Mrs. R. H. Herral** was presented on August 17th with a case of silver teaspoons. The ceremony was at a party held in aid of the comforts fund. The gift was handed over by **Mrs. H. Seymour**.

After forty-six years' service, **Mr. Mark Ormston**, superintendent of telegraphs, Post Office, Newcastle-on-Tyne, is retiring at the end of this month. He was appointed superintendent two years ago.

Mr. James B. Hayes, general manager of the Nova Scotia Light & Power Co. since 1929, was elected president of the Canadian Electrical Association at the annual meeting held recently at Murray Bay, Quebec.

Dr. Edwin Gregory, M.Sc., has been appointed chief metallurgist to Edgar Allen & Co., Ltd., in succession to the late **Mr. S. J. Hewitt**.



Mr. W. A. Roy

Dr. Gregory spent twelve years with Kayser Ellison & Co., Ltd., during which he had complete charge of a battery of electric furnaces. Health compelled him to resign this appointment, but on recovery he became a member of the permanent staff of the Metallurgical Department of Sheffield University in 1921.

The Electrical Power Engineers' Association is advertising for a technical editor and director of studies (commencing salary £600) in succession to Mr. J. W. Thomas, who was recently appointed secretary of the British Engineers' Association.

Obituary

Mr. H. J. Duncan, chief engineer of the General Electric Co., Ltd., for Ireland, died recently at the Royal Victoria Hospital, Belfast. He went to Northern Ireland about twenty years ago.

Mr. J. H. Headley.—We regret to record the death on August 10th of Mr. J. H. Headley, who retired in 1938, after being in the service of Electromotors, Ltd., and (after the amalgamation) Laurence, Scott and Electromotors, Ltd., for thirty-five years. He had been in the electrical industry for nearly fifty years at

the time of his retirement, and was well known in the London area.

Mr. Charles Henry Johnson, managing director of Dent & Co. and Johnson, Ltd., has died while on holiday in the north of Scotland. Before the last war he was with Kelvin, Bottomley and Baird, Ltd., Glasgow, and subsequently, when E. Dent & Co., Ltd. opened premises in Linwood, he became associated with that firm. He was actively engaged in research work, particularly in connection with a type of meter for assessing the horse power of turbine engines and was also associated with the earlier development of wireless equipment.

Mr. Henry W. Lee, a director of the Chloride Electrical Storage Co., Ltd., died recently at Tunbridge Wells at the age of sixty-five. He was also chairman of the Superheater Co., Ltd., and until a year or so ago managing director of J. Stone & Co., Ltd.

Mr. N. B. Dickson.—The *A.E.I. News* reports the death, on July 5th, of Mr. Norman B. Dickson, O.B.E., M.Inst.C.E., who had been a director of Associated Electrical Industries, Ltd., and its predecessors since 1910. He had had considerable railway experience and was a director of a number of other companies.

Indian Power Requirements

Proposed Technical Board

AN All-India Technical Conference on Post-War Electrical Development was held in Calcutta in January last, and brief particulars about it have been sent us by Mr. F. H. Sharpe. The conference, the first of its kind in India, reviewed India's power requirements as a co-ordinated whole. The extent of the heavy plant and equipment required by India in the period immediately after the war was exhaustively surveyed, together with a large number of potential developments many of which were considered ripe for early investigation and the preparation of definite plans. The conference demonstrated the value of drawing upon the regional knowledge of experienced engineers from different parts of India.

In addition to comprehensive details of India's heavy power plant requirements immediately after the war, the conference has presented a number of recommendations to the Government of India setting out the measures considered to be desirable in the immediate future to deal with the large amount of technical work involved in implementing power schemes. In addition to reviewing the electric power developments, both planned and potential, the conference gave consideration to the closely allied problems of siting heavy power consuming industries, rural electrification, power irrigation, synthetic fertiliser production, and the electrification of railways.

Special attention was given to the regional aspect of certain desirable power schemes where development might be affected by the existence of inter-Provincial and State boundaries. Schemes were reviewed for the provision of facilities for the specialised training of Indian power engineers overseas in order to ensure

that Indians of adequate technical ability should be available to play their part in the direction of the national development of the electric power resources.

The desirability of standardising voltages, systems and power practice was considered and specific recommendations were made to deal with certain cases of projected schemes in which divergencies from desirable standards were contemplated. The conference endorsed plans now in hand for the establishment of a national high-voltage engineering laboratory and made recommendations for the inclusion of certain equipment to facilitate the design of large transmission systems. Proposals were put forward for the formation of a Technical Power Board to deal with planning and technical matters generally.

The following delegates attended the conference, which was presided over by Mr. H. M. Mathews, M.I.E.E., electrical commissioner with the Government of India: Lt.-Col. R. L. Evans, A.M.I.E.E., deputy electrical commissioner, Govt. of India; Mr. T. S. Rao, A.M.I.E.E., director of power expansion, Government of India; Mr. P. B. Advani, M.Sc., Tech., director of industries, Government of Bombay; Sir Henry Howard, M.I.E.E., M.Inst.C.E., Madras Government Electricity Department; Mr. N. N. Iengar, chief electrical engineer, Tata Hydro-Electric Agencies, Ltd.; Mr. F. N. Mowdawalla, M.A., Bombay; Mr. F. H. Sharpe, B.Sc., M.I.E.E., chief engineer and manager (India), Merz & McLellan; Flt.-Lt. Sir William Stampe, C.I.E., irrigation adviser, Government of India; and Mr. N. Thornton, M.I.E.E., deputy chief engineer, Electricity Branch, Government of Punjab P.W.D.

COMMERCE and INDUSTRY

Another Model Kitchen. Scottish All-Electric Houses.

American Water Heater Production

IT is reported by the *Electrical World* that the U. S. War Production Board recently approved the manufacture of electric water heaters for civilian use at an annual rate not to exceed 37 per cent. of the total manufactured during the year ended June 30th, 1941. Production will be confined to those plants and materials which can be diverted without prejudicing the war programme; it will be additional to manufacture for war or export purposes.

Only three sizes, and one model per size, are to be made. The W.P.B. has approved the use of metal for heater jackets rather than paper, which has been found less efficient.

West Bromwich Model Kitchen

To invite criticisms and suggestions an experimental all-electric kitchen is now being exhibited in one of the showroom windows of the West Bromwich Electricity Department. The kitchen has been arranged so that a clear



Experimental kitchen at West Bromwich

view of the interior is obtained (through what would in practice be the window of the kitchen itself) from the street. It is composed of four separate units: Sink and washer; cooker and refrigerator; a drying and ironing unit; and a spare cupboard for vacuum cleaner, brooms, etc. Each unit occupies one wall. The sink unit is under the window, and the spare cupboard unit is placed on the wall between the two doors. All the units are raised on a low plinth to enable the floor to be washed easily and to prevent cleaning water entering the cupboards. Lighting is provided by a mercury discharge lamp with additional tubular lighting over the cooker hotplates and dining room hatch.

Between the two sinks provided is a motor-driven wringer which, when not in use, is pushed down out of sight by means of a small knob. Heating units at the base of the washing machine

bring the water from the hot water system up to boiling point. The oven and refrigerator (4 cu. ft.) are situated on opposite sides of an alcove inside which are the hotplates, a grill boiler and an extensible table. At the back of the alcove is a hatch to the dining room. A hot water cylinder is provided in the cupboards overhead, a clock and loud-speaker being situated in the centre of the unit. The cooker oven, which has a drop-down door, is thermostatically controlled and in the final design it is hoped to incorporate a time switch.

The drying cupboard provides ample space for drying clothes indoors, heated air from a motor-driven fan being admitted; an exhaust vent is situated at the top. On the other side of this unit are the ironing board and iron plug and folding table.

Manchester Research Council

The Vice-Chancellor of the Manchester University (Sir John Stopford, M.D.), and the President of the Manchester Chamber of Commerce (Mr. A. H. S. Hinchcliffe) have announced the names of the members of the Manchester Joint Research Council which the University and the Chamber are setting up. The University representatives include the Vice-Chancellor, Sir Ernest Simon, Dr. Willis Jackson (Professor of Electrical Engineering), Professor P. M. S. Blackett (Physics), Professor D. R. Hartree (Theoretical Physics), Professor M. Polanyi (Physical Chemistry) and Professor F. C. Thompson (Metallurgy). Among the Chamber of Commerce representatives are Dr. A. P. M. Fleming (Metropolitan - Vickers) and Mr. L. E. Mather (Mather & Platt).

The first meeting is to be held at the Manchester University on Oct. 9th. Thereafter the Council will meet quarterly. At the first meeting various constitutional matters will be settled, the first chairman will be elected and other members will be co-opted. Proposals will be tabled to ensure close liaison with the British Cotton Industry Research Association and the Department of Scientific and Industrial Research. The establishment of an information bureau will also be considered.

Exhibition of Non-Ferrous Products

Richard Johnson & Nephew, Ltd., in conjunction with the Works Relations Department of the Ministry of Supply, recently staged a four-day exhibition for the interest and information of their employees, emphasising the importance of their non-ferrous products to the war effort. Many of the company's customers

co-operated, among them the Barber Switch-gear Co. (knife switch); John Faulkner & Sons, Ltd. (lightning conductor); Lancashire Electric Power Co. (solid copper line wire after twenty-five years' service); Manchester Corporation Transport Department (trolley-bus junction, etc.); Mersey Cable Works, Ltd. (cables); Metropolitan-Vickers Electrical Co., Ltd. (coils); Phoenix Telephone and Electric Works, Ltd. (telephone tinsel conductor); Post Office Engineering Department (telegraph pole, together with cables); Standard Telephones and Cables, Ltd. (cables); Siemens Electric Lamps & Supplies, Ltd. (lamps); Submarine Cables, Ltd. (copper taped submarine cable); Bertram Thomas, Ltd. (motor starting switch and magnetic blow-out fuse carrier); Richard Whiffen (tray insulator for internal isolation switch).

The Ministry of Supply made available, in addition to several photographs, a variety of radio sets (field, headquarters and bomber), shells and an electrically heated flying suit. Films shown included one illustrating the conversion of blister copper to finished cable.

Lamp Specification

For some time past B.S. 161-1940, which deals with tungsten-filament lamps for general service, has been out of print. The specification has now been reprinted and copies are obtainable for 2s. post free from the British Standards Institution, 28, Victoria Street, London, S.W.1.

National Certificates in Metallurgy

It had been expected that the scheme for National Certificates in Metallurgy in which the Iron and Steel Institute, the Institution of Mining and Metallurgy and the Institute of Metals are co-operating with the Board of Education would be launched in time to allow colleges and schools to start their courses in the academic year beginning September, 1944. This has, unfortunately, proved impracticable, and the scheme is to come into operation so that courses will begin in September, 1945, and the first examinations will be held in 1946 for the Ordinary Certificate.

Scottish All-Electric Houses

Mr. Joseph Westwood, Joint Under-Secretary of State for Scotland recently opened a block of seven "Duplex" houses at Clydebank, a notable feature of which is that they are all-electric. At the opening ceremony it was mentioned that these two-storey dwellings could be erected in eight weeks at a cost of about £650 each. Each floor comprises a living room, two bedrooms and a bathroom; by removing partitions and rearranging the interior each house can be made suitable for a larger family in a few days.

The equipment includes an electric cooker, a water heater and radiators in the bedrooms and a generous supply of outlets is provided for the use of portable appliances.

In the course of a report of the function the *Clydebank Press* says:—"Several local authorities in the country are now inclined towards the view that all domestic requirements—lighting, heating and cooking—can be met as cheaply and efficiently by electricity as by any other means. The advice of the Scottish Advisory Committee on Housing is that there

can be little doubt that electrical cooking has advantages from the point of view of cleanliness over any other form, and that they have found that electric stoves are very popular with working-class tenants."

It may be said that the Burgh Council has already approved three sites for 1,700 houses and a site for a further 500 is under consideration. The Burgh's total housing needs are put at 8,235. Clydebank suffered badly during the earlier air raids.

Iron and Steel Control

The Minister of Supply has made the Control of Iron and Steel (No. 35) Order, 1944 (S.R. & O. 1944, No. 909, Stationery Office, 1d.), which came into force on August 15th. This alters the existing Control of Iron and Steel Orders, the principal alterations being:— (1) the distribution scheme has been amended, (a) with regard to springs, to control only the iron and steel for their manufacture, and not the acquisition and disposal of finished springs, and (b) to free the acquisition and disposal of used wire netting from licence or authorisation; (2) the maximum prices for iron castings and for manufactured iron (wrought iron) are increased; (3) maximum prices are imposed for the first time on certain types of cold drawn tubes; and (4) the control of merchants' (including stockholding merchants') selling prices is extended to include a number of products not hitherto price controlled for sales by merchants, and by fixing margins which may be added by merchants other than stockholding merchants. A number of related price schedules are replaced by new schedules.

New Bolts and Nuts Order

The Minister of Supply has made the Control of Bolts, Nuts, Screws, Studs, Washers and Rivets (No. 5) Order, 1944 (S.R. & O. 1944 No. 910, Stationery Office, 1d.), which came into force on August 15th. This Order amends the Control of Bolts, Nuts, etc. (Nos. 1, 3 and 4) Orders, 1943. The principal alterations are:— (1) reductions in the maximum prices for certain aircraft bolts, nuts and screws; (2) increases in the maximum price of certain black steel bolts and nuts; (3) increases in the maximum prices for steel wood screws and reductions in the maximum prices for brass wood screws; (4) the introduction of maximum prices for certain bolts, studs and screws of specifications not hitherto included, and (5) the introduction of maximum prices for sales of black bolts and nuts by merchants.

The second schedule to the existing Order and the related schedules are replaced by new schedules.

Milk-Handling Equipment

The Machinery, Plant & Appliances (Control) (No. 8) Order, 1944, made by the Board of Trade (S.R. & O. 1944 No. 896) is designed to assist the Ministry of Food to implement its programme for the installation of machinery and plant used for handling, treating or distributing liquid milk or milk products. The goods controlled under the No. 3 Order (S.R. & O. 1942 No. 2487) are extended by the addition of a new class (96) covering heating equipment (including sterilising equipment, not being churn stools or sterilising

chests not exceeding 50 cu. ft. capacity), cooling equipment (not including water-operated coolers of a capacity not exceeding 125 gall. per hour), pumps, tanks, vats, vacuum pans, presses, grinders, disintegrators, etc. Class 41 is amended by the deletion of the words "not being cream separating machinery and plant."

New General Licences are incorporated with the Order which is obtainable from the Stationery Office (1d.).

"Electrical Review" Index

Copies of the index to Vol. CXXXIV (January-June, 1944) are now available to readers who require them for binding purposes. Application should be made to the Publisher, *Electrical Review*, Dorset House, Stamford Street, S.E.1.

Commodity Insurance

For the period from September 3rd to December 2nd, the rate of premium payable under the Commodity Insurance Scheme is to continue at 5s. per cent. for the three months.

Maintenance Electricians' Wages

In its Award No. 609, the National Arbitration Tribunal decides in favour of a number of maintenance electricians employed by a Bedfordshire engineering firm who claimed that they were entitled to a bonus of 12s. which was paid to maintenance millwrights by the firm.

Fatality

At a recent inquest at North Shields on Andrew Bosomworth (44) an electrician, a charred two-feet wooden rule with a metal tip was produced and it was suggested it may have caused the accident. Brian Welch, an employee of the North-Eastern Electric Supply Co., Ltd., who was in charge of work at a lead works said that Bosomworth had been cleaning the terminals of a switchboard. While he was engaged on the second panel there was an explosion which caused a fire. Three of the six contacts on the panel were "dead" and the others "alive." Another panel had already been cleaned in the same manner. Witness said he assumed that Bosomworth had inadvertently allowed the rule to slip and cause a short-circuit.

A verdict of death from burns caused by an explosion due to an accidental electric short-circuit was recorded.

Peruvian Electrical Imports

According to the *Board of Trade Journal* imports of electrical apparatus into Peru during the first quarter of this year were valued at 2,331,000 soles, as compared with 2,316,000 soles for the corresponding period of 1943.

Electric Hot-pressing

A new way of making cemented-carbide objects that are too large to be sintered in ordinary furnaces as well as specially thin-walled parts which tend to become "out-of-round" when pressed and then sintered in the usual way has been devised by the Carboloy Co. of Detroit. According to the U.S. Office of War Information the three distinct processes of hot pressing and two-stage sintering are performed in a single operation, heat being generated by electric resistance elements supplied from a 750-kVA transformer under electronic

contactor control. Large components, the carbide content alone weighing up to 100 lb. in some cases, can be formed in this way by deep-drawing dies. *Machinery* states that the hydraulic press, exerting a 100-ton forming pressure, will accommodate parts up to 100 sq. in. in cross section and 8 in. high.

Trade Announcements

In connection with the establishment of post-war industries, a site on the West Chirton Trading Estate, Tynemouth, has been acquired by De La Rue Plastics, Ltd.

Pyrotenax, Ltd., has opened an office at Nelson House, 2, Moor Street, Bull Ring, Birmingham, 4 (telephone: Midland 1265), under the management of Mr. H. Glover, who, for the past five years, has been in charge of the sales department at the company's Hebburn office. Full facilities and staff for demonstration and instruction in the use of Pyrotenax products, will now be directly available for the Midland Counties.

A. E. Dees, Ltd., are moving to new premises at 24-26, Carlisle Street, Newcastle-upon-Tyne, on November 1st.

Changes of Name

Lighting Trades, Ltd., has changed its name to Earlsfield Manufacturing Co., Ltd. (We recorded last week the registration of a new company, Lighting Trades & Welsbach, Ltd.).

Nelson, North, Ltd., have changed their name to Nelson (Radio Electrical), Ltd.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

KONTIN motors.

TRADE MARK APPLICATIONS

THE following applications have been made for trade marks. Objections may be entered within a month from August 16th.

SUNHOUSE and SUNHOUSE (design). No. 628946 and 628947 respectively, Class 7. Electric motors (not for land vehicles). Nos. 628948 and 628949 respectively, Class 9. Electrical apparatus not included in other classes. Nos. 628950 and 628951 respectively, Class 11. Electric fans, stoves, radiators, heating apparatus, lamps, immersion heaters; apparatus for domestic purposes for lighting, cooking, refrigerating, drying or ventilating, all being electrically operated.—H. Frost & Co., Ltd., Fieldgate, Walsall, Staffs.

Industrial Lighting—II

Wartime Installations

By **E. D. Iliff**,
B.Sc.(Eng.), A.M.I.E.E.

THE considerations reviewed in last week's issue led to the sodium discharge lamp being chosen as the best medium for general lighting in a particular wartime factory where the lamps are burning continuously night and day, year in and year out, and labour for maintenance has to be kept to the minimum. A strong point in favour of sodium is its low brightness; it was adopted for all the earlier main works bays, 140-W lamps being used for high bays (over 20 ft. to roof truss) with 85 W for low bays, and tungsten lamps were added for local lighting as required. In workshops where appreciable daylight was available (so that continuous burning of lamps was not necessary) or where precision work was done, tungsten lamps were used both for general and for local lighting, and tungsten lamps in diffusing fittings were used for offices.

The sodium lamps were wired in the

on each side from the other two phases.

This arrangement has the advantage that in the event of failure of one or two phases the remaining lights are evenly distributed over the whole bay. The merits of this feature are exploited to the full by providing an alternative supply to the lighting distribution boards, to which both main and emergency supplies are connected through single-pole changeover switches, automatic on one phase and hand operated on the other two. Thus one-third of the lighting is automatically restored through the changeover contactor, while one or both of the other two phases can also be reconnected, if required, by operation of the manual changeover switches.

If both main and emergency supplies fail, or are switched off during an air raid, an "evacuation" lighting system comes into operation, comprising 12-V motor-car fog lamps mounted on the roof trusses and

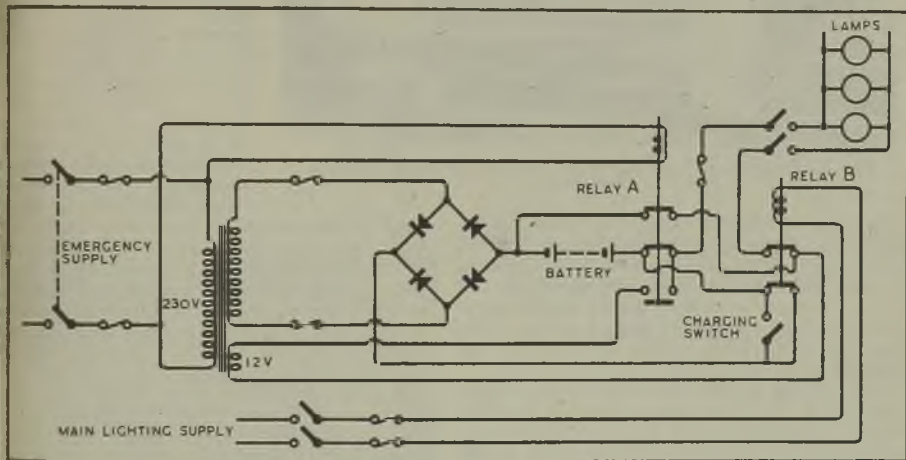


Fig. 2.—Evacuation lighting system diagram

orthodox manner, each having its own transformer and power factor correction condenser, groups of lamps being controlled by each switch. To minimise stroboscopic effect, in the earliest schemes adjacent lamps were always fed from different phases, but this was found to be an unnecessary complication. In low bays there was not enough mixing of light to make phasing-out really effective, while in the high bays it was sufficient to connect all the lamps on each truss to one phase and supply the next truss

adjusted so as to provide sufficient light for personnel to find their way to the shelters. The control is entirely automatic (Fig. 2) and the lamps are fed from a trickle-charger which embodies a relay energised from the main supply to the shop lighting. Normally the primary winding of the transformer of the trickle-charger is connected to the emergency supply, and one winding of the double-wound secondary feeds the rectifier for charging the 12-V battery through a hand switch.

When the main supply fails relay B drops, the battery is automatically "put on charge," and the other secondary winding is connected to the "evacuation" lights. If the emergency supply then fails a second relay A will cause the "evacuation" lamps to be disconnected from the transformer and fed from the battery only. The procedure when the signal for evacuation is given is that, first, the main supply to the shop lighting is switched off. One-third of the lights are then automatically restored and the "evacuation" lights also come on. A few minutes

tube early in 1940 filled, in this factory, a long-felt want. Wherever head room is restricted and yet a high intensity of illumination is required, the fluorescent tube is a most satisfactory source of light, especially when an approximation to daylight is advantageous, as for inspection purposes. The very low surface brightness of the tubes obviates glare, and an almost shadowless light is produced. There is a slight flicker which may be objectionable, but it can to some extent be overcome where there are two lamps in one fitting (or close enough together for the light

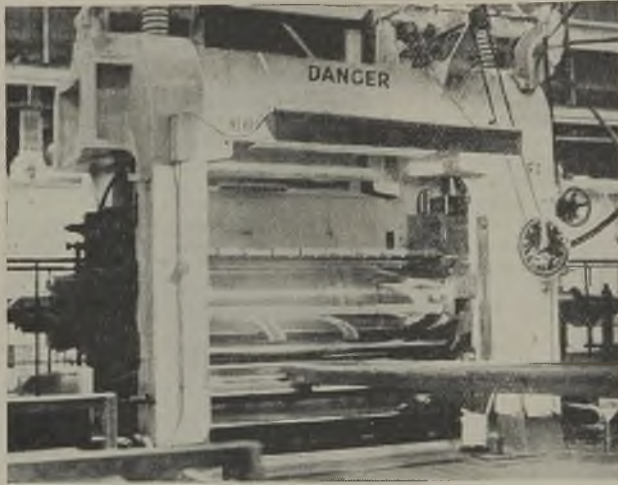


Fig. 3.—Fluorescent tube in trough reflector for local machine illumination

later the emergency supply is switched off from the shop lighting distribution boards, but not from the evacuation lighting apparatus, and the lamps continue to be fed from the transformers of the trickle-chargers. Not until the emergency supply actually fails do the evacuation lights depend on the batteries.

To return to the main lighting system; the initial level of illumination in working areas varied from 8 to 12 ft.-candles in the main bays. The walls and steelwork of the buildings had been sprayed with aluminium paint, the plant was painted cream, and the product also has high reflectivity. The general brightness of the works in course of time became somewhat dimmed and the "depreciation" was probably greater than is usually expected, the level of illumination falling to about 5 to 8 ft.-candles. The yellow light is quite suitable for general purposes and the workpeople on the whole seem to have no objection to it, though it must be admitted that at first many were prejudiced against the innovation.

The introduction of the 80-W fluorescent

from the two lamps to mix) by supplying the lamps from different phases, or alternatively by connecting a condenser in series with the tapped choke of one of the two lamps.

These lamps have been used extensively for machine (Fig. 3), bench and instrument panel lighting in the works, for the drawing office, and in all offices where artificial light is continuously necessary; for these purposes tungsten lamps have almost entirely been replaced. The reflector represents a large item in the total cost of fluorescent tube equipment, but in offices it is often practicable to mount the lamps direct to the ceiling and dispense with a reflector altogether. A 200-W incandescent lamp is about equal in lumen output to an 80-W tube, but must generally be enclosed in a diffusing fitting for use at low mounting heights. The fluorescent tube requires no diffusing medium and is equivalent in effective output to a 300-W incandescent lamp in a diffusing globe.

Merits of Colour Mixing

Fluorescent tubes were so immediate a success that there was a strong temptation to use them extensively for general lighting, but economic considerations ruled that out. It was decided instead to supplement the existing lighting locally with mercury vapour lamps to raise the intensity to the level required and to give the illusion of an approximation to daylight. The first section in which the experiment was made is an inspection area in a main bay where there is an overhead crane and the roof truss is over 20 ft. from the floor, so that low-hung fluorescent lamps could not be used. The existing lighting comprised 140-W sodium lamps arranged alternately three and two fittings on a truss and they were supplied

mented by adding two 250-W mercury lamps to the trusses which carried three sodium lamps, and three 250-W lamps on the trusses which carried two sodium lamps. The whole scheme then comprised five lamps on each truss, alternating three sodium with two mercury and *vice versa*.

The results are most satisfactory and the blue-green light blends very well with the yellow, the effect being quite pleasing. Reference to the spectra of the two types of lamps will show that accurate colour discrimination is not possible, but there is a marked improvement in this respect over the monochromatic sodium light.

With tungsten lamps supplementing the sodium the effect is of diluting the yellow rather than of blending with it. The advantage of the mercury lamp is that it emphasises colours at the blue end of the spectrum where the light of the tungsten lamp is deficient. By using fluorescent h.p.m.v. with sodium instead of tungsten better blending was obtained and, for colour discrimination, it is superior both to tungsten and to the clear type h.p.m.v., over which, however, fluorescent lamps offer little advantage for general lighting in high bays. Both clear and fluorescent h.p.m.v. lamps have

been used quite extensively to supplement the existing sodium installations, and the results have been very satisfactory.

Following these experiments, several large factory areas have been lighted with a system of mixed mercury and sodium lamps, which,

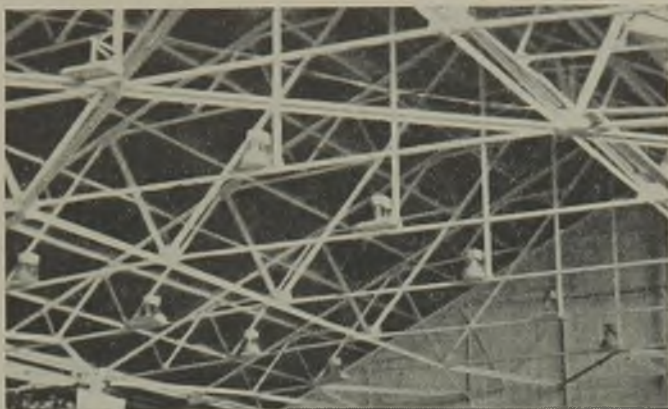


Fig. 5.—Mercury and sodium lamps mounted alternately

so far as I am aware, has not been adopted previously in any large installation. One strong reason for adopting this system is that the workers appear to prefer it to plain sodium or mercury lighting (the latter was tried in one section and preference was expressed for the mixture) but the main practical advantage is in colour discrimination. The higher surface brightness of the mercury lamps does not commend them, but they are better in this respect than clear tungsten lamps of comparable output. Disadvantages of installation and maintenance lie in the multiplication of types of reflector, control gear and lamps.

Interchangeability of Gear

The essential control gear of discharge lamps comprises a tapped choke in the case of a mercury lamp, or a leak transformer in the case of a sodium lamp. The fluorescent tube has a tapped choke and a starting element and, in addition, a radio interference suppression condenser is usually connected. With all discharge lighting a power factor correction condenser is generally connected across the supply to the control unit, and it must be stressed that the purpose is to reduce the current taken by each unit and so keep cable size to the minimum. For example, a 400-W h.p.m.v. lamp takes about 3.1 A, but with a 15 μ F condenser connected across the choke the input is reduced to 2.4 A. Corresponding values for a 140-W sodium lamp are 2 and 1 A respectively. These figures are typical only and will vary with different makes of lamps

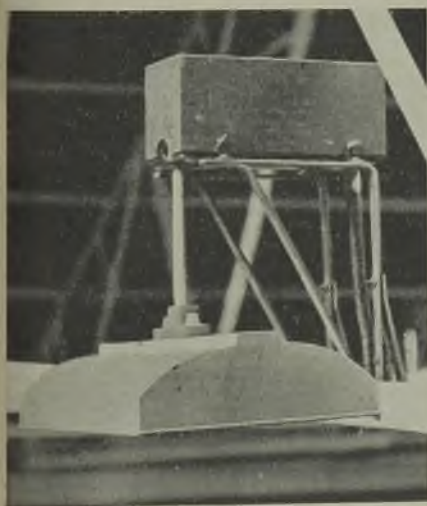


Fig. 4.—Sodium lamp assembly

and control gear. It might be more economical to correct the power factor of groups of lamps, but for simplicity and flexibility it undoubtedly pays to include a condenser in the control box of each of the large lamps at least. In the case of the smaller lamps the condenser may be omitted entirely, provided the total current of each circuit and the length of run do not cause an appreciable volt-drop at the lamp.

Standard Control-Gear Box

The practice I have adopted has been to standardise one box to hold any combination of control gear required for any type of discharge lamp. It comprises a wood base-block about $\frac{1}{2}$ in. thick on a sheet steel tray over which a sheet steel cover is held in position by screws and wing nuts. The control gear is very accessible when the cover is removed and is fixed on a base-block by wood screws so that varying fixing centres will present no difficulty. One size of condenser may be used for all sodium and h.p.m.v. lamps, a different size being required for the fluorescent tube. Only two types of leak transformers are necessary for the whole range of sodium lamps, one for the 140-W size, and the other for the remainder; but each size of mercury lamp requires a different tapped choke. A sodium lamp assembly is illustrated in Fig. 4.

All sodium lamps may be mounted horizontally in a trough-type reflector, which will vary in size with the lamp, though one fitting will do for either 60- or 45-W lamps. The latter may also be fitted vertically in a reflector similar to that used for tungsten lamps. In the case of h.p.m.v. lamps only two types of reflector are required, concentrating for either 400- or 250-W sizes, while a dispersive type is used for the 250-W clear or 125-W fluorescent lamp. The latter is chosen in preference to a 125-W clear lamp because it has a g.e.s. cap like the 250- and 400-W lamps, while the clear lamp has a 3-pin cap. So far the 80-W h.p.m.v. and 125-W clear lamps have not been used, being excluded by the fluorescent tube and the 125-W fluorescent lamp respectively.

In addition to the obvious advantages, keeping the types of equipment to the minimum makes for great flexibility. In my newest installations the layout, or pattern, of the lighting points is arranged so that different combinations of units can readily be obtained without alteration in wiring, cable sizes being kept well up so as to be sufficient for the maximum anticipated requirements. In one bay for example, on each truss there are three control boxes which normally house control gear for 250-W h.p.m.v. lamps alternately with that for 140-W sodium lamps, one mercury between two sodium on one truss and one sodium between two mercury on the next (Fig. 5).

If higher intensities are required over certain areas of floor, as for inspection, then 400-W mercury lamps and chokes are substituted for the 250-W size. If improved colour discrimination were required 400-W fluorescent lamps could be used in place of the 250 W and they could also be used in place of sodium units, in which case it would, of course, be necessary to change the reflectors as well as to substitute chokes for the leak transformers. In factory sections where lower intensities are permissible 125-W fluorescent lamps may be used instead of the 250-W h.p.m.v., the chokes being changed, and smaller sodium lamps could be used if suitable leak transformers were substituted. In lower bays one type only of reflector may be used for either 250-W mercury or 125-W fluorescent lamps. By means of a g.e.s./b.c. adaptor, a 60- or 40-W sodium lamp could be used in a reflector intended for a mercury or tungsten lamp.

Another scheme suitable for mounting heights of about 15 to 20 ft. is to have alternately 125-W fluorescent and 300- to 500-W tungsten lamps, which can be used in the same type of reflector. This layout has the advantage of quite good colour definition and elimination of stroboscopic effect, but my preference is for fluorescent lamps alone. For higher bays 400-W mercury lamps may alternate with 1,000- or 1,500-W tungsten lamps if the mercury-sodium combination is not suitable.

Switching

In a blacked-out factory working continuously lamps are seldom switched off singly, or in groups, and advantage may be taken of this fact to eliminate switches from the individual circuits, which are brought straight back to the fuseboard. All the lights of each phase may then be switched together by means of one single-pole isolator controlling supply to the fuseboard busbar; if any individual circuit is to be made dead, the appropriate fuse may be drawn.

Substantial economies in installation may be effected in this way, both in saving the cost of the tumbler switches and in wiring, since the "switch-drop" is eliminated in every case. If tungsten lamps are switched out when they are not actually required, the saving of current may justify the inclusion of switches, but the same is not necessarily true of discharge lamps owing to their lower current consumption. Furthermore, frequent switching of discharge lamps is not practicable, since it takes about 12 min. for sodium lamps to attain full brightness and about 6 min. for mercury lamps; although sodium lamps will restrike immediately, mercury lamps must first cool before they will restart. Experience suggests, moreover, that frequent switching of discharge lamps tends to shorten their life.

In these days when many factories are working almost continuously there may not be opportunities for regular routine maintenance. It is generally sufficient to keep fittings clean and replace burnt-out lamps and those that are obviously dim. Although users are warned that the efficiency of all classes of lamps falls off, it is doubtful whether regular and systematic checking of the output of all lamps would be economically justified, even if it were practicable.

I have found from experience that discharge lamps usually last a great deal longer than the number of hours quoted by E.L.M.A. as "average life" and suppliers may be persuaded to agree to guarantee 2,500 hours for sodium lamps and 1,500 hours for mercury lamps. The arrangement is that all lamps which fail after burning less than the "average life" are returned and the number of hours by which they fall short is credited to the user, who receives in return a corresponding number of new lamps.

This arrangement entails the testing and marking of all new lamps and the keeping of a record card for each lamp, showing the date received, initial lumen output, current taken, date put into service, location, date returned from service and output when re-tested (if not burnt out, or broken). The service life of discharge lamps can readily be estimated, since they burn practically continuously once they have been installed, and

it is well worth while to keep records, especially in view of their high cost. Detailed records of tungsten lamps are, however, not kept.

Pilot Lighting

To enable workers to find their way about the factory grounds at night "starlight" fittings (B.S./A.R.P.) will give the small amount of illumination necessary, but even this may be considered objectionable during an "alert," especially so when a raid is actually in progress on a dark night. Yet it is under those very conditions that it is most essential to prevent confusion and panic, so some pilot system which does not afford appreciable illumination is most desirable.

Accordingly, $\frac{1}{2}$ -W neon lamps housed in canopied miniature well-glass fittings are mounted about 8 ft. from road level on $1\frac{1}{2}$ in. diameter conduit standards, the bases of which are screwed into 4 in. by 4 in. adaptable conduit boxes set in blocks of concrete. They are interconnected by lead-covered cable laid direct in the ground and jointed at each adaptable box, which is filled with compound. The leads to the lamps are of v.i.r. cable, run inside the standards. This method is inexpensive, and even for very long runs 3/-029 cable is adequate. The number of circuits is kept to the minimum practicable to simplify control and to ensure the greatest possible flexibility.

Presentation to Mr. H. C. Lamb

A PRESENTATION was made on August 15th to Mr. H. C. Lamb on his retirement from the position of chief engineer and manager of the Manchester Corporation Electricity Department. Mr. R. A. S. Thwaites, his successor, paid an eloquent tribute to the great service rendered by Mr. Lamb, an outstanding figure in the electricity supply industry. He had held many high offices, some of them the highest that the industry had to offer. Manchester was perhaps unique in having had only two chief engineers in forty years—Sir Leonard Pearce, appointed in 1904, and Mr. Lamb who succeeded him in 1925. In many respects Manchester had led the way in electrical matters, and during the forty-two years of Mr. Lamb's service enormous changes had taken place. He had always set an exceedingly high standard of efficiency.

The presentation took the form of a handsome dinner wagon with an inscription plate on the drawer, and also a wallet containing Savings Certificates which Mr. Thwaites hoped might, in due course, be devoted towards the purchase or construction of an electric lawn mower.

Mr. Lamb, in replying, referred to the days over forty years ago when life was one of more or less continuous excitement. To-day troubles, when they came, might be very serious; but they were rare and conditions were entirely different. They used to have spectacular fires in the streets with firemen standing round wondering whether they dare put water on the "bitumen gas." It

was a frequent occurrence in those days for a constable to appear at Dickinson Street in a hansom cab to report that he had seen dry places on the pavement where they should have been wet! When he joined the undertaking there were fewer than 5,000 consumers; to-day there were nearly 200,000. In the early days it was by no means easy to get councillors to appreciate the potentialities of public supply, and the first chief engineer, Mr. C. H. Wordingham, a man of very high ideals and great ability, had to fight very hard indeed to prevent another Electricity Department being set up within the Corporation solely for the purpose of supplying power for street transport. It was he who chose the Stuart Street site and foresaw its development to the extent of 50,000 HP. The site could actually accommodate 250,000 HP. Mr. Wordingham was followed by Mr. G. F. Metzger, and his brief tenure of office (three years) saw the famous electricity "scandal," arising from the fact that Mr. Metzger had recommended ordering two 6,000-HP generating sets for the Stuart Street station. It was held by critics that he had completely misled the Committee because the sets would never be needed.

Mr. Metzger was followed by Mr. S. L. (now Sir Leonard) Pearce, who had put everything on a new basis, exercised a firm control, and established good relations between the committee and the staff. Mr. Lamb thanked all members of the staff for helping him to uphold the prestige of the Department.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Dynamic Balancers

IN addition to the range of dynamic testing machines offered by W. T. AVERY, LTD., Soho Foundry, Birmingham (*Electrical Review*, June 25th, 1943) there are now available balancers of various sizes, some of them automatic, for such machine parts as armatures, crankshafts, pump and fan rotors. They are equipped with compensating gear in the form of a disc, mounted on a driven shaft and carrying a weight of known magnitude and position, which is driven synchronously with the test body itself; the latter is supported upon oscillating bearings. Some models will indicate automatically the amount and position of the error.

The actual balancing operation is carried out at the critical speed, when the oscillations set up by the test body's unbalance are in resonance with the oscillating system of the machine. Consequently they are magnified considerably, a fact which affords an exceedingly clear reading.

The vertical planes of the rotor (where the operator requires to carry out the compensation) can be chosen at will to suit the particular nature of the test body and the fulcrum points can be adjusted to coincide with them. This is of great advantage, because the balancing result will thus be related to the total unbalance error of the rotor, leaving no residual moments uncompensated which might have been due to leverage between fulcrum points and compensation planes.

The machines run at constant speed during the entire operation, after having been set to the critical speed; operation is fast and straightforward. There are various models for test bodies weighing from 3½ oz. to 1,100 lb. For larger rotors up to 3 tons when the time factor is not of much importance, machines are available without self-acting compensating gear, the amount and position of the error being

determined by means of an optical oscillation scale and a mechanical marking indicator.

Improved Plug

A three-pin plug produced by STANTON & Co., 60, Moor Street, Birmingham, is claimed to provide improved means of gripping the cable. In wiring this "Stanelec" plug the cable leads are first cut off to uniform length and then connected to the shielded self-aligning



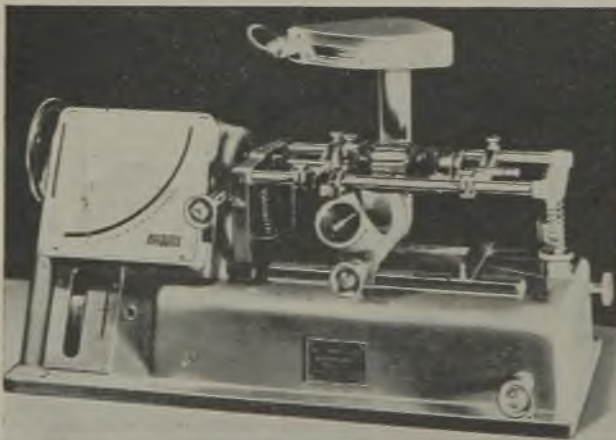
New cord-gripping plug

live terminals. Next the earth wire is doubled back under the cable and attached to the third terminal. Finally the full diameter cable with its covering is wound round the plug pillar and the lid put on, so securely holding the cable by its sheath and leaving an appreciable length inside the plug body. Should the cable

be pulled out, the two live wires would be disconnected first and the earthing wire last, thus reversing the more usual sequence.

The new plug will accommodate fully rated c.t.s. cable; smaller sizes can be wound twice or more times round the central pillar. The terminals are of the usual "pinch" variety, the conductors being pushed through a hole and secured by a screw at right angles.

The earth wire, which is pushed axially down a hole in the third pin terminal, is visible through a cross hole from outside the plug body. The earthing pin can be made to fit plain or self-locking sockets. Similarly contrived two-pin models are produced by the firm of much the same size as ordinary plugs.



Automatic rotor balancing machine

ELECTRICITY SUPPLY

Increases at Glasgow and Sheffield. Stockton Post-war Plans.

Clitheroe.—INCREASE IN LARGE POWER TARIFF.—New large consumers of industrial power will pay £4 per kW for the first 100 kW of maximum demand and £3 15s. per kW above that amount, with a unit charge of 0.35d.

Dartford.—TRANSFORMER AND SWITCHGEAR.—The Corporation Electricity Committee is to provide an additional transformer and switchgear equipment in connection with supply to Burroughes, Wellcome & Co.

Glasgow.—INCREASED CHARGES.—Following the further advance of 4s. per ton in the price of coal, estimated to cost the electricity undertaking £71,000 in the current year, the Electricity Committee is to introduce the following increased scale of charges as from the third and fourth (final) survey periods in the current financial year and until further notice, subject to the approval of the Electricity Commissioners:—Residential tariff secondary rate No. 2, from 0.25d. to 0.3d. per kWh; commercial tariff secondary rate No. 2 from 0.3d. to 0.35d. per kWh; power supply tariff, up to 40,000 kWh per year from 1d. to 1.125d. per kWh, and above that amount from ¾d. to 0.75d. per kWh.

ELECTRODE BOILERS.—A special sub-committee of the Health Committee is to consider a suggestion from the Chief Engineer, West of Scotland District, War Department, that on the grounds of economy in manpower and fuel the Corporation should proceed now with the installation of electrode boilers to provide heating and domestic hot water supply at Cowglen Hospital instead of waiting until the hospital is "de-requisitioned."

Lymm (Cheshire).—ELECTRICITY CHARGES.—The Urban District Council has asked Watlington Corporation to meet a deputation with a view to considering again the cancelling of the 10 per cent. additional charge to electricity consumers in the Lymm area.

Middlesbrough.—SALE OF HIRED APPARATUS.—The Town Council has approved proposals for the sale to consumers of apparatus let out on hire.

Newcastle-on-Tyne.—NEW SUBSTATION.—The City Council has obtained sanction to borrow £8,160 for the construction and equipment of a substation, laying of cables, etc.

Stalybridge.—RATE PRECEPTS NEARLY REPAID.—As already reported, the Stalybridge, Hyde, Mossley and Dukinfield Joint Transport and Electricity Board is this year making a grant of £4,000 from its profits to each of the constituent authorities. At a recent meeting Alderman S. Fawley (Hyde), chairman of the Finance Committee, announced that under present conditions the Board would within two or three years have repaid all the money it had had from these authorities. The net profit from the Electricity Department for the past year was £16,005 and from the Transport Department £12,233.

Sheffield.—INCREASED CHARGES.—The Electricity Committee recommends that, in view of

the increased price of coal and equipment, electricity charges should be increased from 7½ to 15 per cent.

Stockton-on-Tees.—POST-WAR PLANS.—Post-war expenditure on the electricity undertaking proposed by the Town Council includes £78,000 for installations in connection with consumers; £77,000 for consumers' apparatus on hire; £85,000 for the reinforcement of mains; £104,000 for additions to transmission and distribution; £12,000 for offices, showrooms and workshops; and £80,000 for a change in the voltage.

Surrey.—HOSPITAL EQUIPMENT.—The Health Committee of the County Council is to provide seventeen electrically-heated food containers at a cost of £1,100 for St. Helier Hospital.

Overseas

New Zealand.—HUTT VALLEY PROGRESS.—Continued progress is recorded in the operation of the Hutt Valley Electric Power Board during the year ended March 31st last in the annual report sent us by Mr. E. F. Hollands, the general manager and treasurer. Sales of electricity increased from 68,325,274 to 75,621,808 kWh (or from 3,875 to 4,169 kWh per consumer), while the maximum load was 1,132 kVA higher at 18,243 kVA. The number of consumers connected at March 31st was 18,137, an increase of 505 during the year. Apparatus connected now includes 5,944 cookers, 6,736 water heaters, 3,309 motors and 123 milking motors. The total revenue from the sale of electricity was £220,379 (£193,386 in 1942-3), or 0.699d. (0.679d.) per kWh sold.

TRANSPORT

Rotherham.—OVERHEAD EQUIPMENT MODIFICATIONS.—Mr. N. Rylance, who was recently appointed transport manager, has reported to the Transport Committee that in order to comply with the requirements of the Ministry of Transport it is necessary to erect, at intervals of not more than half a mile along the trolleybus routes, pillars containing switches controlling the intermediate lengths of trolley wire. Approximately 46 pillars are required. He has suggested that while these pillars are being installed the overhead feeding arrangements shall be modified with a view to increasing the efficiency of the system. The whole work will be carried out by the Department with the assistance of the Electricity Department and the cost is estimated at £5,360. He has been authorised to proceed with the work.

RADIO & TELEPHONY

Colombo.—RADIO RELAY STATION.—A new wireless relay station has been opened at Colombo, Ceylon, to provide an alternative route for transmission of messages from London to Australia, announces Cable & Wireless, Ltd. The station has been installed for use when the direct London-Australia beam is unworkable.

United States.—NEW INDIA RADIO CIRCUIT.—A new direct radio-telegraph circuit between the United States and India has been inaugurated.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The United River Plate Telephone Co., Ltd., earned a gross revenue of £5,125,875 for 1943, as compared with £4,652,953 in the preceding year. The net earnings, after meeting expenses, depreciation and interest charges, were £1,010,076 (against £1,338,658) and to this were added £18,627 exchange adjustment, £173,089 transfer from capital surplus of realised appraised increment and £3,014,941 brought forward, making £4,216,733. After meeting other charges a final dividend of 3 per cent., again making 6 per cent. for the year is to be paid, leaving £3,603,953 to be carried forward. There was an increase of 3.5 per cent. in the number of telephones during the year, raising the total to 477,518. Pending applications for service numbered 37,658 at the end of the year (against 20,909 at December 31st, 1942).

Metal Industries, Ltd.—Speaking at the company's annual meeting on August 21st, the chairman (Sir J. Donald Pollock, Bt.) said that the holding in the British Oxygen Co., Ltd., had again provided a very satisfactory dividend. The holding in Electrical Switchgear & Associated Manufacturers, Ltd., had again been increased and the company now held all the issued ordinary shares. A dividend had been received from the profits arising mainly from its wholly-owned subsidiary, Brookhirst Switchgear, Ltd., which had operated at a high level of activity and had earned a substantial profit. The accounts also included dividends from the Igranic Electric Co., Ltd., whose issued capital was wholly owned by Metal Industries, Ltd. Further shares of the Sentinel Waggon Works (1936), Ltd., had been purchased.

Anglo-Argentine Tramways Co., Ltd.—The report for 1943 shows a loss amounting to £6,645. A long statement by the board sets out in detail the story of the company's dealings with the Argentine Government. It is stressed that the unsatisfactory position of the Buenos Aires Transport Corporation to which the company's undertaking was transferred is due entirely to the refusal of the Government to sanction increases in the fares, which were fixed some forty years ago, in spite of greatly increased costs. The company's debenture stockholders have agreed to a further postponement of their rights and the shareholders are to be asked to approve the scheme at an extraordinary meeting to follow the annual meeting on September 8th.

The Engineering & Lighting Equipment Co., Ltd., records a trading profit, after providing for depreciation, of £31,215 for the year ended March 31st last. This compares with £38,239 in the previous year. From this has to be deducted directors' fees £550 (same), war damage contribution £88 (£81), war damage insurance £225 (£338), income tax and E.P.T. £7,123 (£5,289) and reserve for E.P.T. £1,775 (£8,750), leaving a net profit of £21,454 (£23,231). The redemption fund receives £7,772 (£7,402), while dividends on preference and

4 per cent. interim on ordinary shares take £9,928 (£10,298). A final dividend of 6 per cent. again makes 10 per cent. for the year and £1,896 (£4,141) is carried forward.

Thorn Electrical Industries, Ltd., show combined trading profits for the company and its subsidiaries for the year ended March 31st amounting to £84,850, as compared with £83,831 for 1942-43. After providing for director's fee £125 (£250), additional management remuneration £2,080 (£1,905), and taxation £58,000 (£57,000), there was a net profit of £24,645 (£24,676). Preference dividends again require £1,500, and £12,000 (£13,000) is transferred to general reserve. The ordinary dividend is maintained at 20 per cent. and £10,235 (£9,091) is carried forward.

The Kalgoolie Electric Power & Lighting Corporation, Ltd., records a profit for 1943 amounting to £31,758, as against £31,173 in the previous year. United Kingdom taxes require £6,392 (£5,025) and depreciation reserve again receives £16,000, making it £186,000. An ordinary dividend of 5 per cent., less tax at 5s. in the £, is to be paid (same), and £9,727 (£9,916) is carried forward. Due entirely to the further withdrawal of man-power from the mining industry, sales of electricity were further reduced by 7,500,000 kWh, or about 16 per cent. of the 1942 sales.

The Broadcast Relay Service, Ltd., held its annual general meeting on August 17th. Mr. Allan Miller, the chairman, reported continued expansion in all departments and new high levels of volume of business and profits earned. One of the company's manufacturing businesses in Canada had been disposed of on very satisfactory terms. The company was in a strong position financially, with ample reserves, and was giving continued consideration to post-war plans for extension and improvement of the business.

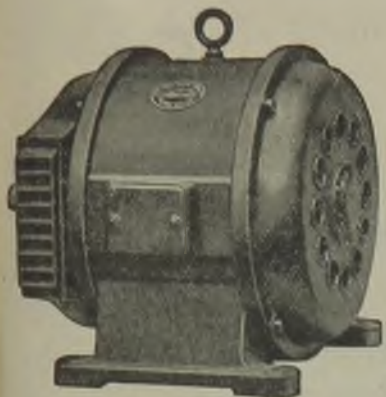
Gabriel, Wade & English, Ltd., report a net profit for the year ended May 31st last amounting to £91,309 (as compared with £86,357 for the previous year after providing £11,181 for E.P.T.). Income tax takes £19,141 (£29,172) and contribution to reserve £30,000 (bringing it up to £150,000). As reported last week, an ordinary dividend of 6 per cent. is again to be paid plus a bonus of 4 per cent. (same), and £64,236 (£71,417) is carried forward.

The Philco Radio & Television Corporation of Great Britain.—Guarantors of the recent issue of 100,000 £1 6 per cent. cumulative preference shares at 20s. 6d. each and 250,000 2s. ordinary shares at 10s. 6d. each are being called upon to subscribe for 11 per cent. of the preference and 2 per cent. of the ordinary shares.

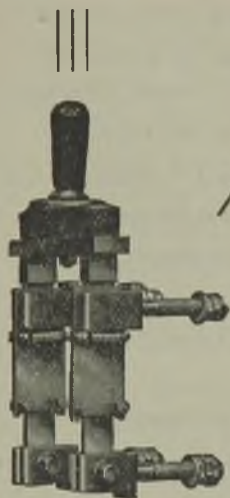
The Kalgoolie Electric Tramways, Ltd., record a net profit for 1943, before providing for interest on "B" debentures, amounting to £2,426 (£1,447), which is carried to reserve for redemption of "B" debentures.

Vactric, Ltd., is to pay a final dividend of 15 per cent. on its ordinary shares making

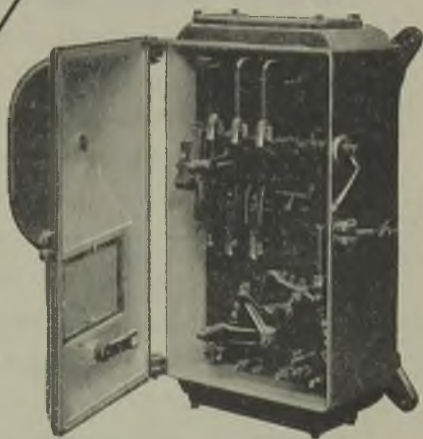
THE VERITY RANGE



MOTORS



SWITCHGEAR



STARTERS

VERITYS LTD. ASTON, BIRMINGHAM 6

Sales Headquarters: BRETENHAM HOUSE, LANCASTER PLACE, W.C.2

(A short series of open letters by L.S.E.,
commenting on some notable letters of the past.)

To Leonardo Da Vinci, who wrote to the Duke of Milan
(in about 1480) offering his services as Court Engineer



Norwich, 1944

Dear Leonardo,

Even though you got the job, it seems to us that you claimed too much. You said, with no false modesty, that you could construct, among many other things, bridges, light, strong and portable, to resist fire; armoured wagons carrying artillery (you certainly had something there!) and ships to withstand the fire of the heaviest cannon; also conduits for water and sculpture in marble, bronze or clay. An impressive list for your noteheading, ending, we may suggest, with the magic words "Estimates Free."

You sought perfection in too many arts and died a disappointed man. Had you specialised, as we do, in mastering one art (in our case the manufacture of electric motors, which would have interested you greatly), to what even greater heights might you not have risen.

But how you would have enjoyed yourself preparing some of your novel devices for the Second Front!

Yours truly,

**LAURENCE, SCOTT
& ELECTROMOTORS LTD.**

22½ per cent. for the year to March 31st last. The last distribution was 4 per cent. in respect of 1937-38.

The North-Eastern Electric Supply Co., Ltd., is paying an interim dividend of 2½ per cent. (same).

The County of London Electric Supply Co., Ltd., is again to pay an interim dividend of 3 per cent.

The Northampton Electric Light & Power Co., Ltd., is again paying an interim dividend of 4 per cent.

The Rushden & District Electric Supply Co., Ltd., has declared an interim dividend of 4 per cent. (same).

New Companies

Electra (Bourne End), Ltd.—Private company. Registered August 8th. Capital, £1,500. Objects: To carry on the business of electrical radio, television and mechanical engineers, etc. First directors: J. C. White, The Margarets, Bourne End, Bucks; and D. G. van Mooydonk, Woodland Thatch, Bovington Green, Marlow. Registered office: Marlow Road, Bourne End, Bucks.

Reda (Electrics), Ltd.—Private company. Registered August 4th. Capital, £500. Objects: To carry on the business of dealers in, and repairers of, radio, television and electrical appliances, etc. First directors: J. E. Wright, 42, Station Road, Cheadle Hulme; and E. W. Davies, 13, Park Avenue, Cheadle Hulme. Registered office: 142a, Finney Lane, Heald Green, Cheshire.

Carey Electrical, Ltd.—Private company. Registered August 9th. Capital, £100. Objects: To carry on the business of electrical engineers and contractors, repairers of, and dealers in, radio and electrical goods, etc. First directors: Sidney F. Landus Fitchie, 84, Hervey Road, Brighton, and four others. Registered office: 766, Fulham Road, S.W.6.

Jackson Automatic Electric Controls, Ltd.—Private company. Registered August 14th. Capital, £1,000 in 1,000 shares of £1 each. Objects: To carry on the business of manufacturers of, and dealers in, instruments and appliances (either static or rotary) for the measurement, operation and control of liquids, gases, solids, power, etc. Directors: S. B. Jackson, 47, Christchurch House, S.W.3 and Freda M. Haddy, 21, Queen Anne's Gate, S.W.1. Registered office: Windsor House, 46, Victoria Street, S.W.1.

H. C. Wall & Co., Ltd.—Private company. Registered August 10th. Capital, £2,500. Objects: To acquire the business of an electrician and the like carried on by Harold C. Wall at 44, Lowesmoor, Worcester. First directors are: H. C. Wall, 8, Georgina Avenue, Worcester, and two others. Registered office: 44, Lowesmoor, Worcester.

Electruks, Ltd.—Private company. Registered August 10th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electric vehicles, motor cars, lorries, tractors, wireless equipment, batteries, etc. Subscribers: W. Reeves, 141, Hendon Way, N.W.2, and A. A. C. N. Smith, Egremont House, Sudbury, Middlesex. Secretary: S. E. Hoar. Registered office: 8, Fitzroy Road, N.W.1.

D. G. Wiggins (Engineers), Ltd.—Private company. Registered August 11th. Capital, £500. Objects: To acquire the business of an electrical and mechanical engineer carried on by David G. Wiggins at Thornaby-on-Tees; also to carry on the business of wireless service agents, etc. Directors: D. G. Wiggins and Olive Wiggins, both of 11, Lexden Avenue, Acklam, Middlesbrough. Registered office: Lanehouse Garage, Thornaby Road, Thornaby-on-Tees, Yorks.

Arthur Ellis (Electrical), Ltd.—Private company. Registered August 12th. Capital, £2,000. Objects: To acquire the business of an electrical engineer and contractor carried on by Arthur Ellis at 14, Lonsdale Road, Harborne, Birmingham. Directors: A. Ellis and Emily M. Ellis, both of 46, Harts Green Road, Harborne. Registered office: 14, Lonsdale Road, Harborne.

Companies' Returns

Increases of Capital

M.C.L. & Repetition, Ltd.—The nominal capital has been increased by the addition of £380,000 beyond the registered capital of £120,000. The additional capital is divided into 250,000 5 per cent. cumulative preference and 130,000 new ordinary shares of £1 each.

Watford Electric & Manufacturing Co., Ltd.—The nominal capital has been increased by the addition of £60,000 beyond the registered capital of £100,000. The additional capital is divided into 60,000 6 per cent. cumulative preference shares of 10s. each and 300,000 ordinary shares of 2s. each.

Controller Contacts (Cardiff), Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 ordinary shares, beyond the registered capital of £1,000.

Liquidations

Reliance Lift & Engineering Co., Ltd. (in voluntary liquidation).—Particulars of claims to be sent by August 31st to one of the liquidators, Mr. J. W. Grayston, Whitaker's Buildings, New Victoria Street, Bradford.

St. James Electrical Co., Ltd.—Meetings, September 18th, at 38, Jubilee Place, King's Road, London, S.W.3, to receive an account of the winding up by the liquidator, Mr. A. G. Warne.

W. B. & H. C. Cables, Ltd.—Meeting, September 18th, at 19, Moorgate Street, Rotherham, to receive an account of the winding up by the liquidator, Mr. F. H. W. Green.

Bankruptcies

W. T. Dalton, wireless engineer, 62, East Street, Horsham.—Proofs for dividends by August 29th to the trustee, Mr. A. C. Williams, 8, Old Steine, Brighton.

T. Johnson, electrician, lately carrying on business at 25, Granville Street, Sheffield, as "Tom Johnson & Co.", mechanical and electrical engineer and contractor.—Proofs for dividend by September 2nd to the trustee, Mr. A. H. Ward, 55, Queen Street, Sheffield.

STOCKS AND SHARES

TUESDAY EVENING.

THE month of August is—by general consent founded upon past experience—always a quiet one in the Stock Exchange markets. There have been times when this tradition was broken, but it holds good in nineteen years out of twenty. The disposition is for prices to suffer some reaction owing to the usual buyers holding off. This gives the automatic selling for deceased accounts, etc., an exaggerated importance. News of the opening of a new front on the Riviera created a good impression, but had no effect upon Stock Exchange prices. Promise of an easing of street lighting restrictions during the coming winter gave a mild impetus to the buying of Home electricity supply shares. The radio group for want of public interest has leaned to the lower side.

Home Electricity

The Home electricity supply companies continue to declare dividends at the same rates as a year ago. This is taken as an indication that the final dividends will show no change from the 1943 distributions. Prices of the well-known undertakings stand at levels which may be almost regarded as equivalent to those of gilt-edged securities. County of London ordinary, for instance, are offered at 43s. 9d. to give £3 13s. per cent., assuming maintenance of the 8 per cent. dividend which has been paid annually for some years past. Edmundsons ordinary, obtainable at 32s., return £3 15s. per cent. on their 6 per cent. dividend. In the Provincial group, Yorkshire Electrics, paying the same dividend as County of London ordinary, stand at about the same price.

Four per cent. Basis

Midland Electric Power, which pays 9 per cent. dividends can be bought, as to 5,000 shares, at 44s. 3d.; this returns the more satisfactory yield of £4 1s. 6d. per cent. From Lancashire Electric ordinary at 37s. 3d. the yield is a few pence above 4 per cent.; there are 2,500 shares on offer at the price mentioned. Clyde Valley at 42s. 6d. give £3 15s. 3d. and Scottish Power ordinary at 42s. pay £3 16s. per cent. The dividend in each of the last two cases is 8 per cent. per annum.

Fewer Fluctuations

What has come to be for weeks past a nearly invariable series of rises in our price-lists, is interrupted this time by a slight preponderance of minus signs. Some of the improvements, however, are worthy of note; a gain of 2s. raised Westinghouse Brakes to £4 and Johnson & Phillips have advanced to the same figure. With a gain of 1s. 6d., Telegraph

Constructions are up to 56s. and Vactric at 19s. 3d. show an improvement of 2s. 9d. British Insulated rose to within a florin of £6. Chloride Electrical Storage at 4 $\frac{7}{8}$ are $\frac{1}{8}$ better and Reyrolles, with a similar advance, are up to 73s. 9d. Electric Construction at 58s. have put on 6d. The falls range from $\frac{1}{2}$ in Metal Industries "B," at 51s. 3d., to 6d. in Automatic Telephones and Enfield Cables, at the common price of 64s. 6d. Cable & Wireless preference and ordinary are both 10s. lower. Victoria Falls ordinary, upon publication of the report, rose to 83s. 9d. Tokyo sixes are another point higher at 27.

Hall Telephone

At the present price of Hall Telephone shares, 31s. 6d., the yield on the 12 $\frac{1}{2}$ per cent. dividend now being paid is £3 19s. 4d. per cent. This seems a moderate return from an ordinary share of this nature, but is justified by reference to the manner in which the company's profits have been mounting over the past few years. The record is best illustrated by setting out the gross and net profits for the five years ended 1943. The figures are as follows:—

Year	Gross profit	Net profit
1939	£114,213	£41,606
1940	205,688	68,639
1941	399,090	152,572
1942	573,389	258,409
1943	829,086	499,626

The dividend the first two years, 1939 and 1940, was 10 per cent., after which it became 12 $\frac{1}{2}$ per cent.; this is the present rate of distribution. A couple of years before the outbreak of war the company issued new shares at 11s., the proceeds being used to build a factory at Dowlais.

Thorn Electrical

Thorn Electrical Industries at 26s. have recovered the dividend lately deducted. The company makes up its accounts to the end of March, and those just published show little difference from the figures of the previous corresponding period. The company made a net profit of £24,600, practically the same as that for the year ended March, 1943. The dividend is again 20 per cent. and the earnings more than twice that amount. The capital is £100,000 in ordinary shares of 5s. each and £50,000 in 6 per cent. preference shares of £1 each. The reserves are nearly £140,000. At the present price of 26s. the yield on the money comes to £3 17s. per cent., which in itself indicates the expectation that under more normal conditions the dividend will be increased.

Enfield Cables

The price of Enfield Cables at 65s. allows a return of £3 17s. per cent. on the money,

(Continued on page 286)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend		Middle Price Aug. 22	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Aug. 22	Rise or Fall	Yield p.c.
	Pre-vious	Last					Pre-vious	Last			
Home Electricity Companies						Public Boards					
£ s. d.						£ s. d.					
Bournemouth and Poole	12½	12½	63/-	..	3 19 4	Central Electricity 1955-60 (Civil)					
British Power and Light	7	7	33/6	..	4 3 7	Defence)	3	3	100	..	3 0 0
City of London	7	5½	31/-	..	3 11 0	1955-75	5	5	115	..	4 7 0
Clyde Valley	8	8	42/-	..	3 16 0	1951-73	4½	4½	107	..	4 4 1
County of London	8		43/6	..	3 13 3	1963-93	3½	3½	104½	..	3 7 0
Edmundsons:						1974-94	3½	3½	101	..	3 4 4
7% Pref.	7	7	34/6	..	4 1 4	London Elec. Trans.					
Ord.	6	6	31/-	..	3 17 5	Ltd.	2½	2½	97½	..	2 11 3
Elec. Dis. Yorkshire	9	9	45/6	..	3 19 6	London & Home Counties 1955-75	4½	4½	111	..	4 1 1
Elec. Fin. and Securities	12½	13½	58/-	..	4 11 4	London Pass. Trans.:					
Elec. Supply Corporation	10	10	47/6	..	4 4 2	A	4½	4½	121½	..	3 14 1
Isle of Thanet	Nil	Nil	18/-	..	—	B	5	5	121½	..	4 2 4
Lancs. Light and Power	7½	7½	37/-	..	4 1 1	C	3	3½	71	..	4 11 7
Llanelli Elec.	6	6	26/6	..	4 10 7	West Midlands J. E.A. 1948-68	5	5	108½	..	4 12 4
London Assoc. Electric	3	4	26/6	..	3 0 6						
London Electric	6	6	31/-	..	3 17 5						
London Power Red.											
Deb.	5	5	105½	..	4 14 7						
Metropolitan E.S.	8	8	42/6	+ Gd.	3 15 2						
Midland Counties	8	8	41/6	..	3 17 0						
Mid. Elec. Power	9	9	44/-	..	4 1 9						
Newcastle Elec.	7	7	31/-	..	4 10 4						
North Eastern Elec.											
Ordinary	7	7	35/-	..	4 0 0						
7% Pref.	7	7	35/-	..	4 0 0						
Northampton	10	10	50/6	..	3 19 6						
Notting Hill 6% Pref.	6	Nil	11	..	—						
Northmet Power:											
Ordinary	7	7	42/-xd	+1/-	3 6 8						
6% Pref.	6	6	30/6	..	3 18 8						
Richmond Elec.	6	6	26/6	..	4 14 1						
Scottish Power	8	8	41/6	..	3 17 2						
Southern Areas	5	5	23/-	..	4 7 0						
South London	7	7	29/-	..	4 16 7						
West Devon	5	5	23/6	..	4 5 1						
West Glos.	4½	3½	24/6	..	2 17 0						
Yorkshire Elec.	8	8	43/-	..	3 14 5						
Overseas Electricity Companies						Traction and Transport					
Atlas Elec.	Nil	Nil	7/3	..	—	Anglo-Arg. Trans.:					
Calcutta Elec.	6°	6°	48/6	-1/6	2 9 6	First Pref. (£5)	Nil	Nil	2/6	..	—
Cawnpore Elec.	10	7	40/-	..	3 10 0	4% Inc.	Nil	Nil	6	..	—
East African Power	7	7	34/6	..	4 1 4	Brit. Elec. Traction:					
Jerusalem Elec.	7	5	29/6	..	3 8 0	Def. Ord.	45	45	1315	..	3 8 5
Kalgoorlie (10/-)	5	5	11/6	..	4 7 0	Pref. Ord.	8	8	180	..	4 9 0
Madras Elec.	4°	Nil	32/-	-1/-	—	Bristol Trams	10	10	57/-	..	3 10 2
Montreal Power	1½	1½	25	..	—	Brazil Traction	\$1	\$1½	26½	-½	6 12 1
Palestine Elec. "A"	4°	5°	40/6	..	2 10 0	Calcutta Trams	5½	6½	70/6	..	1 17 2
Perak Hydro-elec.	6	7	14/-	..	—	Cape Elec. Trams	5	6	26/6	..	4 14 1
Shawinigan Power	83cts.	90cts.	16½	..	—	Lancs. Transport	10	10	46/6	..	4 8 0
Tokyo Elec. 6%	6	6	27	+1	—	Mexican Light:					
Victoria Falls Power	15	16	4½	+½	3 11 7	1st Bonds	5	5	107½	..	4 13 0
Whitehall Inv. Pref.	—	6	24/6	..	4 18 0	Rio 5% Bonds	5	5	105½	..	4 14 9
						Southern Rly.:					
						5% Prefd.	5	5	76	..	6 11 7
						5% Pref.	5	5	116½	..	4 5 9
						T. Tilling	10	10	60/-xd	+6d.	3 6 8
						West Riding	10	10	46/-	..	4 7 0

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend		Middle Price Aug. 22	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Aug. 22	Rise or Fall	Yield p.c.	
	Previous	Last					Previous	Last				
Equipment and Manufacturing												
Aron.Elec.Ord.	10	15	61/-	..	4 18 4	General Cable (5/-)	15	15/-	..	5 0 0	2 0 0	
Assoc. Elec.:						Greenwood&Batley	15	16/-	..	6 10 4	6 10 4	
Ord.	10	10	53/6	-2/-	3 14 9	HallTelephone(10/-)12½	12½	31/6	-1/6	3 19 4	3 19 4	
Prof.	8	8	40/-	..	4 0 0	Henley's (5/-)	20	20	27/-	..	3 14 0	3 14 0
AutomaticTel.&Tel.12½	12½	12½	64/6	-6d.	3 17 8	4½% Pref.	4½	4½	24/-xd	+3d.	3 15 0	3 15 0
Babcock & Wilcox	11	11	52/-	-1/6	4 4 7	Hopkinsons	15	17½	71/3	..	4 18 4	4 18 4
British Aluminium	10	10	51/6	..	3 17 8	India Rubber Pref.	5½	5½	23/6	..	4 13 9	4 13 9
British Insul. Ord.	20	20	118	+6d.	3 10 3	Intl. Combustion	30	30	64	..	4 10 0	4 10 0
British Thermostat (5/-)	18½	18½	20/9	..	4 9 0	Johnson & Phillips	15	15	80/-	+1/-	3 15 0	3 15 0
British Vac. Cleaner (5/-)	15	30	30/-	..	5 0 0	LancashireDynamo	22½	22½	98/9	..	4 11 2	4 11 2
Brush Ord. (5/-)	8	9	10/9	..	4 3 9	Laurence,Scott(5/-)12½	12½	12½	13/6	..	4 12 2	4 12 2
Burco (5/-)	15	17½	17/-	..	5 3 0	London Elec. Wire	7½	7½	39/-	..	3 17 8	3 17 8
Callender's	15	20	35/6	-½	3 12 2	Mather & Platt.	10	10	55/9	..	3 14 1	3 14 1
ChlorideElec.Storage	15	15	88/9	+½	3 6 7	Metal Industries(B)	8	8½	51/3	-½	3 6 6	3 6 6
Cole, E. K. (5/-)	10	15	32/6	-1/6	2 6 2	Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6	5 3 6
ConsolidatedSignal	24	27½	6½	..	4 1 6	Murex	20	20	5½	-½	3 18 2	3 18 2
Cossor, A. C. (5/-)	7½*	10*	25/6	-6d.	1 19 6	Pye Deferred (5/-)	25	25	35/-	-½	3 11 5	3 11 5
Crantree (10/-)	17½	17½	42/6	..	4 2 6	Revo (10/-)	17½	17½	43/-	..	4 1 1	4 1 1
Crompton Parkinson Ord. (5/-)	20	22½	33/6	..	3 7 3	Reyrolle	12½	12½	73/9	+½	3 8 1	3 8 1
E.M.I. (10/-)	6	8	34/-	-2/3	2 7 1	Siemens Ord.	7½	7½	35/6	..	4 4 8	4 4 8
Elec. Construction	10	12½	58/-	+6d.	4 6 2	Strand Elec. (5/-)	7½	7½	8/9	+3d.	6 1 3	6 1 3
Enfield Cable Ord.	12½	12½	64/6	-6d.	3 17 8	Switchgear & Cowans (5/-)	20	20	19/-	..	5 5 1	5 5 1
English Electric	10	10	53/3	..	3 15 2	T.C.C. (10/-)	5	7½	22/6	..	3 4 8	3 4 8
Ensign Lamps (5/-)	25	15	21/3	..	3 10 8	T.C. & M.	10	10	56/-	+1/6	3 11 6	3 11 6
Ericsson Tel. (5/-)	22*	20*	56/3	..	1 15 7	TelephoneMfg.(5/-)	9	9	12/8	..	3 10 7	3 10 7
Ever Ready (5/-)	40	40	44/6	..	4 10 0	Thorn Elec. (5/-)	20	20	26/-xd	+6d.	3 17 0	3 17 0
Falk Stadelmann	7½	7½	35/-xd	+9d.	4 5 9	Tube Investments	20	20	98/-	-2/-	4 1 8	4 1 8
Ferranti Pref.	7	7	31/3	..	4 9 7	Vacric (5/-)	Nil	22½	19/3	+2/9	5 16 10	5 16 10
G.E.C.:						Veritys (5/-)	7½	7½	8/3	..	4 11 0	4 11 0
Pref.	6½	6½	34/-	..	3 16 6	WalsallConduits(4-)355	55	55	51/-	..	4 6 6	4 6 6
Ord.	17½	17½	96/6	-1/6	3 12 2	Ward & Goldstone (5/-)	20	20	28/9	..	3 13 6	3 13 6
						WestinghouseBrake	12½	14	80/-	+2/-	3 10 0	3 10 0
						West, Allen (5/-)	7½	7½	8/9	..	4 5 9	4 5 9

* Dividends are paid free of Income Tax.

Stocks and Shares (Continued from page 284)

which is higher than the yield available from British Insulated Cables, Callender's and Henley's. The Enfield Cable Company's 12½ per cent. dividend has been repeated for the past four years, before which the dividend was at the rate of 16¼ per cent. in 1938 and 1939, and 25 per cent. per annum in the four previous years.

The last new issue which the company made was in February, 1938, when 300,000 new ordinary shares were offered to the proprietors in the proportion of three new for every five old, free of charge.

Miscellaneous Matters

The effect of the lessened interest in semi-speculative issues can be seen by reference to Electric & Musical Industries, where the price, at 34s. is down by 2s. 3d. Pye deferred have gone back to 35s., E. K. Cole to 32s. 6d. and Cossor to 25s. 6d. Philco at 13s. 9d. are 6d. lower.

Lively dealings continue in Calcutta Trams, where the price gave way abruptly to 68s., to rally almost as sharply to 70s. 6d. Conflicting estimates continue to be made of the price which the Corporation of Calcutta

may be expected to pay for the undertaking. Of the other Indian industrials, Calcutta Electric Supply at 48s. 6d. and Madras Electric at 32s. are sympathetically influenced by the dullness prevailing elsewhere. De la Rue at 9¼ are easier. Ultra Electrics have been changing hands at 9s.

High Prices Imply Confidence

So far from prices of shares in the industrial group giving way, as they have done in New York, the opposite is the case in the London market. The significance of the meagre yields that industrial shares afford lies in the measure that they demonstrate of the confidence felt with regard to the post-war outlook.

The leading industrial shares quoted in our price lists furnish ample illustration of this confidence. Prices of ordinary shares in the front-rank companies, as our tables show, stand at levels which give little more than a gilt-edged yield, on the basis of dividends now being paid. Were there to be any doubt felt as to the result of post-war conditions, our price-lists would present a very different appearance from that which they exhibit to-day.

NEW PATENTS

Electrical Specifications Recently Published

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

AUTOMATIC Telephone & Electric Co., Ltd., P. N. Roseby and J. F. Mackenzie.—“Electric signalling systems.” 1067. January 21st, 1943. (563218.)

British Thomson-Houston Co., Ltd.—“Protective systems for electric traction motors.” 14028/42. October 8th, 1941. (563177.) “Current-limiting means for electric discharge devices.” 484/43. January 16th, 1942. (563188.)

British Thomson-Houston Co., Ltd., and J. R. Mortlock.—“Earth-leakage AC electric protective arrangements.” 1363. January 27th, 1943. (563194.)

Brush Electrical Engineering Co., Ltd., A. E. Harrison and A. Forsyth.—“Reversing gear of internal-combustion engines.” 1627. February 1st, 1943. (563250.)

A. L. Cianchi.—“Magnetically-operated switches for controlling a sequence of operations.” 15130. October 28th, 1942. (563129.)

Davey, Paxman & Co., Ltd., and E. P. Paxman.—“Fuel injector devices for internal combustion engines.” 6488. April 22nd, 1943. (563163.)

W. H. Devine.—“Overhead conductors of electric transport systems.” 6353. April 21st, 1943. (563154.)

Electro Metallurgical Co.—“Chromium steels.” 1515/43. February 4th, 1942. (563249.)

English Electric Co., Ltd., and E. A. Binney.—“Resilient torque-transmission couplings.” 1362. January 27th, 1943. (563140.)

English Electric Co., Ltd., and E. H. H. Hassler.—“Shaft bearings.” 4815. March 24th, 1943. (563153.)

E. G. Greville and H. W. Grover.—“Apparatus for enabling high-tension unidirectional current to be obtained from a low-tension direct-current supply.” 6327. April 20th, 1943. (563256.)

Hazeltine Corporation.—“High-frequency signal-translating system.” 1416/43. March 3rd, 1942. (563146.)

P. Holmes and Metropolitan-Vickers Electrical Co., Ltd.—“Removal of enamel coverings from metallic members.” 1771. February 3rd, 1943. (563253.)

Holophane, Ltd. (D. H. Tuck).—“Lighting systems and lighting units for use therein.” 5475. April 22nd, 1943. (Convention date not granted.) (563162.)

C. G. Lemon and Tenaplas, Ltd.—“High-frequency cables.” (Cognate applications 645/43 and 5245/43.) February 1st, 1943. (563251.)

Limit Engineering Co., Ltd., and A. L. Collins.—“Commutators for electric motors

and the like.” 2315. February 11th, 1943. (563228.)

M. & C. Switchgear, Ltd., and R. Morrison.—“Glands for electric cables.” 16751. November 25th, 1942. (563132.)

Marconi's Wireless Telegraph Co., Ltd.—“Piezo-electric crystals and supports therefor.” 1347/43. July 5th, 1941. (563139.)

“Frequency modulator.” 6571/43. April 27th, 1942. (563205.) “Monitoring and measuring apparatus for frequency modulation signals.” 3364/43. February 27th, 1942. (563237.)

Ozonair, Ltd., and E. F. W. Cowell.—“Electrical dust-precipitation apparatus.” 2471. February 15th, 1943. (563230.)

P. Peillon, N. Sarruf and L. Castro.—“Electric arc welding.” 18626. December 31st, 1942. (563216.)

Proctor & Schwartz, Inc.—“Electrically-heated cooking apparatus.” 3485/43. March 11th, 1942. (563238.)

Revo Electric Co., Ltd., and F. H. Reeves.—“Universal fixture mounting for trough lighting fittings.” 1763. February 3rd, 1943. (563224.) “Electric lamp reflector fittings.” 2853. February 20th, 1943. (563231.)

Sangamo Weston, Ltd.—“Electrical resistance elements.” 6525-6/43. July 1st, 1942. (563203/4.)

W. Sharp.—“Snap-action electric switches.” 3263. February 27th, 1943. (563235.)

Siemens Electric Lamps & Supplies, Ltd., and H. Austin.—“Manufacture of luminescent materials.” 18404. December 28th, 1942. (563185.)

Siemens-Schuckert (Great Britain), Ltd., and A. B. White.—“Automatic temperature control of electrically-heated apparatus.” 13884. October 2nd, 1942. (563176.)

Simms Motor Units, Ltd., and W. Bryan.—“Supercharging the high-tension electrical ignition system of an internal-combustion engine.” 16201. November 16th, 1942. (563131.)

Standard Telephones & Cables, Ltd.—“Grid electrode constructions.” 3163/43. April 7th, 1942. (563234.)

Standard Telephones & Cables, Ltd., and M. M. Levy.—“Thermionic valve circuits.” 1532. January 29th, 1943. (563220.) “Thermionic valve circuits.” 1538. January 29th, 1943. (563222.)

Standard Telephones & Cables, Ltd., and G. Newton.—“Chassis construction for mounting radio and like component parts.” 1457. January 28th, 1943. (563197.)

Western Electric Co., Inc.—“Housings for apparatus employed particularly in submarine cable systems.” 6388/43. April 21st, 1942. (563158.)

Westinghouse Brake & Signal Co., Ltd.—“Electrical relays.” 1377/43. August 21st, 1942. (563141.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

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

Morpeth.—Tubular heaters, electric water boiler, refrigerator, etc., for conversion of Thomas Taylor Homes to hospital; county architect, County Hall, Newcastle-on-Tyne.

Newcastle-on-Tyne.—Corporation Health Committee. Refrigerating plant at the Newcastle General Hospital. Specification and form of tender from the City Architect, 8, Cloth Market.

Wolverton.—September 4th. Urban District Council. Electric pumping machinery. Plans, etc., from W. H. Radford & Son, Albion Chambers, King Street, Nottingham.

Orders Placed

Berwick.—Electric lighting extensions in connection with the adaptation of Castle Hills as a maternity hospital.—I. & E. Morton.

Glasgow.—Corporation Health Committee. Accepted. Bacteriological Laboratory:—Refrigerating plant (£145).—L. Sterne & Co.; centrifuge machine, electric incubators, water baths (£441).—Thomson, Skinner & Hamilton. Food mixing machine, complete with motor, etc., for Gartloch Hospital (£183).—Hobart Mfg. Co.

Municipal Transport Committee. Accepted. Carbon brushes.—Morgan Crucible Co. Asbestos covered wire.—B.I.C. Gear cases (£2,512).—General Electric Co.

Oldham.—Town Council. Accepted. Strengthening and modification of "Rippled" control system.—Metro-Vick. Wiring and switchgear for lighting and power installations for Central kitchen, Hollinwood.—S. Charlesworth & Co.

Contracts in Prospect

Aspatia (Cumberland).—Factory; Cumberland Development Council, Whitehaven.

Barrow-in-Furness.—Temporary houses, for T.C.; borough surveyor.

Billingham-on-Tees.—Church, north of Billingham Station; Rev. F. C. Tymm.

Bucks.—Additional accommodation (£32,887). Peppard Sanatorium; county architect.

Campbeltown.—Temporary houses (78); burgh surveyor, County Buildings.

Chester.—Extensions, City Grammar School, for E.C.; city engineer.

Dunfermline.—Dormitory block at Combination Home and Hospital (£4,000); County Clerk, Cupar, Fife.

Glasgow.—School, Crompton Avenue, for Corporation; city architect.

Hindley.—Central kitchen, Hindley Green, for E.C.; surveyor, Council Offices.

Horsham.—Infants' school, Victory Road (£14,559), for West Sussex E.C.; county architect, Chichester.

Inverness.—Houses (20), Kessock Road, for Corporation.—J. S. Chisholm & Co., surveyors, 11, High Street.

Leeds.—Church; W. A. Freeborn, Christ Church, Manston Gardens.

Leicester.—Buildings (£14,421), for patients and nursing staff, at the City General Hospital, North Evington; city surveyor.

Macclesfield.—Wing, Macclesfield Infirmary; H. S. Fairhurst & Son, architects, 55, Brown Street, Manchester, 2.

Manchester.—New kitchens in infants' and junior mixed departments of New Moston Municipal School, Moston Lane; G. Noel Hill, city architect, Town Hall.

Houses (88). Winchester Furness, Kirkstall, Royston and Sherbourne Roads, Davyhulme; A. Locke, Ltd., builders, 130, Lostock Road, Davyhulme.

Matlock.—Twelve houses for pensioners, Cromford bus station; surveyor, Town Hall.

Newcastle-on-Tyne.—Repairs to electric lighting installations in Council houses; city architect, 18, Cloth Market.

Newcastle (Staffs).—Maternity home, Far Croft, Chesterton (£10,000); borough surveyor.

Newton-le-Willows.—Infants' and junior schools, Crow Lane East, for Lancashire E.C.; county architect, Fishergate Hill, Preston.

Rochdale.—Community centre, Kirk Holt Estate; borough surveyor.

Processing plant and dairy; United Co-operative Dairies, Ltd., Moss Lane.

Rotherham.—Central kitchen (2,000 daily meals); borough engineer, Town Hall.

Salford.—Offices, stores and workshop; H. Davies & Sons, Ltd., engineers, Worsley Street.

Salop.—Adult college and community house; county architect, 5, Belmont, Shrewsbury.

Sheffield.—Sleeping accommodation for nursing staff at City General Hospital (£3,000); city architect.

Stafford.—Houses (12), Dale Lane, Haughton, for R.D.C.; E. M. Coombs, architect, County Buildings.

Stockton-on-Tees.—Extensions, Robson Maternity Home, for T.C. (£3,000); R. W. Bell & Co., Ltd., builders.

Tyneside.—Demobilisation centre for Ministry of Works (£400,000).

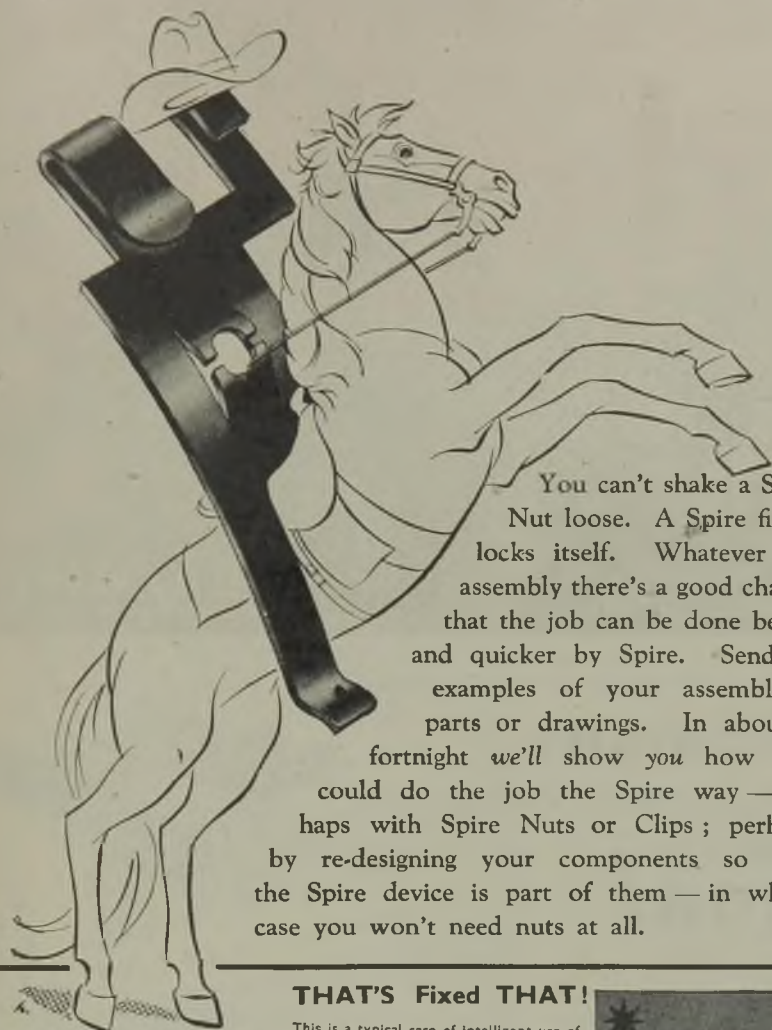
Warrington.—Extensions, Y.W.C.A. Club, Legh Street; Y.W.C.A., Great Russell Street, W.C.1.

West Riding.—Infants' school, Denison Road; Selby; county architect, County Hall, Wakefield.

West Sussex.—Junior technical school, Worthing, and school canteens, Pulborough and Camelside (£1,455); county architect.

Wigan.—Church, Beech Hill Estate; Rev. J. A. Lawton, St. Anne's Vicarage, Beech Hill, Wigan.

Workshop.—Additions, maternity wing, County General Hospital; county architect, Shire Hall, Nottingham.



You can't shake a Spire Nut loose. A Spire fixing locks itself. Whatever the assembly there's a good chance that the job can be done better and quicker by Spire. Send us examples of your assemblies; parts or drawings. In about a fortnight we'll show you how you could do the job the Spire way—perhaps with Spire Nuts or Clips; perhaps by re-designing your components so that the Spire device is part of them—in which case you won't need nuts at all.

THAT'S Fixed THAT!

This is a typical case of intelligent use of Spire fixing. This was originally a spring clamp which was screwed to its base with screw, washer and nut. Now the clamp is redesigned to incorporate its own Spire fixing, and the nut and washer have disappeared. Apart from the saving in material, it is a much quicker and simpler assembly job, the clamp is 'zipped' on to the screw and tightened firmly home. Designed as a fuse holder this fixing NS 1307 is suitable also for securing any cable, rod or circular equipment from $\frac{1}{4}$ in. to $\frac{3}{16}$ in. diameter.



Spire

* **A BETTER way of fixing**

Simmonds Aerocessories Limited · Great West Road · London · A Company of the Simmonds Group

DURATUBE & WIRE LTD.
FAGGS ROAD, FELTHAM, MDD5X.
Telephone, FELtham 3332 & 5805

DURAWIRE
YOUR ELECTRICAL WORK AND BE SURE

THE **RIGHT**
INSULATING VARNISH
FOR THE
JOB!



It is not always easy for the Electrical Engineer to decide which particular type of Insulating Varnish will give the best results. As makers of Insulating Varnishes for over half a century we may be able to help you in selecting the right treatment for the various electrical equipment you may have in production.

The **RIGHT** Insulating Varnish for **YOUR JOB** will be found in the new range of

“ARMOUR” BRAND INSULATING VARNISHES

Consult our Technical Department. Insulating Varnishes supplied to Government Specifications.

GRIFFITHS BROS. & CO., LONDON, LTD.
MACKS ROAD, BERMONDSEY, LONDON, S.E.16. BER. 1151



BRISTOL AND EKCO

"Ship-shape and BRISTOL fashion." No wonder the city soon took to the brightness of EKCO Lamps. Dealers knew the name stood for reliability, stocked them and now consistently sell them. Posters prominently sited in Bristol and other great cities, together with consistent newspaper advertising, are creating profitable business for stockists.

Write for full details to
E. K. COLE LTD., Lamp Sales Dept., Southend-on-Sea



CHURCHOUSE



Lighting Fittings
FOR
Merchant Ships

C. M. CHURCHOUSE LTD., CLARENDON WORKS,
CLARENDON CROSS, LONDON, W 11

The screw which
actually cuts a
STANDARD MACHINE SCREW THREAD



British Patents
Nos. 386083,
386895, 495194,
495252, 496445
others pending

"SHAKEPROOF"
THEY MAKE US BETTER
THREAD-CUTTING SCREWS

BARBER & COLMAN LTD. HARSLAND ROAD - BROOKLANDS
MANCHESTER TEL. SALE 2771 (3 LINES) GRAMS. "BARCOL" SALE

WRITE FOR CATALOGUE
E.R./110

ADASTRA
HIGH TENSION POLES

POLES LTD TYBURN RD ERDINGTON,
BIRMINGHAM. 24.

"DECO" Registered Design MIDGET

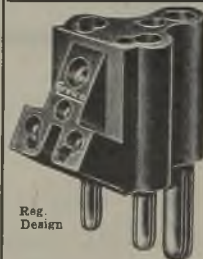


FABRICATED
SPRING CONTROLLED
RADIAL DRUM

to reel in 50 feet 1" diameter
4-core flexible T.R.S. cable.
Manufacturers of Cable Reel-
ing Drums, spring, power
driven, counterweighted,
direct coupled and hand
operated, to suit all applica-
tions where loose trailing
cables are employed.

DALYTE ELECTRICAL CO. LTD.

West Row, North Kensington, W.10
Telephone: LADbroke 3066



Grelco
MULTI-PLUG
ADAPTORS

ELEVEN TYPES

Fully illustrated descrip-
tive folder on application

Reg.
Design

Phone: Molesey 3000-1

GRELCO Ltd., 91-93 Stanley Road, Teddington, Middx.

Always Reliable

LONDON DEPOT

20, NEWMAN ST.

OXFORD ST. W.1

TEL. MUSEUM 3132/3

WORKS

THE UNION CABLE CO. LTD.

DAGENHAM DOCK

ESSEX

TEL. RAINHAM 25



UNION CABLES



TANGENT


"TANGENT" TELEPHONES are installed throughout the country in Government and Corporation Departments, Hospitals, Hotels, Cinemas, Offices, Factories, Mines, etc. Although our war-time activities limit their installation to priority requirements, we look forward to the time when we can satisfy the demand for them.

- TANGENT Products include

SOUND SIGNALS · LUMINOUS CALL SYSTEMS · STAFF LOCATORS · MINING SIGNALS · FIRE, BURGLAR AND BANK RAID ALARMS · TELEPHONES INTERPHONES · WATCHMAN'S CLOCKS · ELECTRIC IMPULSE CLOCKS AND SYNCHRONOUS CLOCKS · STRIKING, CHIMING AND TOLLING MECHANISM LIQUID-LEVEL INDICATING, RECORDING AND ALARM APPARATUS · IDLE MACHINE AND OUTPUT RECORDERS · SPECIAL APPARATUS

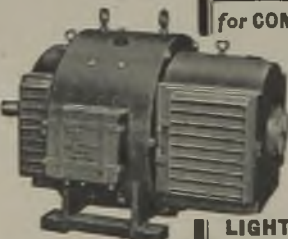
GENT & CO. LTD. *Faraday Works, LEICESTER*
LONDON · NEWCASTLE-ON-TYNE · GLASGOW · BELFAST · DUBLIN

GENTS'
OF LEICESTER
ESTAB. 1871

MAKERS OF ALL TYPES OF
**SYNTHETIC
 RESIN
 PAPERS**
 FOR THE MANUFACTURE OF LAMINATED SHEETS AND TUBES
**IMPREGNATED
 AND COATED**

BUTTERFLY BRAND
SAMUEL JONES & CO. LTD
 16/17 NEW BRIDGE ST. EC4 CENTRAL 6500

EEKO
PRODUCTS
 FIREBARS SPIRALS
 MICA - ELEMENTS
**HEATING
 ELEMENTS**
 The **ELECTRIC ELEMENTS Co.**
 NOTTINGHAM.

McCLURE & WHITFIELD
 MERSEY DYNAMO WORKS, STOCKPORT
 Telephone : Telegrams :
 STOCKPORT 3653/4 "MOTORS, STOCKPORT"
D.C. MOTORS
GENERATORS



for COMPRESSORS
 CRANES
 HOISTS
 PUMPS
 MACHINE
 TOOLS,
 etc.

LIGHTING SETS
 for
 Ships' Auxiliaries,
 Anodising and Plating,
 M.G. Sets.

London Office :
 Fulwood House, Fulwood Place
 High Holborn, LONDON, W.C.1
 Telephone : Telegrams :
 HOLBORN 1594. "TRIBORD, PHONE, LONDON"

Legg
**MANUFACTURING
 ELECTRICAL ENGINEERS**
 LEGG (Industries) LTD., WILLIAMSON ST., WOLVERHAMPTON
 WOLV. 57

YES A POWERFUL, ROBUST, SELF-SUSTAINING WINCH



Small text describing winch features: "Special small space winch or fork lifting, also special types..."

Also used for: Winches, Auto-lighting Hoists, Electric Lighting Fixtures in Works, Hotels, etc., Escapement, Cranes, Locomotives, Hoisting Lifting, Hoisting Slips, Street Lighting, A.S.P. Chain Racks, Railway Station Lighting, Mains, etc.

Phone: Uplands 4871/2
LONDON ELECTRIC FIRM, CROYDON.

NO RATCHETS, PAWLS, SPRINGS OR GEAR WHEELS

*It's all right!
It's one of ours!*



YARROW LAND BOILERS

YARROW & CO. LTD., SCOTSTOWN, GLASGOW.



A SPIDER has three sets of spinnerets, each with up to 100 spinning tubes, from which fluid silk issues and is spun to a thickness of $1/2000''$ or less

Fine Wires, insulated and covered, $8/100''$ to $1/1000''$, made and spun with all the latest and most modern machinery and materials, by a firm with a lifetime of experience in delicate textile coverings

FINE WIRES Ltd

NOTTINGHAM

Fine Wires Limited Grove Road Castle Boulevard Nottingham

PITMAN BOOKS

Aircraft Electrical Engineering

By F. G. Spreadbury, A.M.Inst.B.E. 21s. net

Electrical Measurements and Measuring Instruments

By E. W. Golding, M.Sc.Tech., A.M.I.E.E., M.A.I.E.E. Third Edition. 21s. net

The Telephone Handbook

By Joseph Poole, A.M.I.E.E. Revised by N. V. Knight, B.Sc., A.M.I.E.E., and W. Prickett. Eighth Edition. 25s. net

Experimental Electrical Engineering

By E. T. A. Rapson, M.Sc.(Eng.), A.C.G.I., D.I.C., etc. Fourth Edition. 6s. net

Electric Wiring Diagrams

By W. Perren Maycock, M.I.E.E. Revised by H. C. Fabian. Third Edition. 6s. net

Dictionary of Electrical Terms

By S. R. Roget, M.A.(Cantab), A.M.Inst.C.E., A.M.I.E.E. Fourth Edition. 12s. 6d. net

Some of the books advertised may be temporarily out of stock when you place an order. If you have any difficulty in obtaining copies of Pitman Books through your bookseller, write to Enquiry Department, Pitman House, Kingsway, W.C.2. Please do not send money when making enquiries.

PITMAN BOOKS

**FOR TRAM & TROLLEY WORK
FOR CABLE CONSTRUCTION & REPAIR
FOR USE IN CHEMICAL FACTORIES**



P & B
INSULATING
TAPE

P & B Insulating Tape retains its adhesiveness and offers permanent resistance to mechanical damage. It is proof against water and the fumes of acids and alkalis. Extensively used for motor leads, trolley poles, and wrapping machine cables in mines. Supplied in rolls from $\frac{1}{2}$ " width upwards. Write for samples and prices.

THE RUBEROID CO. LTD.

92 Commonwealth House, New Oxford Street, W.C.1



RECORD

'MINOR' TEST SET FOR INSULATION TESTING

You could not have a more reliable or more convenient test set than the "Record Minor." Made with the high "Record" precision, this compact unit gives direct and dead accurate readings independent of voltage variation. The case is of reinforced bakelite, size $5\frac{1}{2}'' \times 3\frac{1}{2}'' \times 3\frac{1}{2}''$, with clear open scale 5,000 ohms to 20 megohms. Weight only 3 lb. Height allows full swing of handle. A free handle is fitted to prevent the generator being turned in the reverse direction.

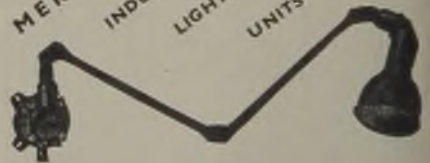
RECORD ELECTRICAL CO. LTD.

BROADHEATH · ALTRINCHAM · CHESHIRE

Tel.: Altrincham 3221/22. Grams: "Insulon," Altrincham

London Office: 28, Victoria Street, S.W.1.

MEKELITE
INDUSTRIAL
LIGHTING
UNITS



MEK-ELEK Engineering Ltd.

17 Western Road, Mitcham, Surrey

SAXONIA

ELECTRICAL WIRE CO. LTD

GREENWICH · S.E.10

TELEGRAMS: "SAXONIST" LONDON TELEPHONES: GREENWICH 0485 & 1872

THE HOUSE FOR
QUALITY AND SERVICE
ESTABLISHED 1895

Silk and Cotton covered Wires
Copper Strands and Braids
Non-rubber Flexibles

PULTRA
MANCHESTER

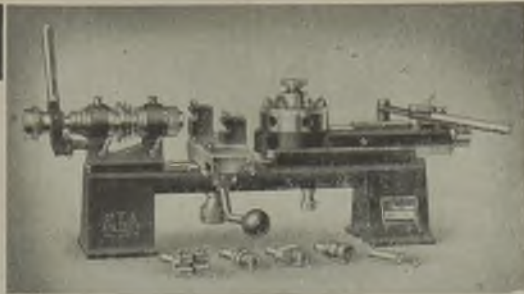
MICRO-LATHES

MODERN SMALL
PRECISION
BENCH LATHES

for

WATCH, CLOCK, AND
INSTRUMENT WORK
METER TEST ROOM
& REPAIR WORK, ETC.

British made to highest
International Standards



Micro-Capstan Lathe Model **HU 42**

Centre Height: 50 mm. Spindle Bore: 10 mm.
Speed Range: 400 r.p.m. to 6,000 r.p.m. for
motorised model.

MANY ACCESSORIES AVAILABLE

We are always ready to advise upon the adapta-
tion of Pultra Lathes to meet special requirements

Write for Catalogue CA 4

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

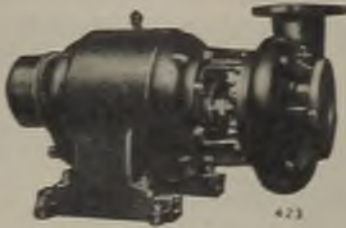
ELECTRICAL APPLIANCES

Dowsing's

enjoy the prospect of
presenting in-
teresting de-
velopments in their domestic and
industrial appliances to the post-
war world.

Metal, Glue and Wax
Pots : Industrial Cord
and Cordless Electric
Irons of all types:
Special Heating Ap-
pliances to Individual
Requirements : Brand-
ing, Soldering and
Domestic Appliances.

DOWSING COMPANY (ELECTRICAL MANUFACTURERS) LIMITED
Kangley Bridge Road, Lower Sydenham, London, S.E.26



Mopump

A

**Motor - Driven
Pump**

in unit construction suitable for general Water Service

Boosting low pressure supplies Pumping oils and chemicals

RHODES, BRYDON & YOUATT LTD.
Stockport London office: 22, VICTORIA STREET, S.W.1 England.



*Stake YOUR
claim now - others have*

We are already discussing with a few wise manufacturers the part we shall play in their post-war schemes. These are firms who have known us in the past and value our adaptability and reputation for tackling problems.

If your post-war plans need dependable sources of supply of presswork, components, welded assemblies, small machined parts and also things we have not previously manufactured, why not stake a claim on our services now, by admitting us to a confidential discussion on your plans?

**GIRDEX COMPONENTS
ASSEMBLIES**

GIRDEX ENGINEERING COMPANY LIMITED
WESTON LANE, TYSELEY, BIRMINGHAM, 11

MOULDED HANDWHEELS



STANDARD SIZES IN
BAKELITE 1½" - 7"

Saves Metal and Machining Time
Improves Appearance, Costs Less

LEAFLET FROM

**RAY ENGINEERING
CO. LTD.**

Southmead

Bristol

SCREENING & PROTECTION
OF CABLES



WITH
"PRANA"
WOVEN WIRE ARMOURING
FLEXIBLE - DURABLE - ECONOMICAL
Write for booklet to Dept. 52
SPARKLETS LIMITED
LONDON, N.18

Sand CASTINGS

FROM A FEW OUNCES TO ONE TON
IN ALL NON-FERROUS
METALS INCLUDING
HIGH TENSILE BRONZES
AND ALUMINIUM
SMALL - CAST RODS AND TUBES



TRIONITE LTD.

TRIONITE WORKS, CLIFFE VALE - STOKS-ON-TRENT

SAVE RUBBER — use



Stocks available at all
Crompton Depots

Full particulars from

CROMPTON PARKINSON LIMITED, ELECTRA HOUSE, VICTORIA EMBANKMENT, LONDON, W.C.2, or Branches

ATLAS ELECTRIC BUTT WIRE WELDING MACHINE

(PATENT APPLIED FOR)



Capacity : Standard machine welds wires 0.026" to 0.125" diameter and if specially ordered for wires 0.012" diameter to 0.25" diameter.

Suitable for welding steel, copper, nickel, tungsten, brass, molybdenum, etc.

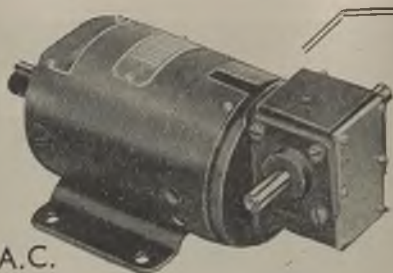
During the last few years, the Lamp, Valve and Wire Industries have been endeavouring to obtain a Welder capable of quick and accurate production.

The "Atlas" Electric Butt Wire Welding Machine has been developed and is an equipment of outstanding performance.

The machine does not require a skilled operator, excellent production being obtained by unskilled labour : one operation only completes a weld, and welds between 500 and 900 per hour may be obtained.

ENGINES & ELECTRICS LTD.

3 St. James's Square, London, S.W.1



A.C.

D.C.

UNIVERSAL "FRACMO"

FRACTIONAL H.P. MOTORS AND GEARED UNITS

Delivery of urgent priority orders as follows :—

- 1/150th—1/30th h.p. . . 5-6 weeks
 - 1/20th—1/8th h.p. . . 6-7 weeks
- 6-250 volts

FRACTIONAL H.P. MOTORS LTD.

ROOKERY WAY, HENDON, N.W.9
COLINDALE 8022-3

BABY TORCH CASE

RECHARGEABLE BATTERIES

IDEAL FOR THE POCKET OR IN A LADY'S BATHING BAG

RECHARGEABLE BATTERIES

RECHARGEABLE BATTERIES

General Lighting Equipment Co. Ltd.

TORCH CASE MANUFACTURERS

11 Singer Street Chambers, Singer Street
LONDON, E.C.2

Telephone

CLERKENWELL

7744/5

G.A.RIX

Tel. 2420 & 2863

GRAMS : RIX, KEIGHLEY

VICTORY WORKS, KEIGHLEY

MOTORS
1/10 to
5,000 H.P.
and
TRANSFORMERS

REWINDING SPECIALISTS

PRICE LIST ON APPLICATION

"B-W" INDUSTRIAL OVENS

Electrically Heated

WITH AUTO-CONTROL
"B-W" OVENS are speeding-up and economising production in the Aircraft, Electrical, Radio and other Industries. Several standard sizes. Specials to requirements.

Write for leaflet OV/ER

BARLOW-WHITNEY LTD.
COOMBE RD., NEASDEN LANE
LONDON, N.W.10.

Telephone : Gladstone 1152/3





PERMANENT MAGNETS

For over 40 years we have been making permanent magnet alloys. To-day we are equipped to handle competently any problem of magnet design, manufacture and supply. A comprehensive research and advisory department exists at our works, and is at the service of those with specific magnet application problems.

Write for Permanent Magnet Booklet, naming firm and position, to—

EDGAR ALLEN & CO. LTD.

IMPERIAL STEEL WORKS

SHEFFIELD · 9



TENAPLAS

ELECTRICAL
INSULATION

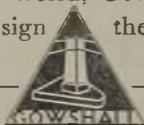


A
TENAPLAS
PRODUCT

TENAPLAS LTD., 7 PARK LANE, LONDON, W.1



Whatever form the new roads take in the post-war world, Gowshalls will be ready to sign them as before




GOWSHALL LIMITED

Manufacturers of Road Direction Signs

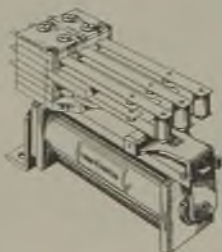
ST. PAULS STREET, WALSALL, STAFFS.

and at 14/15 LAMB'S CONDUIT PASSAGE, LONDON, W.C.1

A TUBE INVESTMENTS  GROUP COMPANY

INSTANTA

DESIGN AND
MANUFACTURE



BRITISH TO
THE CORE

RELAYS

Universal A.C. or D.C. Silent Operation. Fully TROPICAL, Shockproof Insulation. Low Power Factor under moist conditions. High Switching Capacity, low consumption. Coils Continuously rated 2 to 1000 volts. Multiple contact assembly, silver contacts. Universal Mounting bracket, weatherproof casing if desired. SEND FOR ILLUSTRATED LIST G.P.101/A.

INSTANTA ELECTRIC LTD.
VILLAGE WAY, PINNER, MIDDX.

TELEPHONE: PINNER 4932/3

NETTLE

ELECTRICAL PRODUCTS



LAMP-
HOLDERS
OF
ALL
TYPES

CEILING
ROSES
WITH
PORCELAIN
INTERIORS

VICTOR H. IDDON LTD.
Wythenshawe, Manchester

Telephone: WYT 2291 and 2292



KLAXON PERMANENT CAPACITOR INDUCTION MOTORS

85/-

each
with
condenser

Constant Speed, 1375 R.P.M.,
1/100th H.P., 220/240 volts, single
phase, 50 cycles, 3 lead reversing
type, which can be reversed by
single pole change-over switches.

DELIVERY FROM STOCK.

L. WILKINSON

"Electric House," 204 Lower Addiscombe Rd., Croydon

AUTOMATIC VOLTAGE, CURRENT AND SPEED REGULATORS

COX-WALKERS LTD.
COXPAN DARLINGTON

**The Sign of Service
with Efficiency** ↓

HALSEY'S

ELECTRIC CO. LTD.

WHOLESALE ELECTRICAL DISTRIBUTORS

Comprehensive stocks of E.L.M.A. Lamps, Switchgear
of every description, Cables, Conduits, Fittings,
Accessories, etc. . . . Delivery in Greater London
by our own transport

HALSEY'S ELECTRIC CO. LTD.

10 LOWER GROSVENOR PLACE, S.W.1

Telephone: Victoria 5762-7

TRADE COUNTER NOW OPEN AT ABOVE ADDRESS

Branch Depot:—24 GREAT EASTERN RD., STRATFORD, E.15. Phone: Maryland 4336-8

POWER TRANSMISSION BY KENYON

**Don't
Wait-
Plan
Now**

Write to our
Planning Department

IN conjunction with well-known manufacturers of electrical and power transmission machinery, we have formulated complete data and specifications of power transmission appliances for factory equipment.

THE Kenyon service advises impartially on main drives, group and individual machine driving, incorporating the most suitable motors and all ancillary millwrighting.

WE shall be pleased to conduct, without obligation, a complete survey and scheme for the smallest to the largest installation.

**WM. KENYON & SONS LTD.
DUKINFIELD . CHESHIRE**



SKEF

Double Row Self Aligning Ball
Single Row Deep Groove Ball
Double Row Self Aligning Roller
Single Row Cylindrical Roller
Taper Roller

BEARINGS

THE SKEFKO BALL BEARING CO..
LUTON · BEDS

PROVED SWITCHGEAR . . . These two Crompton

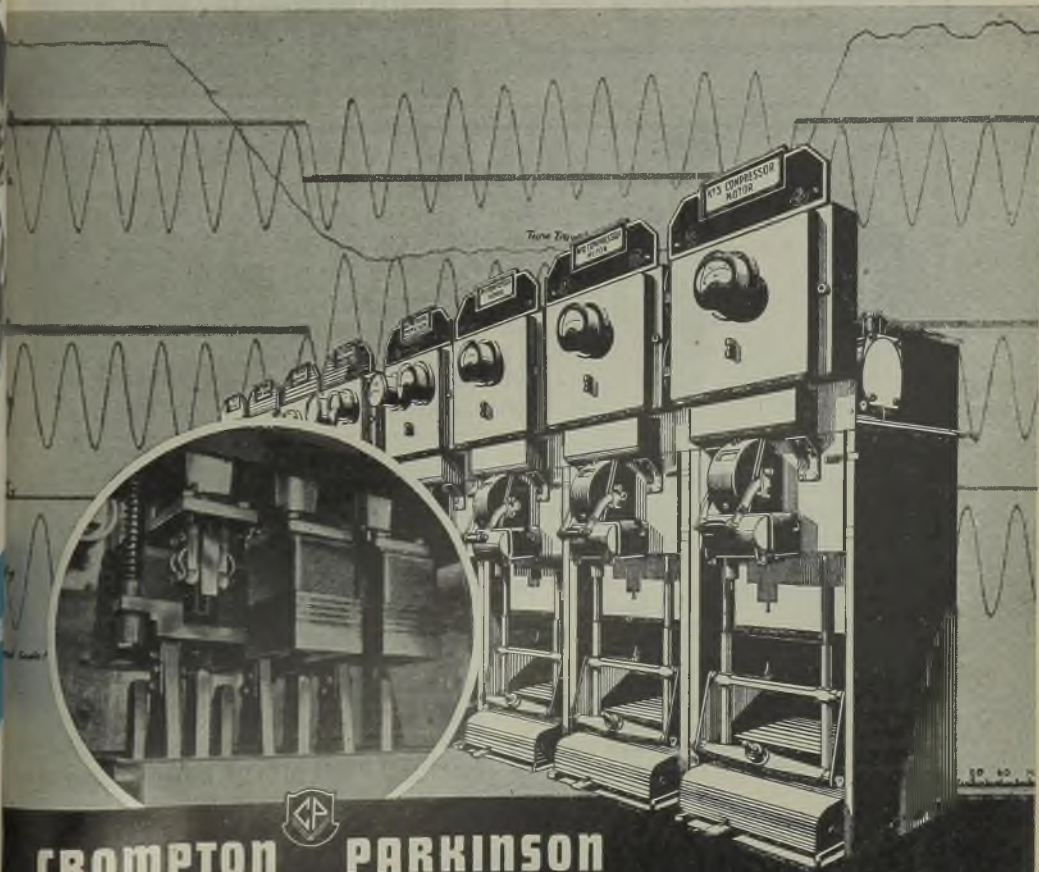
4-panel Switchboards, Type M.C.B.1. are certified by A.S.T.A.

Certificate No. 566. The rating is 100 M.V.A. 6.6 kV. The

arc duration at 10% rating is .03 second and at 100% .019

second maximum. ★ *Crompton Switchgear is proved*

in the Crompton Short-Circuit Testing Station.





**B. A. and B. S. F. NUTS, BOLTS
and SCREWS
STUDING & ALL THREAD STUDS**

LARGE STOCKS — PROMPT DELIVERIES

TELCO LTD. *Makers of
TELCOMATIC
Machine Tools*

41 GORDON SQ., LONDON, W.C.1

Telephone: Euston 1467/8

93-15

Denso
PERMANENTLY PLASTIC
PROTECTION

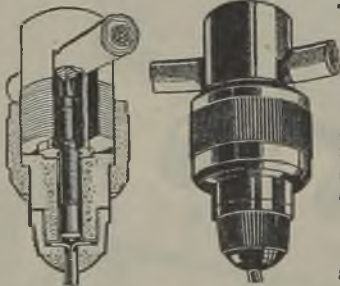
They shall not pass!
that is the motto of Denso,
where damp and all types of
chemical action are active.



Write for Specification and Price List.

WINN & COALES LIMITED,
Terminal House, Grosvenor Gardens,
LONDON, S.W.1.

Telephone & Telegrams: SLOANE 6264.



The FLASH "H" CONNECTOR

The LAST WORD in Cable Connecting.
Attached to Live Lines WITHOUT DANGER.

Connection made in a few minutes. No damage to Cables.
High rupturing capacity fuse at tapping point. No joints
to be soldered. Re-fused in one minute. Made to accom-
modate six sizes of cable. Fitted with 5, 10 or 15 amps.
H.R. Fuse. 30-amp. size also made.

RICH & PATTISON

81 JAMAICA ROW, BIRMINGHAM 5. Tel.: Midland 0153-4-5

-Immediate Deliveries!

"Triumph" Fuses are in stock,
for Switchboard and Busbar
Mounting, in all ratings from
5 amps. 250 volts to 300 amps.
500 volts.
Prompt deliveries of all types of
Distribution Boards, including
H. R. C.

The only Rewirable H.O. Fuses
incorporating both pressure self-
aligning contacts and vented
explosion chamber in base.

Sole Patentees and Manufacturers:—

The Castle Fuse & Engineering Co. Limited
Castle Works, 31/35 Chester Street, Liverpool 8
Phone: Royal 1610. Grams: "Corundum, Liverpool"



FOR
MAINS
OR
"LOW"
VOLTAGE

E.D.L.

INDUSTRIAL LOCAL LIGHTING UNITS



ELECTRIC DEPOT LTD., 114 PRITCHETT ST., B'HAM

Low Loss



The Highland Laddie seems to object to any loss, but even an insulation engineer likes to keep his losses as low as possible. So when a low loss machinable material is required which will stand up to 400° C. he naturally turns to MYCALEX.

Power Factor (1 meg & over) .002	Tensile Strength (lbs./sq. in.) 5,800
Permittivity 6.7	Water Absorption Nil.
Electric Strength (volts/mil) 550	Plastic Yield 450° C.

Send for illustrated brochure

MYCALEX COMPANY LIMITED • CIRENCESTER • GLOS.

SK45



These approved and certified Conduits and Fittings are consistently reliable under the most arduous conditions of service. You can specify none better.

HILDICK & HILDICK
WALSALL TUBE WORKS
PLECK ROAD · WALSALL · PHONE WAL 2123

London Stores: 8 Howland Mews West, Howland St., W.1. Phone: Museum 6225



HART ACCUMULATOR CO. LTD.

MARSHGATE LANE, STRATFORD, LONDON, E.15

Telephones: MARYland 1361/3

Branches at

Birmingham, Bristol, Cork, Dublin, Glasgow, Manchester
Newcastle-on-Tyne • Nottingham and Westminster

HIGH SPEED*Revolution Counter*

Type A—Clockwise.	Type B—Anti-Clockwise.
Speed	4,000 R.P.M.
Number of figures	5
Height of figures	2 1/4 in.
Length of baseplate	4 in.
Height of Counter	1 1/2 in.
Width from centre to centre of lugs	3 3/4 in.
Weight of Counter	1 lb. 3 ozs.

MADE IN ENGLAND

**THE AUTOMATIC COIL WINDER
& ELECTRICAL EQUIPMENT CO., LTD.**
Winder House, Douglas Street, London, S.W. 1

Telephone: VICtoria 3404/4

A.I.D. APPROVAL, Part I

VIDAFLEX

INSULATING SLEEVINGS

We are large manufacturers of all types of sleeving, from raw material to finished product.

Vidaflex Products include—

Varnished & Unvarnished **COTTON SLEEVING**
Varnished & Unvarnished **SILK SLEEVING**
Varnished & Unvarnished **GLASS SLEEVING**

which comply to Air Ministry and other specifications. Deliveries from stock. Our Technical Department can assist you with the design of new types of sleeving for particular purposes, or on the use of our standard product.

London Representative: **NORMAN & CO.**, 55 Downs Road, Coulsdon, Surrey. Telephone: Downland 225.

Birmingham Representative: **F. G. GRIMES**, Coleridge Chambers, 177 Corporation St., Birmingham. Telephone: Central 3889

Price list and samples available on request.

JONES STROUD & Co. Ltd., VIDA MILLS, LONG EATON, NOTTS.
Telephone: Long Eaton 424 6

Dear Sirs,

BEVERLEY WORKS,
ALMA STREET,
BIRMINGHAM 6.

ALSO HOT STAMPINGS SPRINGS AND PRESSWORK.

Yours faithfully
REDFERN STEVENS LTD.

HBE ELECTRIC TIME SWITCHES

The HORSTMANN GEAR Co. Ltd.
ALBION WORKS, BATH, SOMERSET.

Telephone: Bath 7241 (3 lines).

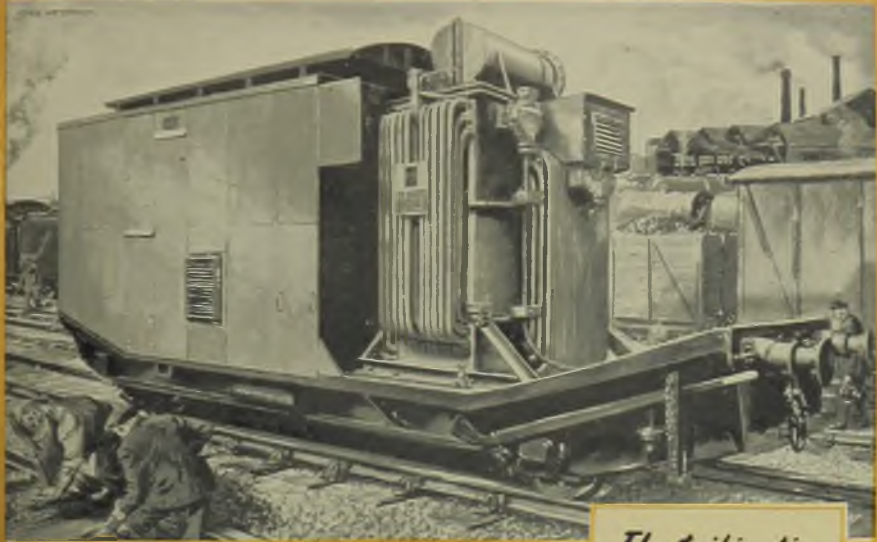
Telegrams: Horstmann, Albion, Bath

FUEL
ECONOMY
Switch off
when you
can.

G.E.C.

in war — as in peace —

at the service of the Empire



Electrification Schemes

An important example of how electrical inventiveness has served the needs of war, with equipment which will afterwards become of great service to industry generally when the war is won, is the Mobile Rectifier Substation.

During the war the vast G.E.C. technical and manufacturing resources are devoted to one purpose—providing equipment to help win the war quickly.

When peace comes, however, the important advances made by the Company in all applications of electricity, including electronics, as a result of the urgent and numerous problems arising from the needs of war, will be available to all concerned with reconstruction.

G.E.C. Electrification Schemes have been applied to all industries, including: Aircraft Factories; Chemical Works; Collieries; Food Factories; Gold Mines; Iron, Steel and Copper Works; Locomotive and Railway Carriage and Wagon Works; Motor Car Works; Ships and Shipyards; Textile Mills, etc., etc.

G.E.C. always in the forefront of electrical progress

THE GENERAL ELECTRIC CO. LTD.; MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

DISTRIBUTION PANELS FOR SUBSTATIONS

These typical Sub-station Distribution Panels built up with Henley standard tailless type units, show how readily any desired arrangement of fuses, instruments, etc., can be assembled on an angle iron framework, making a neat and compact assembly for installation in a Sub-station. We shall be pleased to put forward suggestions for panels to meet your particular requirements.



FIG. 1

Figure 1. Two Panels fitted with standard Tailless Units having Current Transformers for operating the instruments. The Instrument Panel contains an Ammeter with Selector Switch for reading the current in each phase a Voltmeter with Selector Switch and protective Fuses, three Maximum Demand Indicators and a Watthour Meter.

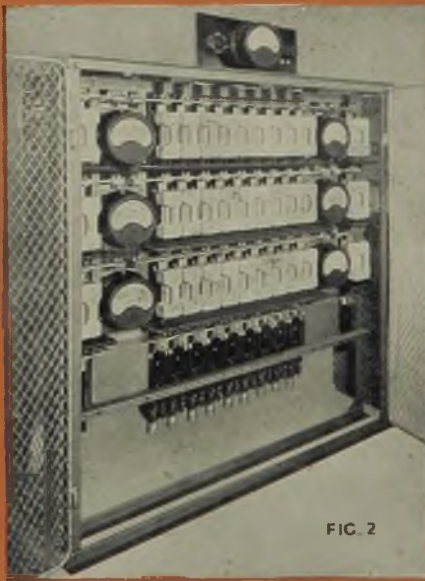


FIG. 2

Figure 2. A Henley Unit Panel fitted with two Feeder Units with direct-reading Ammeters connected in the busbars on the phases, and nine Distributor Units. The Voltmeter, with Voltmeter Fuses and Selector Switch, is mounted above the Panel and woven wire screens and doors are fitted.

HENLEY

UNIT TYPE DISTRIBUTION PANELS



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

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



Reliability in Domestic and Industrial Electrically Heated Appliances is assessed by the life of the element.

Manufacturers increasing their sales by reputation use "CROMALOY IV" Nickel-Chromium Alloy Resistance Wires

A. C. SCOTT & CO. LTD. CROMALOY HOUSE, CITY RD., MANCHESTER

dm 1129

We are moving
TO LARGER PREMISES

NOTE NEW ADDRESS
16 to 18
Russell Street
MANCHESTER. 1.

Rockman ENGINEERING CO., LTD.

Sole Makers of the Rockman Solder Gun



GRAMPIAN

'SOUND IN SOUND'

- ★ SPEAKERS
- ★ AMPLIFIERS
- ★ MICROPHONES

WHEN HAPPY DAYS ARE HERE AGAIN

Tel: FELtham 2657-8



GRAMPIAN REPRODUCERS LTD., HAMPTON ROAD, HANWORTH, MIDDLESEX

ELECTRONIC DEVICES

*for
Science &
Industry*

G.E.C.

CATHODE RAY
TUBES ETC

Osram

Valves

Osram

PHOTO CELLS

A TYPICAL EXAMPLE OF AN ELECTRONIC APPLICATION

Valve amplifiers for all industrial purposes



So many occasions arise where considerable power is required to actuate mechanical devices from a source providing only a very small alternating voltage.

The Thermionic Valve Amplifier is an ideal means of providing this power. It is adaptable to cover a range of frequencies from that of the supply mains to the highest audio or radio frequency.

Examples of this are :—

- Automatic Alarms
- Machine Control
- Loud Speaker Announcements
- Stage Entertainment
- Traffic Control
- Vibration Testing

OSRAM valves have for years set a standard in power amplifying valves, where a high degree of reliability is essential.

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First post on Monday**, at Dorset House, Stamford Street, London, S.E.1.

THE CHARGE for advertisements in this section is 2/- per line (approx. 8 words) per insertion, minimum 2 lines 4/-, or for display advertisements 30/- per inch, with a minimum of one inch. Where the advertisement includes a Box Number there is an additional charge of 6d. for postage of replies.

SITUATIONS WANTED.— Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Original testimonials should not be sent with applications for employment.

SITUATIONS VACANT

None of the vacancies for women advertised in these columns relates to a woman between 18 and 41 unless such woman (a) has living with her a child of hers under the age of 14, or (b) is registered under the Blind Persons Acts, or (c) has a Ministry of Labour permit to allow her to obtain employment by individual effort.

BOROUGH OF GRAVESEND

Appointment of Borough Electrical Engineer and Manager

A PPLICATIONS for the above appointment are invited from engineers who are experienced in the management and administration of an electricity undertaking. Candidates must have been engaged in the business of electricity supply for an extended period and have had practical experience in the generation and distribution of electricity.

The salary will be in accordance with the Agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers, dated 9th July, 1941. The present salary according to the scale is £1,422 per annum, and this salary will be paid from the date of taking up duties.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the person appointed will be required to pass a medical examination.

Application forms for the appointment may be obtained from the undersigned and must be returned by Friday, 1st September, 1944.

Canvassing either directly or indirectly will disqualify.

H. H. BROWN,

Town Clerk.

4, Woodville Terrace,
Gravesend, Kent.
3rd August, 1944.

492

ELECTRICAL POWER ENGINEERS' ASSOCIATION

Appointment of Technical Editor and Director of Studies

THE National Executive Council invite applications for the combined appointment of Technical Editor of "THE ELECTRICAL POWER ENGINEER" and Director of Studies of the Correspondence Tuition Scheme of the Association.

Applicants should be Corporate Members of the Institution of Electrical Engineers or possess equivalent technical qualifications, should have had experience of the technical side of the Electricity Supply Industry and, in addition, experience of technical journalism. Industrial and teaching experience desirable, together with a background knowledge of trade unionism and industrial relationships.

Salary to commence £800 per annum.
The successful applicant will be required to pass a medical examination and to contribute to the Association's Pension Scheme.

Forms of Application to be obtained from the

General Secretary,

Electrical Power Engineers' Association,
102, St. George's Square,
London, S.W.1.

should be returned, endorsed "Technical Editor," not later than Friday, September 15th, 1944

539

REPLIES to advertisements published under a Box Number if not to be delivered to any particular firm or individual should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Letters of applicants in such cases cannot be returned to them. The name of an advertiser using a Box Number will not be disclosed. All replies to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. Cheques and Postal Orders should be made payable to ELECTRICAL REVIEW LTD. and crossed.

ROYAL BURGH OF STIRLING

Appointment of Electrical Engineer and Manager

A PPLICATIONS are invited from qualified electrical engineers, experienced in the management and administration of a small electricity undertaking.

Applicants must not be more than 45 years of age, unless the applicant has a transfer value under the Local Government Superannuation (Scotland) Act, 1937.

Applicants must be Corporate Members of the Institution of Electrical Engineers, with experience in all branches of the Electric Supply Industry, including the distribution of electricity, both on direct current and alternating current systems.

Conditions of Appointment may be had from the undersigned.

Applications, stating age, qualifications, training and experience, with twelve copies of not more than three recent testimonials, must be lodged with the undersigned on or before Saturday, 2nd September, 1944.

JOHN CLINK,

Town Clerk.

Stirling,
19th August, 1944.

544

LONDON COUNTY COUNCIL

A PPLICATIONS are invited for the undermentioned Principalships:—

1. Hackney Technical Institute, Dalston Lane, E.8.—Day and evening technical classes, with higher national certificate courses, and a junior technical day school for boys. Present salary scale £820-£50-£960 a year basic, plus war bonus.

2. South-East London Technical Institute, Lewisham Way, S.E.4.—Day and evening technical classes for men and women, including higher national certificate courses, and junior technical day schools for boys and girls. Present salary scale £980-£50-£1,200 a year, plus war bonus.

Apply to Education Officer (T.1), County Hall, Westminster Bridge, S.E.1, for particulars and application form(s), enclosing stamped addressed foolscap envelope. Canvassing disqualifies. Last day for the receipt of applications, 30th September.

533

GREAT NORTHERN RAILWAY COMPANY (IRELAND)

A PPLICATIONS are invited for the appointment of an Electrical Engineer, with practical and theoretical experience, as Assistant to the Company's Mechanical Engineer at Dundalk.

The commencing salary will be £500 per annum, and the position will be pensionable.

Applications, stating age, qualifications and full details of experience, accompanied by copies of testimonials, should be sent to the undersigned so as to be received not later than Wednesday, 30th August, 1944.

F. C. WALLACE,

Secretary.

Great Victoria Street Station,
Belfast.
12th August, 1944.

535

A SSISTANT Storekeeper (exempt or discharged), with knowledge electrical/radio equipment, required for American Company's King's Cross premises. Salary £4-£4 10s. per week according experience. Apply, giving full details age, etc., to—Box 545, c/o The Electrical Review.

ELECTRICAL Wholesalers require a Clerical Assistant, conversant with trade and materials as handled.—London Electrical Co. (Blackfriars) Ltd., Blackfriars Road, S.E.1.

ENSIGN Lamps Limited require Representative to take over and further develop sales connections throughout Sussex. The appointment is permanent and carries salary, commission and car expense payments. Applications in writing to—The Manager, Ensign Lamps Limited, 10, Kingston Hill, Surrey.

MANAGER to take complete control of electrical contracting section of large engineering business. Essentials—first-class technical qualifications, wide knowledge of installation design, estimating and general business experience (preferably in contracting field). Salary up to £1,500, according to qualifications. Good prospects. Applications held confidential. State age, education and detailed employment record.—Box 482, c/o The Electrical Review.

MOTOR Control Gear Designer, experienced in small and medium size apparatus, required in Birmingham. State age, experience and salary required. Apply—Box 6153, c/o The Electrical Review.

OVERSEAS Employment. Sudan Railways require the services of an Electrical Foreman. Candidates should have served a full apprenticeship with a reputable firm and should have had a good general experience in the maintenance of both A.C. and D.C. distribution and of motors and equipment. Diesel Power Station experience an advantage. Selected candidate will be appointed for two years on Short Term Contract. Salary £E.400-500 per annum according to age, qualifications and experience. (£E.1 = £1 Os. 6d.). There is no income tax in the Sudan. Full particulars will be supplied to candidates considered suitable for interview. Written applications (no interviews), giving the following essential details:—(1) Full name, (2) Date of birth, (3) National Service Registration number, (4) Local Office shown on address side of Registration card N.S.2, (5) Medical grade if known, (6) If discharged from the Forces, particulars of Service number, rank, unit, and reasons for discharge, (7) Industrial training and experience, (8) Name and address of present employers, (9) Details of present work, should be sent to The Secretary, Overseas Man Power Committee (Ref. 374/2), Ministry of Labour and National Service, Alexandra House, Kingsway, London, W.C.2. Applications will not be acknowledged.

PERSONNEL Manager. Established firm, 1,800 employees, require experienced man capable of handling engagement of labour, labour returns, deferment cases, applications for release and appeal cases, apprenticeship scheme, etc. Knowledge of the Essential Works Order, Factory Acts, working conditions and rates of wages under Engineering Federation agreements essential. Applications treated in confidence. Apply—Box 526, c/o The Electrical Review.

REQUIRED. Estimator for electrical contractors, Oxford. Must have knowledge of consultants' and Government department specifications, plans, etc., and be capable of preparing complete electrical installation schemes. State age and experience and reply to—Box 541, c/o The Electrical Review.

REQUIRED immediately for Municipal Power Station in S.W. England, the following Shift Operation Staff: Turbine Drivers, 25.87d. per hour; Assistant Turbine drivers, 24.34d. per hour; Boiler Firemen, 25.24d. per hour; Assistant Boiler Firemen, 24.01d. per hour; Ash Conveyor Attendants, 23.96d. per hour. The positions are permanent and pensionable for suitable men, and a medical examination is necessary. Previous similar experience is required in all cases. Applicants must ascertain their position regarding release from present employment. In view of the acute housing shortage in the area, successful applicants who, as a result of taking up one of these appointments, have to maintain two homes, will, during the period of hostilities, and whilst awaiting a house, be paid lodging allowances on the Ministry of Labour scale.—Box 498, c/o The Electrical Review.

SALES Representative, permanent progressive position for man with personality and good experience of electrical contracting industry, London and South. Full particulars, experience, salary, etc.—Box 6131, c/o The Electrical Review.

TECHNICAL Manager required for design section of firm manufacturing F.H. and H.F. Motors, good theoretical electrical qualifications necessary and practical experience of F.H. motors very desirable, good prospects for right man. Applications in confidence. State age, education, experience and salary required.—Box 532, c/o The Electrical Review.

WORKS Manager wanted for Electrical Instrument Works, fully experienced in modern production methods and labour control. Essential work with excellent post-war prospects. Write—Box 505, c/o The Electrical Review.

APPOINTMENTS FILLED

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

SITUATIONS WANTED

A Constructional Engineer (37), with 19 years' experience with supply companies and contractors engaged on overhead and underground electrification, erection of substation equipment, cable jointing, surveying, office routine, control of labour, etc., seeks progressive position. Free now—Box 6160, c/o The Electrical Review.

A and administrative qualifications, 8 years' practical and administrative experience, design, testing and installation of aircraft electrical and mechanical apparatus, desires contact substantial concern, interested progressive ideas. Write—Box 6174, c/o The Electrical Review.

EDITORIAL Dept.: Electrical Engineer, recently invalided from Services, desires settlement in permanency. S. Midlands, Central or N. London. House journal and/or articles for technical press, advertising. Age 40, over 20 years' experience of wide variety of electrical works. Trained supply co. and manufacturer. £500-£600 per annum.—Box 6150, c/o The Electrical Review.

ELECTRIC Lamps, associated products and components. Production specialist, with wide experience seeks post in executive capacity.—Box 6152, c/o The Electrical Review.

ELECTRICAL Engineer (A.M.I.E.E.), 18 years' managerial experience, seeks responsible post on Technical Sales Staff in Manchester district. Would consider representation on agency basis. Replies treated confidentially.—Box 6132, c/o The Electrical Review.

ELECTRICAL Engineer, age 52, seeks supervising position or charge of factory plant, long experience with D.C. and A.C. layouts for power and lighting, highest testimonials.—Box 6161, c/o The Electrical Review.

ELECTRICAL Engineer, M.I.E.E. (exempt), transmission, distribution, L.T.—132 kV, construction, administration, executive and consulting experience, requires position offering post-war prospects. Available month's notice.—Box 6130, c/o The Electrical Review.

ELECTRICAL Engineer (31), industrial power installations and maintenance O.H. lines and substation erection (ten years), area management for rural undertaking (five years), executive position in Ministry (three years), desires appointment to permanent progressive position.—Box 6151, c/o The Electrical Review.

ENGINEER, age 39, general distribution experience, knowledge of generation, specialised experience of measurements, testing and protected gear, A.M.I.E.E., seeks change.—Box 6127, c/o The Electrical Review.

F.H.P. Motor and Ancillary Equipment Specialist (40), 21 years' comprehensive experience, energetic and enthusiastic, desires responsible managerial post, either sales or works.—Box 6108, c/o The Electrical Review.

LONDON B.Sc., age 37, seeks a managerial position, experienced generation and distribution, industrial research, mass production of radio components and general management.—Box 6149, c/o The Electrical Review.

LONDON Electrical and Mechanical Engineer desires change to country or provincial town, 25 years' practical experience, used to controlling labour, good organizer, married, 44 years of age, good accommodation required.—Box 6159, c/o The Electrical Review.

YOUNG Engineer, 27, exempt military service, requires responsible position with London firm. Technical qualifications including Higher National Certificate and 8 years' experience.—Box 6162, c/o The Electrical Review.

FOR SALE

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

ARC WELDING MACHINES FROM STOCK

We offer our latest type No. 2 Max-Arc Welder for immediate delivery, 15/250 amps. Operates off any A.C. supply voltage. Send for details.

MAX-ARC WELDERS LTD.,
190, THORNTON ROAD, CROYDON.
THORNTON Heath 4276-8.

GEORGE COHEN. SONS & CO. LTD.

for
**GUARANTEED ELECTRICAL
 PLANT.**

**MOTORS, GENERATORS,
 SWITCHGEAR,**
 etc.

WOOD LANE, LONDON, W.12.
 Telephone: Shepherds Bush 2070
 and

STANNINGLEY, NEAR LEEDS.
 Telephone: Pudsey 2241.
 Established 1834.

REBUILT 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 1,000 RATINGS ACTUALLY IN STOCK HERE.

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.

WATER TUBE BOILERS IN STOCK

Two 12,000 lbs. evaporation, 200 lbs. W.P.
 One 12,000 160

We install complete, including brickwork. Economisers, Pumps, Piping Valves, Generating Sets and Motors in stock. Please send us your enquiries; we can give immediate delivery.

BURFORD, TAYLOR & CO. LTD.,

Boiler Specialists, Middlesbrough.
 Telephone, Middlesbrough 2622.

BURDETTE & CO. LTD.

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

STONHOUSE STREET, CLAPHAM, S.W.4.

Day and night service. MACaulay 4555.

ECONOMISERS IN STOCK

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

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

LICENCES IN PRACTICE
 (No. 1) Order, 1943, Ministry of Supply
 Control of Industrial Elec. Equipm.

Our daily experience when selling

**ELECTRIC MOTORS * GENERATORS
 TRANSFORMERS * GENERATOR-SETS**
 etc.

makes us familiar with the ruling of this Order, thus enabling us to minimise inconvenience and delay for purchasers.

Ask:

J. GERBER & CO. LTD.,
 Wembley, Middx.
 Phone, Wembley 3691.
 Grams, Powaguide (Phone), London.

FOR SALE BY PRIVATE TREATY

**THE BUSINESS AND ASSETS OF THE
 WELL-KNOWN SINCLAIR SPEAKER**

including the

**GOODWILL, COIL WINDING AND WAVE LINING
 MACHINES, FINISHED STOCK, SPARE PARTS, ETC.**

Full particulars of

HENRY BUTCHER & CO.,
 73, CHANCERY LANE, LONDON, W.C.2.
 Telephone, HOLBORN 8411 (5 lines).

ELECTRIC MOTORS AND DYNAMOS

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

For Sale or Hire. Send your enquiries to:—

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

Telephone: 5512-3 Clerkenwell.

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

A.C. and D.C. House Service Meters, all sizes, quarterly repairs and recalibrations.—The Victoria Electrical Co., 47, Battersea High Street, S.W.11. Tel. Battersea 0780.

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

A.C. Motors, 1/50th h.p. to 3 h.p. from stock, for essential work only.—The Johnson Engineering Co., 26, Great Portland St., W.1. Tel. Museum 6373.

AERIAL Cables, all sizes quoted for, good deliveries against Government contract numbers.—Edwards Bros., 20, Hockfriths Road, London, S.E.1.

ALTERNATOR, Lancashire Dynamo & Motor Co., 500 k.w., 625 kVA, 400 volts, 900 amps per phase, 3-phase, 50 cycles, 300 r.p.m., direct coupled engine type or can be arranged either as single-bearing engine type or 2-bearing type. All present direct coupled to Diesel engine, fabricated frame, manufactured 1932, operated only 510 hours. Offers invited.—Box 6157, c/o The Electrical Review.

ALTERNATOR, 500 kVA, 3-p., 50 c., 400/440 v., 750 revs., direct coupled exciter, 2 bgs., on bedplate.—Stewart Thomson & Sons, Fort Road, Seaforth, Liver-

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

BEST English Cables, 1/044 up to 127/103, deliveries against M.O.S. requirements.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 6165

CARBONS, large stocks assorted sizes, solid and cored.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 6166

ELECTRIC Hoists!! Save time and labour. We can supply any size from 3 cwt. upwards, and any other type of Lifting Gear. Send us particulars of your requirements.—George Cohen, Sons & Co. Ltd., Wood Lane, London, W.12, and Stanningley, near Leeds. 34

ELECTRIC Lighting Plant for sale, Petter Engine (12 h.p.) and D.P. batteries. Apply—Y. H. A. Bradley House, Wirksworth, Derbyshire. 6156

EXHAUST Fans, new, 14", 1-phase, 200/250 v., 1,900 cu. ft./min., £11 15s.—Southern Ignition Co. Ltd., 190, Thornton Road, Croydon. 75

FOR disposal, Channel Type Teak Fuseboards, 250 v.: 24 6-way, 10 5-way, 1 7-way.—Rich & Pattison (B'ham) Ltd., 81, Jamaica Row, Birmingham, 5. 528

FOUR identical 150-kW. Weir Sulzer/E.C.C. Diesel driven Generating sets, 220 volt D.C.—Stewart Thomson & Sons, Fort Rd., Seaford, E. Poot. 21. 74

GENERATING Set for sale. 50-kW Belliss & Morcom condensing steam engine, steam 160 lbs., plus 100° F. superheat, direct-coupled to 220-volt D.C. Phoenix generator on combined bedplate. Complete switchboard panel. All in good working condition. Best offer submitted by September 9th, 1944, will be accepted.—C. & W. Walker Ltd., Donnington, Wellington, Shropshire. 537

HEAVY duty Arc Welding Plants, 200 amps. Price £21 10s. complete. Also Spot Welders, £36 15s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 50

HIGH Voltage Test Apparatus for sale. Will test from 500 to 5,000 volts, giving visual and oral indication of test breakdown, complete with special test posts. Suitable for A.I.D. and Admiralty tests. Price £18 10s.—Kentish Electrical Engineering Co., 3a, Mornimston St., London, N.W.1. Phone. Eng. 3254. 542

HOUSE Meters, 200/240 v., A.C. or D.C., 3, 5 and 10 H. amps., at 17s. 6d. each.—Universal, 221, City Rd., London, E.C.1. 42

KEITH Blackman Electric Blower, 3,500 c. ft. p.m. cpd., to 20-h.p., 400/3/50, ball bearing motor, with O.I. starter.—Greenhalgh Bros., Burton's Field Mill, Atherton, Lancs. 458

LEAD-covered and Armoured Cables, P.I. and V.I.R., various special lines at low prices.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 6167

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

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

NAMEPLATES, Engraving, Die-sinking, Stencils, Steel Punches.—Stilwell & Sons Ltd., 152, Far Gosford Street, Coventry. 14

ONE Converter by the General Electric X-Ray Corporation of Chicago, 230 volts D.C. to 143 volts A.C., 3,000 r.p.m., D.C. input 1 h.p., A.C. output 7-10 amps.—Electricals Ltd., 14, Claremont Place, Newcastle-upon-Tyne, 2. 534

PORCELAIN Cleats, 2 and 3 groove, various sizes ex stock, price list.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 6168

PORCELAIN Insulators and Spindles, also Cleats, cheap.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 6169

QUANTITY of C.I. Weatherproof Bells, 6" dia. gong, 6 to 230 volts.—Higgins, 15, Kingsley Grove, Audenshaw, Manchester. 497

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

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

SINGLE-core V.I.R., Braided Flexible, heavy insulation, carry 24 amps., cheap.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 6170

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

SWITCH and Fuse Units, Conduits and fittings, works requirements stocked.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 6171

TR.S. Cables and Flexibles, Welding Cables, supplied to M.O.S. requirements.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 6172

TRANSFORMERS, single and three-phase. All types up to 10 kVA.—Woden Transformer Co. (Phone, Bilston 41959), Moxley Road, Bilston, Staffs. 12

TRANSFORMERS, 100 VA to 10 kVA, fully shrouded or skeleton type. Quick deliveries.—Midland Transformer Co. (Temporary address) 80, Albert Street, London, N.W.1. 543

10-h.p. 400-v. 1,460-r.p.m., single-ph. rep. induc., R.O. bearing Century Motor and Starter, £45.—Colley, 51, Lambs Conduit Street, W.C.1. 6158

60 yds. 920/029 (1 sq in.) single core, V.I.R. Braided Flexible.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 6173

250-h.p. Electric Motor, 440 v., 3 ph., 50 cyc., 365 r.p.m., with starter, pulley, etc., lying at Slough, cheap to clear.—Burlleigh, Brownswood Works, Exhibition Grounds, Wembley, Middx. Tel. Wembley 2011. 6094

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

400-kW Belliss Steam Set, 460/230 v. D.C.; 50-kW Hindley ditto; 75-h.p. National Diesel Engine; 35-kW Tangey Diesel Set, 220 v. D.C.; 3,000-gal. Fuel Tank.—Harry H. Gardam & Co. Ltd., Staines. 30

ARTICLES WANTED

ENGINEERING Technical Books (new or secondhand) wanted in any quantity. Attractive cash offers. Call—Third floor, 356, Oxford Street, W.1, or "Stoneleigh", St. George's Avenue, Weybridge. 62

MERCURY (Quicksilver) wanted. Write for packing instructions. Gold, Silver and Platinum also purchased.—Collingridge & Co. Ltd., Riverside Works, Riverside Road, Watford. (Tel. 5963.) 506

URGENTLY wanted, Autom. Kohler Sets, 800 and 1,500 watts, 110 volt., any cond. Full details to—Box 540, c/o The Electrical Review. 542

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

WORK WANTED AND OFFERED

MOTOR REPAIRS

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

SOUTHERN IGNITION CO., LTD.,

190, THORNTON RD.,
CROYDON,
THORNTON Heath 4276-8

REWINDING AND REPAIRS

WE rewind and repair any motors, A.C. or D.C., from 1 h.p. to 500 h.p. Motors lent while repairs are being carried out. Established over 24 years.

W. H. SUGDEN & CO. LTD.,

Glenny Road, Barking, Essex.
Phone, Rippleway 3302

ARMATURE, Rotor and Stator rewinds and repairs, fractional to 60 h.p. Prompt deliveries.—T. A. Boxall & Co., Horley, Surrey. Phone 654. 6136

ELECTRICAL Measuring Instruments skilfully repaired and recalibrated.—Electrical Instruments Repair Service, "Stanimede," Forlease Road, Maidenhead. 6109

FULLY experienced engineer with small plant, Manchester district, requires small or medium assembly or experimental work, electrical or mechanical.—Box 486, c/o The Electrical Review.

MACHINING Work, for Centre Lathes up to 6½ in. centres and medium-sized milling (good grade work preferred).—The London Electric Firm, Croydon. Up lands 4871. 56

MEASURING Instrument Repairs. All makes of meters and instruments skilfully repaired by experts. Prompt service for essential purposes.—Runbaken Electrical Repairs, Meter Dept. (Q52), Manchester, 1. 54

REPAIRS, Clocks, Watches, Time-Switches, Jewellery, Radio, Gramophones, Electric and Mechanical Apparatus of all kinds repaired by skilled staff. Inquiries welcomed. Representative will call in the London area if required.—Hughes (Ground Floor), 58, Victoria Street, London, S.W.1. Phone, Victoria 0134. 6038

AGENCIES

AGENCY required London and S.E. England for Turned and Bolted Screws and Nuts, patent nut considered, advertiser holding stocks. Write first instance to—Box 6155, c/o The Electrical Review.

AGENTS, having old-established and cordial connection with all leading electrical wholesalers in London and district, wish to contact manufacturers of domestic appliances, lighting fittings and standards, electrical glassware, wiring equipment, etc., with view to sole representation, now or post-war.—Box 470, c/o The Electrical Review.

MANUFACTURERS' Agent covering Yorkshire, Lancashire and North, including Edinburgh and Glasgow, public supply undertakings and the trade, commission basis. Commence October, would entertain well-established line.—Box 6138, c/o The Electrical Review.

MANUFACTURERS' Agent (with assistant representative), 20 years' experience as outside representative in the electrical trade, fully conversant with Accessories, Cable, Lamps, Heating Appliances, etc., requires additional lines for Midland area, expenses and commission, or commission only; own car. All replies in confidence.—Box 530, c/o The Electrical Review.

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

PRINCIPAL of small co., with connections amongst municipalities and large users in West Country, would represent interests of reputable manufacturers, commission or retainer.—Box 536, c/o The Electrical Review.

BUSINESSES FOR SALE AND WANTED

FIRM requires to purchase small Valve Manufacturing Company making Cathode Ray Tubes, or alternatively would consider a manufacturing arrangement.—Box 6154, c/o The Electrical Review.

WANTED, Electrical Contracting Business in or near London, central London preferred.—Box 6111, c/o The Electrical Review.

WANTED, Electrical Engineering or General Engineering Business in Hampshire or Sussex, for either amalgamation or purchase.—Box 6163, c/o The Electrical Review.

PATENT NOTICES

CENTRIFUGAL Clutches, Hydro-mechanical, of any h.p., for Induction Motor application. Manufacturing and financial interest invited from those with all-round technical facilities. Apply—Box 6137, c/o The Electrical Review.

IT is desired to secure the full commercial development in the United Kingdom of British Patent No. 524,120 which relates to Winding Machines for Winding Together in a Roll Ribbons of Metallic Foil Separated by Ribbons of Insulating Material, either by way of the grant of licences or otherwise on terms acceptable to the Patentee. Interested parties desiring copies of the patent specifications should apply to—Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, London, W.C.2. 546

MISCELLANEOUS

BATTERY Chargers Modernised. Your old Charger made like new by specialists. Conversion from valve to metal rectification. Send for interesting leaflet "Q.D." on this service.—Runbaken Electrical Products, Manchester, 1. 45

DON'T Disclose Your Plans. Produce blue prints and black line copies, etc., in your own office, without glass frame, privately and economically. "Arcoflex" Copiers from 28 shillings. As supplied to H.M. Government.—W. A. Boughton, 53, Kenley Road, Merton, S.W.19. 43

LESLIE Dixon & Co. for Dynamos, Motors, Switchgear, Chargers and Telephones.—214, Queenstown Road, Battersea, S.W.8. Telephone, Macaulay 2159. Nearest Rly. Sta.: Queen's Road, Battersea (S.E.). 11

STAFF Identity Passes that Embody the Photographs of employee now being supplied to firms on Government contracts. Utility Installations. Forgery proof; Celluloid Encased; Inexpensive; any size staff; anywhere; distance no object. Any kind of photographic work undertaken. Write for particulars and specimens from—Miles & Kaye, Ltd., Pass Specialists, 100, Southampton Row, High Holborn, London, W.C.1. Est. over 50 years. 462

EDUCATIONAL NOTICES**LATEST A.M.I.E.E. RESULTS**

IN the recent Examinations held by the Institution of Electrical Engineers 477 Candidates sat who had taken B.I.E.T. courses. Of these 457 were successful in passing the examinations. We believe this record of 457 successes out of 477 entrants has never before been approached by any oral or correspondence tutorial organisation, and indicates the very high efficiency of the modern system of Technical Training which we have laid down.

The B.I.E.T. tutorial organisation is waiting to assist you either with a short specialist course or complete training for a recognised examination.

We have available a large full-time staff of instructors, while the efficiency of our extensive organisation is a byword among engineers.

WE GUARANTEE—"NO PASS—NO FEE"

May we send a copy of "ENGINEERING OPPORTUNITIES"? Containing a great deal of useful advice and detailed information on over 200 Home-Study Courses and examinations, this handbook is of very real value to the ambitious engineer.

Our highly informative handbook will be sent FREE and without obligation on request.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY.

Established 1927—over 200,000 students.

12, Shakespeare House, 17, 18 & 19, Stratford Place, Oxford Street, London, W.1.

33

Great Possibilities for TECHNICALLY QUALIFIED ENGINEERS**Key Men in War-Time and Afterwards**

THE finest posts and the great majority of posts in Great Britain in this war are technical. The same will be the case when the war is over. The vast increase in mechanisation now being applied to war purposes will then be suitably utilised in reconstruction, and in trade and commerce. Take a Recognised Engineering Qualification through home-study with the T.I.G.E., whose Students have gained 35 FIRST PLACES in the A.M.Inst.C.E., A.M.I.E.E., A.M.I.Mech.E., A.F.R.Ae.S., etc., examinations. Write to-day for "The Engineer's Guide to Success," containing the world's widest choice of engineering Courses—over 200—covering all branches: Electrical, Aeronautical, Mechanical, Wireless, etc.

THE TECHNOLOGICAL INSTITUTE OF G.T. BRITAIN,

35, Temple Bar House, London, E.C.4.

77

ELECTRIC PADS and BLANKETS

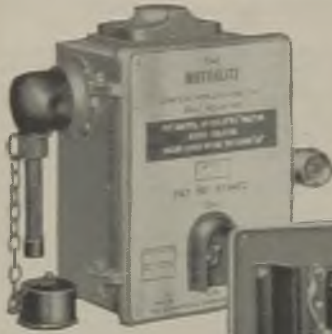
PROFITS on these articles lost through the restriction on their manufacture and sale can be made up on **REPAIR WORK**. **EXPERT** business. **PROMPT** return of all makes



MOTOR REWINDING.—We respectfully ask our customers to remove armatures or field coils before sending for rewinding as owing to diversion of labour to Priority work we cannot now undertake dismantling or assembly. Phone:

THERMOELECTRICS LTD. Wimbledon
11 COPSE HILL, WIMBLEDON, S.W.20. 2728

THE "MOTORLITE" TRANSFORMER UNIT



Made by
THE CONCORDIA
TRANSFORMER CO.
a subsidiary of
THE CONCORDIA
ELECTRIC SAFETY LAMP
CO. LTD.

SOLE SALES AGENTS:

ELCORDIA LIMITED

2 Caxton Street, Westminster, London, S.W.1

Telephone: ABBey 4266

This low-voltage unit of maximum efficiency and safety incorporates a double-wound transformer (to B.S.S. 794) and double-pole switch with 4 fuses (2HT and 2LT) all mounted on a readily removable Gas Oven type door, the opening of which breaks both circuits. The HT Terminals have safety shields. Two spare fuses for each circuit are mounted in the case.

Two or three arm lamp brackets can be supplied at an extra cost. Each unit can be fitted with one or two Reyorle sockets and plugs for the operation of hand lamps, etc., etc.

Standard rating—
60, 80 and 120
V A max. Volts
440, min. Volts 12

A.I.D. APPROVED



Telephone: Temple Bar 0055 (3 lines)
Telegrams: "Arwelidite, Westcent, London"

The "TEMCO" SWITCH

COMPLIES FULLY WITH B.S. MINIMUM
REQUIREMENTS (B.S. 816-1938)

Surface, Semi-recessed and
Flush types

OUTSTANDING VALUE

Marketed by:

T.M.C.-HARWELL (SALES) LTD.
BRITANNIA HOUSE, 233 SHAFTESBURY AVENUE
LONDON, W.C.2

ADVERTISEMENT COPY AND BLOCKS

should reach us 15 days preceding
date of issue addressed to

ELECTRICAL REVIEW
Dorset House, Stamford Street
LONDON, S.E.1

ELECTRICAL REVIEW'S—

INSTRUCTION CHART

FOR DEALING WITH APPARENT
DEATH FROM **ELECTRIC
SHOCK**

In accordance with H.O. ELECTRICITY REGULATION 29

ELECTRICAL REVIEW Dorset House
Stamford St., S.E.1

“600 and All That”



600 - MODERN SECONDHAND MACHINERY

We can give you delivery, ex stock, of Electric Generating Sets, Electric Motors, Switchgear, Transformers, Boilers, Pumps, Air Compressors, Cranes, Locomotives, Diesel Engines, Power Presses and Sheet Metal Working Machinery, Excavators, Dumpers, Mixers, Track and Wagons, Tanks, Steel Sections, Tubes and Fittings, and virtually every kind of modern Secondhand Works' Equipment.

THE LARGEST STOCKS IN THE COUNTRY FOR ESSENTIAL PURPOSES ONLY

George Cohen, Sons & Co., Ltd.

ESTABLISHED 1834

WOOD LANE, W.12 & STANNINGLEY, Nr. LEEDS
 Tel: Shepherd's Bush 2070 Tel: Pudsey 2241
 Grams: Omniplant, Chisk. London Grams: Coborn, Leeds

AND AT BIRMINGHAM · SHEFFIELD · GLASGOW · NEWCASTLE ·
 MANCHESTER · SOUTHAMPTON · BATH · BELFAST · ETC · ETC





Just as prehistoric creatures left their impressions on the Sands of Time, so Man has continued to make his in metal. To-day, progress in Metallurgical production has advanced rapidly.

As Specialists in the art of Hot Brass Pressing, we invite enquiries from users who want QUALITY.

We design and make our own Tools, and by our experience in manufacture can often, in the case of complicated shapes, save several operations — with resultant economy in cost.



HOT PRESSED PRODUCTS
WELLHEAD LANE, PERRY BARR
BIRMINGHAM 22 B.

Tel. : Birchfields 4532. Grams : Hotpress, B'ham.

Electrical Accessories



BAKELITE LAMP HOLDERS

We can supply on priority a wide range of Lamp Holders made to B.E.S.A. specifications. Angle Button type with fixing holes, either diagonally or as illustrated, can be supplied with Porcelain or Bakelite interior.

ASHLEY ACCESSORIES
 ULVERSTON • LANCASHIRE

INTERLOCKED SWITCH-SOCKETS & PLUGS

UP TO 100 AMPS



Plug completely interlocked with switch. Current can be switched off without removing the plug. Plug cannot be removed or inserted unless switch is "off."

RELY UPON

DONOVANS

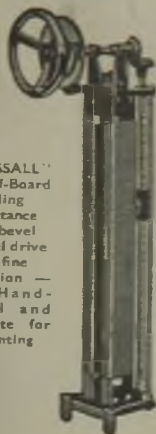
THE DONOVAN ELECTRICAL CO. LTD. ELECTRICAL ENGINEERS AND STOCKHOLDERS
 BIRMINGHAM 9

Phone: TECHNICAL 2277. I.P.B. XI

SLIDING RESISTANCES

FOR ALL PURPOSES

"Cressall" Sliding Resistances are manufactured in an immense variety of types and sizes to meet every known requirement.



"CRESSALL" Back-of-Board Sliding Resistance with bevel wheel drive for fine regulation — with Hand-wheel and Dialplate for mounting

Every "Cressall" Resistance is of sound design and incorporates the best possible workmanship—yet

PRICES ARE COMPETITIVE

THE **CRESSALL** MANUFACTURING CO. LTD.

31 & 32 TOWER STREET BIRMINGHAM

Phone: Aston Cross 3463/4
Grams: Ohmic, Birmingham

Please send us your enquiries—and ask for descriptive literature

PORTABLE TOOLS

must be
SAFELY EARTHED!



THE **EARTH CONTINUITY TESTER** DETECTS A

FAULTY EARTH LEAD *at once*

by passing a 15/20 amp. testing current through the earth wire. The importance of regular testing is officially stressed. Write for pamphlet A 44.

BRITISH CENTRAL ELECTRICAL CO. LTD.
6-8 Rosebery Avenue, London, E.C.1. TERminus 2525

Litholite

40 Years
of
Plastic
Moulding

LITHOLITE INSULATORS & ST. ALBANS MOULDINGS LTD

WATFORD

PHONE: WATFORD 4494



INSULATED WIRES AND STRIP

COVERED WITH ENAMEL COTTON SILK VARNISH GLASS ENAMEL AND PAPER

Samples and Prices on Application

MADE BY—

F. D. SIMS LTD.

HAZELHURST WORKS, RAMSBOTTOM, LANCs

Telegrams: "SIMS, RAMSBOTTOM"

Telephone RAMSBOTTOM 2213/4

Index to Advertisers

	PAGE
Acru Electric Tool Mfg. Co. Ltd.	76
Air Ducts Ltd.	34
Allen, Edgar, & Co. Ltd.	55
Alton Battery Co. Ltd.	21
Asea Electric Ltd.	33
Ashley Accessories Ltd.	74
Automatic Coil Winder & Elecl. Equipment Co. Ltd.	62
Barber & Colman Ltd.	46
Barlow-Whitney Ltd.	54
Benjamin Electric Ltd.	35
Braithwaite & Co. Engineers Ltd.	80
British Central Electrical Co. Ltd.	75
British Insulated Cables Ltd.	9
British Klockner Switchgear Ltd.	80
British Thomson-Houston Co. Ltd.	23
British Trane Co. Ltd.	32
Brush Electrical Engineering Co. Ltd.	37
Burco Ltd.	32
Cable Makers' Association.	6
Canning, W., & Co. Ltd.	20
Castle Fuse & Engineering Co. Ltd.	60
Churchouse, C. M., Ltd.	46
City Electrical Co.	78
Cohen, George, Sons & Co. Ltd.	73
Cole, E. K., Ltd.	45
Consolidated Pneumatic Tool Co. Ltd.	7
Cox-Walkers Ltd.	56
Cressall Manufacturing Co. Ltd.	75
Crompton Parkinson Ltd.	Cover i, 53 & 59
Cryselco Ltd.	30
Dalyte Electrical Co. Ltd.	46
Davis & Timmins Ltd.	80
Desoutter Bros. Ltd.	15
Donovan Electrical Co. Ltd.	74
Dowsing Co. (Electrical Manufacturers) Ltd.	51
Drake & Gorham Ltd.	Cover ii
Durabute & Wire Ltd.	44
Durham Cables Ltd.	77

Ebonestos Industries Ltd.	77
Elcordia Ltd.	72
Electric Construction Co. Ltd.	14
Electric Depot Ltd.	60
Electric Elements Co.	48
Ellison, George, Ltd.	38
Engines & Electrics Ltd.	54
English Electric Co. Ltd.	19
Erskine, Heap & Co. Ltd.	13
Everett Edgcombe & Co. Ltd.	40
Ferranti Ltd.	11
Fine Wires Ltd.	49
Foster Transformers & Switchgear Ltd.	29
Fractional H.P. Motors Ltd.	54
General Electric Co. Ltd.	63 & 66
General Lighting Equipment Co. Ltd.	54
Gent & Co. Ltd.	47
Girdex Engineering Co. Ltd.	52
Gowshall Ltd.	56
Grampian Reproducers Ltd.	65
Greloco Ltd.	46
Grey & Marten Ltd.	76
Griffiths Bros. & Co. London Ltd.	44
Hackbridge Electric Construction Co. Ltd.	26
Halsey's Electric Co. Ltd.	57
Hart Accumulator Co. Ltd.	61
Heatrae Ltd.	1
Hedin Ltd.	78
Henley's, W. T., Telegraph Works Co. Ltd.	64
Hewittic Electric Co. Ltd.	16
Hildick & Hildick.	61
Horstmann Gear Co. Ltd.	62
Hot Pressed Products.	74
Iddon, Victor H., Ltd.	56
Imperial Chemical Industries Ltd.	22
Instanta Electric Ltd.	56
Insulators Ltd.	18
Johnson & Phillips Ltd.	31
Jones, Samuel, & Co. Ltd.	48

(Continued on page 78)

GREY & MARTEN LTD.

Manufacturers For

For all Electrical Work. To British Standard or any other specifications. With a reputation for purity of constituents and excellence of appearance.

LONDON:

SOUTHWARK BRIDGE S.E.1

Phone: Hop 0414 Grams: Amalgam, Boro

BIRMINGHAM:

11 JAMES STREET 3

Phone: B'ham Cent. 6008 Grams: Amalgam, B'ham

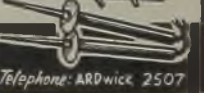
S
O
L
D
E
R

PORTABLE FLASH TEST

This Flash Test required by all making, repairing and servicing electrical equipment. 1,000, 2,000 to 5,000 volts. Send for Leaflet (Q 53) about Flash Testing.



Runbaken
MANCHESTER-1 Telephone: ARDwick 2507



The PYROBIT Soldering Iron

for Precision Instrument Work can be operated like a pencil

With only 45 watts a Bit Temperature of over 300°C is obtained

For all Voltages from 6—250 volts.

The Acru Electric Tool Mfg. Co. Ltd.

123 HYDE ROAD

ARDWICK, MANCHESTER 12



Brit. Patent No. 560,806

Telephone: ARDwick 4284



DURHAM CABLES LTD.
MAKERS OF ELECTRIC CABLES
BIRTLEY,
Co. DURHAM.

TEL. PHONE 145
GRAMS DECELITE
NEWCASTLE UPON TYNE



We cannot mould battleships

But we have battled with and overcome many moulding problems. As specialists with over 44 years' experience of work to the highest standard of quality and precision limits, you can therefore be assured that

**IF IT IS MOULDABLE
EBONESTOS CAN MOULD IT**

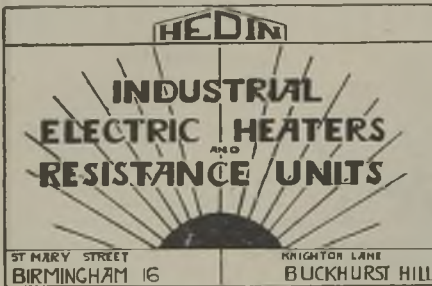
EBONESTOS INDUSTRIES LTD., Excelsior Works, Rollins Street, London, S.E.15
Telephone : New Cross 1913 (6 lines)

Index to Advertisers

(Continued from page 76)

	PAGE		PAGE
Jones Stroud & Co. Ltd.	62	Sims, F. D., Ltd.	75
Kenyon, William, & Sons Ltd.	57	Skefko Ball Bearing Co. Ltd.	58
Laurence, Scott & Electromotors Ltd.	42	Sordoviso Switchgear Ltd.	16
Legg (Industries) Ltd.	48	Sparklets Ltd.	52
Litholite Insulators & St. Albans Mouldings Ltd.	75	Standard Telephones & Cables Ltd.	3
Londex Ltd.	80	Steatite & Porcelain Products Ltd.	17
London Electric Firm	48	Stirling Boiler Co. Ltd.	27
McClure & Whitfield	48	Sturtevant Engineering Co. Ltd.	5
M.C.I. & Repetition Ltd.	1	Taylor & Petters Ltd.	Cover iii
Mek-Elek Engineering Ltd.	50	Telco Ltd.	60
Metropolitan-Vickers Electrical Co. Ltd.	24	Tenaplas Ltd.	55
Micanite & Insulators Co. Ltd.	28	Thermoelectrics Ltd.	71
Morgan Crucible Co. Ltd.	Cover iv	Thew, Edward H., Ltd.	80
Mycalex Co. Ltd.	61	T.M.C.-Harwell (Sales) Ltd.	72
Normand Electrical Co. Ltd.	4	Trionite Ltd.	52
Parmiter, Hope & Sugden Ltd.	79	Tufnol Ltd.	34
Pitman, Sir Isaac, & Sons Ltd.	50	Tullis Russell & Co. Ltd.	10
Poles Ltd.	46	Tyne Truck & Trolley Co. Ltd.	Cover iii
Premier Electric Heaters Ltd.	8	Union Cable Co. Ltd.	47
Pultra Ltd.	51	Vent-Axia Ltd.	36
Ray Engineering Co. Ltd.	52	Veritys Ltd.	25 & 41
Record Electrical Co. Ltd.	50	Viscose Development Co. Ltd.	12
Redfern, Stevens Ltd.	62	Ward & Goldstone Ltd.	39
Rediffusion Ltd.	2	Wardle Engineering Co. Ltd.	Cover iii
Rhodes, Brydon & Youatt Ltd.	52	West Insulating Co. Ltd.	Cover iii
Rich & Pattison	60	Westminster Engineering Co. Ltd.	1
Rix, G. A.	54	Wilkinson, L.	56
Rockman Engineering Co. Ltd.	65	Winn & Coales Ltd.	60
Ross Courtney & Co. Ltd.	1	Yarrow & Co. Ltd.	49
Ruberoid Co. Ltd.	50	Zenith Electric Co. Ltd.	78
Runbaken Electrical Products.	76		
Saxonia Electrical Wire Co. Ltd.	50		
Scholes, George H., & Co. Ltd.	36		
Scott, A. C., & Co. Ltd.	65		
Simmonds Aerocessories Ltd.	43		
Simmonds & Stokes Ltd.	79		

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this Journal should not be taken as an indication that they are necessarily available for export



HEDIN

**INDUSTRIAL
ELECTRIC HEATERS
AND
RESISTANCE UNITS**

ST MARY STREET BIRMINGHAM 16 KNIGHTON LANE BUCKHURST HILL



MOTORS

from **STOCK**

CITY ELECTRICAL CO.

EMERALD STREET, LONDON, W. C. 1. TELEPHONE HOLBORN 8721.



REGISTERED **ZENITH** TRADE-MARK

RESISTANCES

FOR LABORATORY AND TEST-ROOM

You cannot buy better

Illustrating latest design Type B embodying patented improvements

Zenith Resistances of proved durability are in constant use and are giving every satisfaction in all parts of the world

CATALOGUE ON REQUEST

Unequaled Service

THE ZENITH ELECTRIC CO., LTD.

Sole Makers of the well-known "Zenith" Electrical Products

**ZENITH WORKS, VILLIERS ROAD
WILLEDEN GREEN, LONDON, N.W. 2**

Phone W1Lluden 4067-8-9 Grams Volselm. Phone London

Delay is dangerous!



Post-war developments and the increased use of electricity will more than ever before demand fusegear of high performance. Plant which is inadequate now may fail when called upon to meet increasing needs. Ensure that your future needs will be met and—

specify Aeroflex fusegear now

PARMITER, HOPE & SUGDEN LTD.

Longsight, Manchester 12. London : 34 Victoria St., S.W.1

PLUGS AND SOCKETS

5-amp, 250-volt, 3-pole couplings

N633 A.
Two-way
Angle Plug.



N632 A.
Angle Plug.



N651 A.—Cast
Iron Through
Socket screwed
1/2" conduit.



N663 A.
Terminal
Socket and
Cover screwed
1/2" conduit.

SIMMONDS & STOKES LTD.

Victoria House, Southampton Row, London, W.C.1. Holborn 8637 & 2163

DATIM

ROLLED THREAD SCREWS



Delivery
from Stock

BRASS and STEEL

Countersunk Head
Round Head
Cheese Head

B. A. Sizes 0 10
Whitworth $\frac{3}{32}$ " - $\frac{1}{2}$ "



DAVIS & TIMMINS LTD

Head Office: BILLET ROAD - WALTHAMSTOW - LONDON - E.17

Telephone: 1 Arkwood 3244 and 4461

Small Turned
Parts and Inserts
Made to Order

Engraved

and

CAST

ENAMELLED PLATES

Enquiries are invited by the
Empire's largest general engravers for—

ENGRAVED BRASS, CAST BRASS AND ALUMINIUM,
ENAMELLED BRONZE AND CHEMICALLY
ENGRAVED PLATES of all types in all languages

Samples and quotations for large or small quantities
upon request. Phone or write.

Telephone 20221

Engr. EDWARD H. THEW LTD 1944
11, DEAN STREET NEWCASTLE-ON-TYNE

BRAITHWAITE

Pressed Steel Tanks

BRAITHWAITE & CO. ENGINEERS, LTD.

London Office (Temporary Address) :
45 King's House, Haymarket, London, S.W.1
Telephone: WHI 3993 Telegrams: Bromkirk-Phone



25 AMP. TRIPLE-POLE
ON-OFF SWITCH



Other Products:

AUTOMATIC
STARTERS
LIMIT SWITCHES
CONTACTORS
OVERLOADS

FLUSH MOUNTING
TYPE PE 253B

British Klockner Switchgear Ltd.
Chertsey, Surrey. Phone: Obersey 2221, 2.

LONDEX for RELAYS



For A.C. and D.C.


including Time Delay
Relays, High Sensitive
Relays, Synchronous
Process Timers and
complete Control Plants.

Midget Relay ML (for D.C. only) Ask for Leaflet SPN/ER

L O N D E X · L T D

MANUFACTURERS OF RELAYS
AMERLEY 207 AMERLEY ROAD · LONDON · S · E · 20 SYDENHAM 61-62/9

Printed in Great Britain at THE CHAPEL RIVER PRESS, Andover, Hants, and published by ELECTRICAL REVIEW, LIMITED, at Dorset House, Stamford Street, London, S.E.1.



HAND-TRUCKS
of Every Description.

"WEASEL" =
Lifting-Trucks
with Platforms.

Tyne Truck & Trolley Co. Ltd.
66/68 Northumberland Street
Newcastle-on-Tyne 1
Telephone 24196

**MICA AND MICANITE
INSULATORS**

**Precision Gauged and Stamped
Condenser Plates
Radio Valve Spacers, etc.**

TAYLOR & PETTERS LTD. 3-11 WESTLAND PLACE N.1
Insulation Engineers Tel.: Clerk. 4105

HORIZONTAL OR VERTICAL MOUNTING FOR LARGE BSS CONDUIT BOX.



WARDLE

ADJUSTABLE MACHINE TOOL LIGHTING FITTINGS



For local lighting on Machine Tools and Assembly Benches.

Price List L587 on application

WARDLE ENGINEERING CO. LTD.

OLD TRAFFORD, MANCHESTER 16
LONDON 34 VICTORIA STREET, S.W.1



**INSTRUMENT WIRES
INSULATING MATERIALS**

ENAMELLED, SILK and COTTON covered Copper Wires, Single or Stranded, also Tinned, Paper, Asbestos and Plastic Westoflex covered. RESISTANCE WIRES. LITZ WIRES.

MICA, MICANITE and BAKELITE in all forms. Heat Resisting Boards, Canvasite for Silent Gears, Oil Cloth, Silk and Paper. Slot Insulations, Insulating Varnishes. Varnished Fabric and Plastic Sleeving. Moulded and Machined Pieces, etc.

WEST INSULATING COMPANY LTD.
2 Abbey Orchard Street, Westminster, S.W.1

A 'RESERVOIR' BUSH



The porous bronze bush holds a generous reserve of oil which is fed to the bearing surface as a perfect film, as and when needed.

THE MORGAN CRUCIBLE COMPANY, LTD., LONDON, S.W.11
Specialists in Powder Metallurgy since 1912

A **MORGAN**
product