

THE

# ELECTRICIAN

Vol. CXXXV. No. 3511. Friday, September 14, 1945.

Sixpence

(Registered at the General Post Office, Entered as Second Class at the New York U.S.A. Post Office.)



ARM OF THE LAW...

THERE HE STANDS—symbol of authority in an orderly World —controlling—directing—obeyed because absolutely trustworthy and reliable.

What a fitting comparison with BIRCH RESISTANCES. *Arms of the Ohm's Law.*

Backed by many years of practical experience in which their reliability has been tested under all conditions, BIRCH RESISTANCES, in their various applications, stand up to

their job and can always be depended upon to provide specified service because of their first-class workmanship.

*Please call upon us to help you solve any Resistance problem.*



## Resistances

ARMS OF THE OHM'S LAW

May we quote you for any of the following:—

DIMMERS—REGULATORS (Field, Shunt, Voltage)—RESISTANCES (Arc Lamp, Charging, Regulating, Sliding)—RHEOSTATS—ELEMENTS and SPIRALS—Asbestos Woven Resistance Nets and Grids.

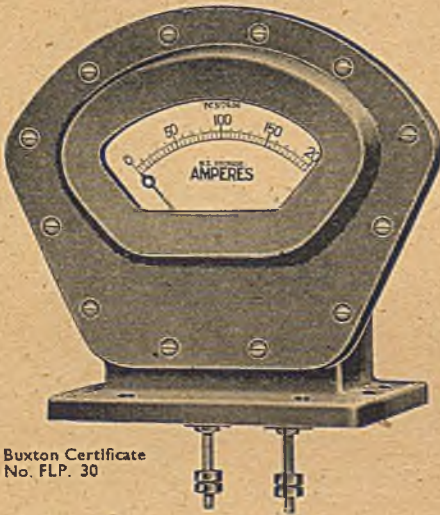
H. A. BIRCH & CO. LTD., Wilohm Works, Wood Street, WILLENHALL, STAFFS  
Telegrams: "WILOHM," Willenhall. Telephone: Willenhall 494-495

# FLAMEPROOF

## INSTRUMENTS

*by*

# NALDER

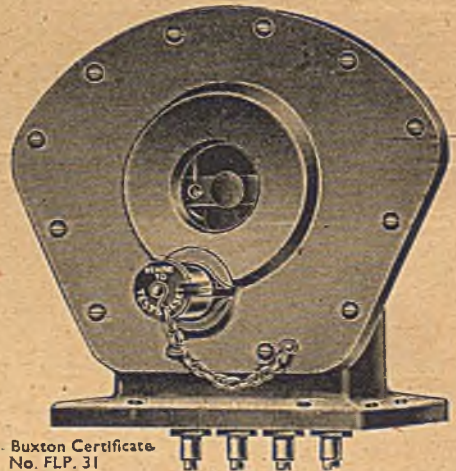


Buxton Certificate  
No. FLP. 30

Other N.C.S. Instruments include Ammeters, Voltmeters, Wattmeters, Frequency Meters, Power Factor Meters, etc., all conforming to the requirements of the British Standards Institution Specification.

PLEASE LET US QUOTE

N.C.S. Flame-proof Instruments are specially designed to comply with the general regulations for the installation and use of electricity in mines, and B.S.I. specifications for accuracy. Instruments of this type include Relays, Ammeters and Voltmeters. They are mounted in cast-iron cases of adequate strength to resist explosive pressure, and are fitted with armoured glass fronts. The Nalder Flame-proof Instruments will resist any explosion which might occur within them and will not transmit sparks or flames to the external atmosphere.



Buxton Certificate  
No. FLP. 31

## NALDER BROS. & THOMPSON LTD.

DALSTON LANE WORKS, LONDON, E.8

Telephone : CLISSOLD 2365 (3 lines)

Telegrams : OCLLUDE, HACK, LONDON



## THE WITCHING WAVES THAT DAMP

Torsional fluctuations from an internal combustion engine are frequently of such amplitude—and involve such stresses—as to be beyond the capacity of ordinary mechanical elastic couplings. The solution to such problems lies in the use of the Metalastik patent Mago coupling. In this, rubber cushions of especially designed configuration, are formed integrally with the driving and driven members by means of the Metalastik rubber-to-metal weld. Heavy load capacity, with a considerable degree of deflection, is permitted, with a progressive control and an inherent damping action. Combined with these advantages is a different characteristic on the over-run and a positive drive in the unlikely event of the rubber failing.

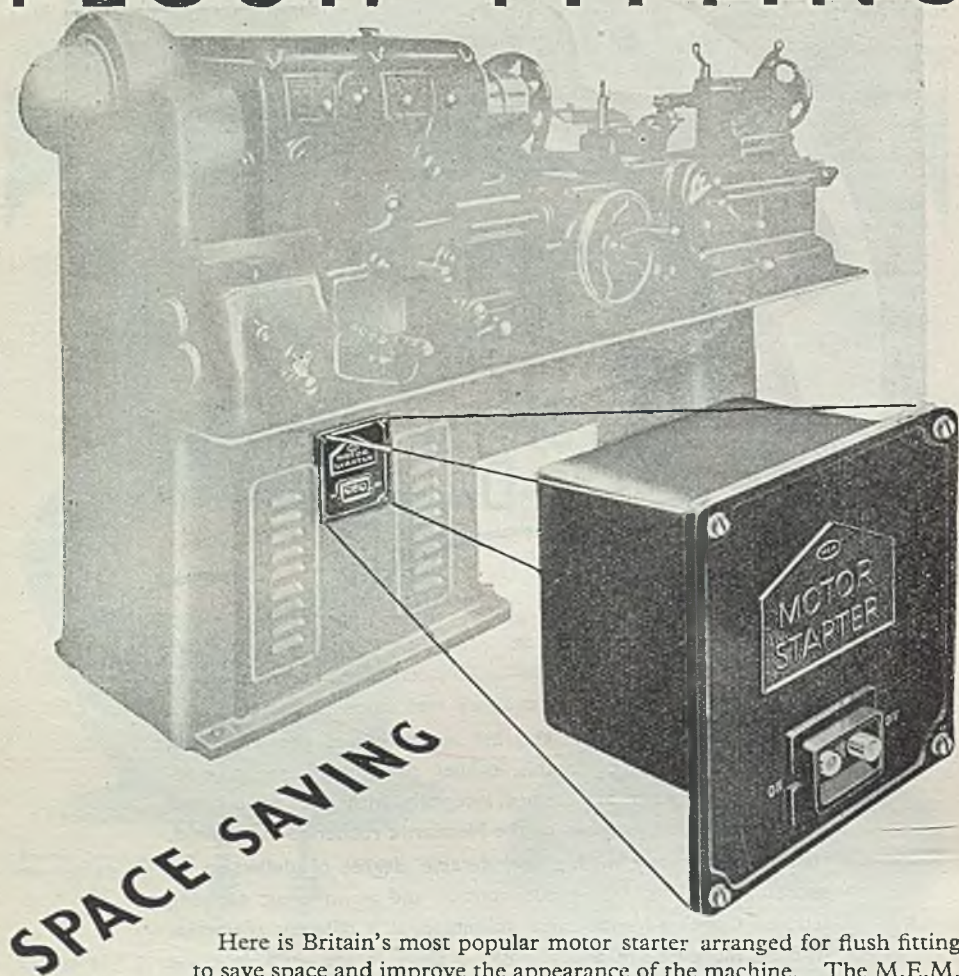
These couplings are made in an extensive range which includes small 3-lobe couplings for driving auxiliaries: they are available to cope with any desired frequency or amplitude of vibration, and in natural or synthetic rubber as may be required.

The services of our engineers are at your disposal.

*Metalastik Ltd., Leicester.*

# METALASTIK

# FLUSH FITTING



Here is Britain's most popular motor starter arranged for flush fitting to save space and improve the appearance of the machine. The M.E.M. "Auto-Memota" Push-button Automatic Direct Starter is available in all sizes in enclosed or open versions of this inset form. M.E.M. "Auto-Memota" Inset Starters are suitable for motors from  $\frac{1}{2}$  to 15 H.P. and give complete overload protection. Designers will find them a great help in giving machines a clean, modern appearance. Full details can be obtained on application. Write for List No. 249.



## INSET STARTERS

MIDLAND ELECTRIC MANUFACTURING CO LTD., TYSELEY, BIRMINGHAM, 11  
Specialists in the manufacture of Switch, Fuse and Motor Control Gear.

London Showrooms and Stores: 21-22 Rathbone Place, London, W.1 • Manchester Showrooms and Stores: 48-50 Chapel Street, Salford, 3



**When resistance to high temperature is an important factor in the choice of a winding wire, the job calls for BI-GLASS, a winding wire rated for continuous operation at 140°C**

**It has high resistance to moisture and abrasion. Other advantages are high dielectric strength, freedom from ageing, and high space factor . . . .**

**BI-GLASS**  
WINDING WIRES and STRIPS

**BRITISH INSULATED CALLENDER'S CABLES LTD.**

**PRESCOT, LANCASHIRE.**

Telephone: Prescot 6571.



A new era of brightness in the home, office and factory! Brightness, cheerfulness, cleanliness, fresh air, good health and good lighting are the order of the day. Good lighting is a tonic—especially with Osram!

**GOOD LIGHTING IS A TONIC**

**ESPECIALLY WITH OSRAM**

**Osram**

**THE WONDERFUL LAMP**

*A G.E.C. PRODUCT*

Advertisement of The General Electric Company Limited.



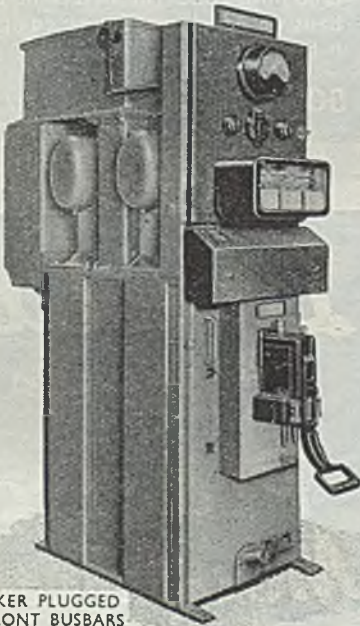
# SWITCHGEAR

OIL-BREAK • AIR-BREAK • AIR-BLAST

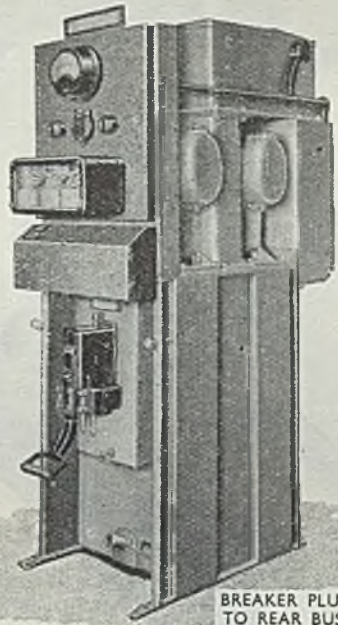
*Class QF*

## DUPLICATE BUSBAR

(Compound Filled).



BREAKER PLUGGED  
TO FRONT BUSBARS



BREAKER PLUGGED  
TO REAR BUSBARS

Incorporating  
Drop-traverse-raise  
Vertical-plugging  
Oil Circuit-Breaker

**UP TO 11kV.,  
250 MVA.**

**FULLY TESTED FOR  
SHORT-CIRCUIT DUTY**

# BTH

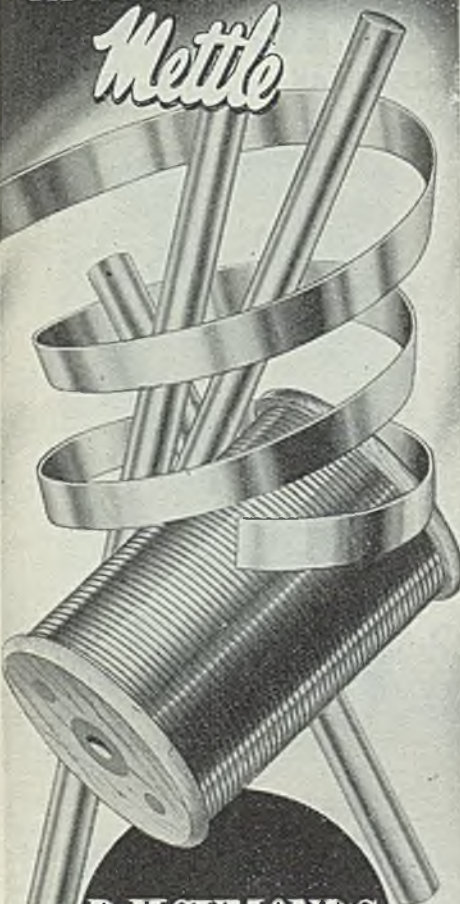
# WILLESDEN

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED, WILLESDEN, ENGLAND

A 3564



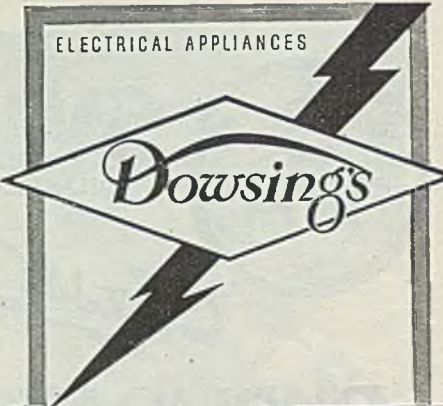
In fine  
*Mettle*



**R.H. SYMONDS**  
LTD.  
★  
39, VICTORIA STREET  
WESTMINSTER S.W.1

COPPER & BRASS WIRE & STRIP  
PLAIN & TINNED

ELECTRICAL APPLIANCES



**Dowsing's**

The reputation acquired in nearly half a century's diligent labour is no small asset. For us, it is the proud basis on which our future equipment is being built.

**DOWSING CO. (ELECTRICAL MANUFACTURERS) LTD.**  
Kangley Bridge Rd. Lower Sydenham S.E.26

*Litholite*  
40 Years  
of  
*Plastic Moulding*

LITHOLITE INSULATORS &  
ST. ALBANS MOULDINGS LTD.

**WATFORD**

'PHONE: WATFORD 4494





*A 'pattern' of workshop lighting*



Workshop lighting should be a model of efficiency, and the pattern-shop illustrated is an excellent example of what a well-lit workshop should be. Whatever the lighting problem in your factory, Metrovick Illuminating Engineers will solve it for you.

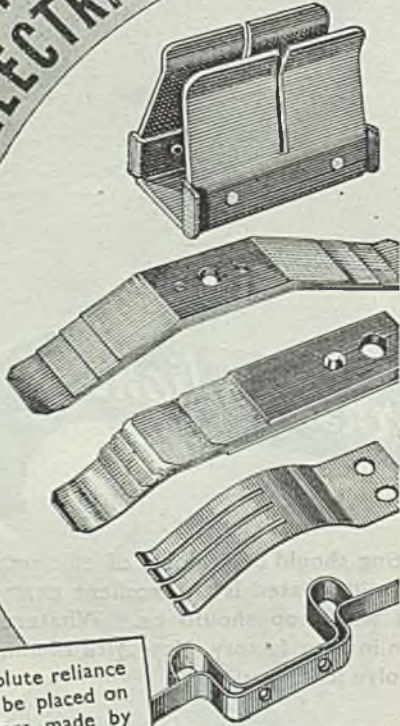
*Metrovick's 'light' product*

**COSMOS**  
and  
**METROVICK**  
**LAMPS**

**METROPOLITAN-VICKERS ELECTRICAL CO., LTD.**  
Number One Kingsway · · · London, W.C.2.

**RILO**  
REGD TRADE MARK

**SPRINGS FOR THE ELECTRICAL TRADE**



Absolute reliance can be placed on springs made by Riley of Rochdale. Technical leaders since 1821. On Admiralty, War Office and Air-Ministry Lists.

EST. 1821

**ROBERT**  
**Riley**  
LTD.

MILKSTONE SPRING WORKS, ROCHDALE, LANCS.  
PHONE: ROCHDALE 2237-8. 'GRAMS: "RILOSPRING."

If delivery is important  
send your enquiries  
for  
**GOTTON & PAPER COVERED  
AND  
COTTON BRAIDED H.C.  
COPPER WIRES & STRIPS**  
to:  
**Thames Wire & Cable Co. Ltd.**  
BATH HALL WORKS,  
BELL LANE, HODDESDON, HERTS.  
Telephone: HODDESDON 2485  
**A.I.D. APPROVED**

**ALCHO-RE**  
SOLDERING FLUX  
D.T.D. 599

Safety non-corrosive  
flux developed for  
Electrical and  
radio work

Fry's Metal Foundries Ltd.,  
Tandem Works, Merton  
Abbey, S.W.19. Tel.:  
Mitcham 4023.

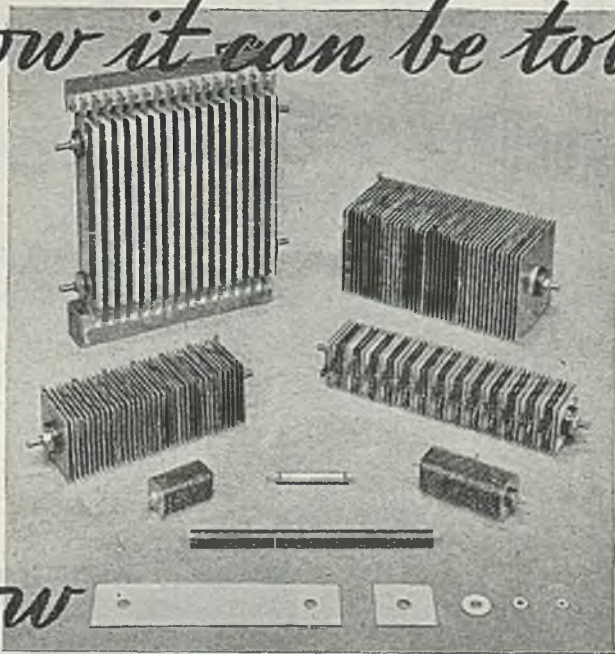
**REWINDS**  
MOTORS, GENERATORS, TRANSFORMERS  
ALL SIZES WITH THE MINIMUM DELAY

FOR EFFICIENT SERVICE WIRE  
**"PORTER," LINCOLN**  
PRIORITY ORDERS ONLY UNTIL  
BETTER TIMES

**PENNEY & PORTER (1932) LTD.,  
LINCOLN**

Grams: Porter. Phone: 1706/7.

*Now it can be told*



*How*

**WESTINGHOUSE**

## METAL RECTIFIERS

*served the needs of war to further  
the aims of peace*

Because of the many and varied purposes for which [they have been, and are still being, used on War Service,] Westinghouse Metal Rectifiers have found their place—on land, sea, and in the air—in every theatre of war, as well as in every branch of war industry itself.

The number of rectifier elements produced from the outbreak of war up to the beginning of 1945 reached 115,000,000, and completed sets 76,500; together with over 120,000 transformers and chokes, in the manufacture of which 1,625 tons of electrical steel sheet were used for laminations, with over 500 tons of copper wire.

Westinghouse Brake & Signal Co. Ltd., Pew Hill House, Chippenham, Wilts.

You'll have to ask  
your Dad?



You'll have to ask your Dad? . . . Not you! Every live man in the Trade knows the unique merits of the Tenby Wiring System. If you cannot get all the Tenby Accessories you require, at least be assured that we distribute them without favour and to the very best of our ability.

**Tenby**

**Tenbylux**

**Tenby Pilot**

**S · O · BOWKER**  
Limited

19-21 Warstone Lane  
BIRMINGHAM, 18

Telephone:  
CENTral 3701

*Light up...  
at less cost!*

**SINGLE-COIL**

STANDARD VOLTAGES 100-130, 200-260V

WATTS	PEARL AND CLEAR	PRICE
15		1/7
25	" " "	1/7
40	" " "	1/7
60	" " "	1/7
75	" " "	2/-
100	" " "	2/3
150	" " "	3/5
200	CLEAR	5/8
300	"	8/-
500	"	10/6

**COILED-COIL**

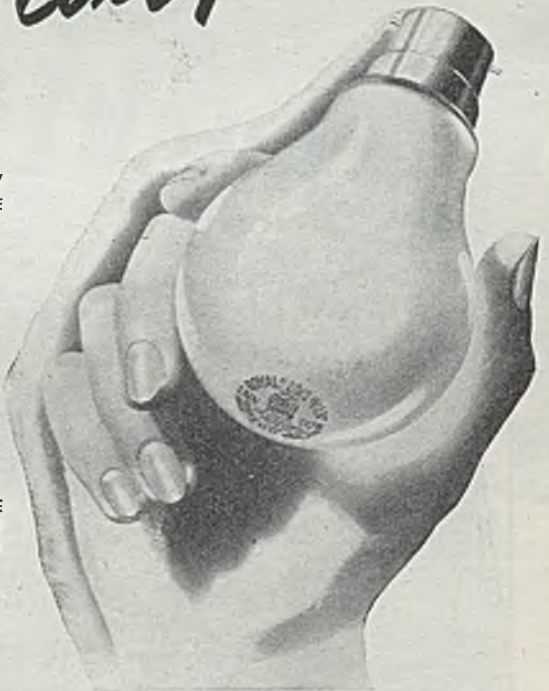
STANDARD VOLTAGES 200-260V

WATTS	PEARL	PRICE
40		1/11
* 60	"	1/11
* 75	"	2/1
* 100	"	2/4

*\* available shortly*

PRICES INCLUDE PURCHASE TAX

*write for folder No. L.1254*



**ROYAL**

**"EDISWAN"**

**LAMPS**



THE EDISON SWAN ELECTRIC CO. LTD.

BY APPOINTMENT  
SUPPLIERS TO HER MAJESTY  
THE KING GEORGE VI

155 CHARING CROSS RD., LONDON, W.C.2



# ELEPHANTIDE

REGISTERED

The **BRITISH MADE**  
PRESSBOARD INSULATION

for

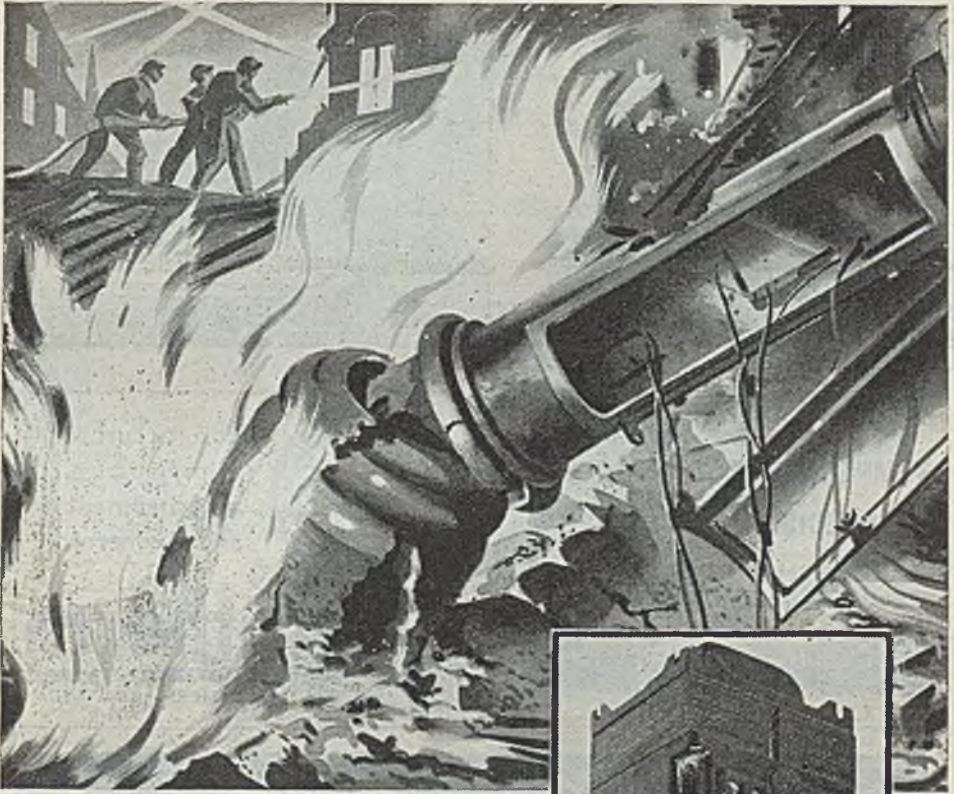
**TRANSFORMERS  
SWITCHGEAR  
MOTORS**

*and all other*  
**ELECTRICAL  
APPARATUS**

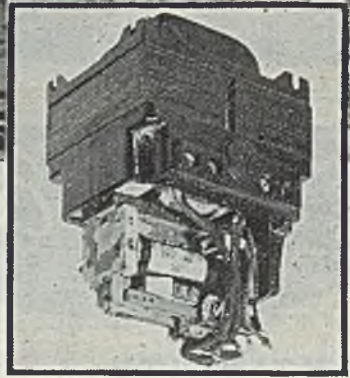
**B. S. & W. WHITELEY LTD.**  
POOL-IN-WHARFEDALE · YORKS.

Telegrams: "WHITELEY. POOL-IN-WHARFEDALE"  
Telephone: ARTHINGTON 98 and 99

LONDON OFFICE: 104 HIGH HOLBORN, W.C.1  
Telephone: CHAncery 7646



*Blitzed-but still  
Electrically sound*



**T**HIS unit suffered in the 1940 Blitz on London. It was controlling street bollard lighting at the time and was still electrically sound afterwards.

We do not recommend the treatment however, but we do recommend our very robust street lighting control system to your urgent attention.

*Full details will gladly be sent upon request.*



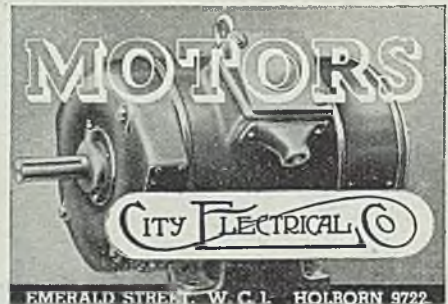
**STREET LIGHTING CONTROL SYSTEMS**

*Advertisement of Standard Telephones and Cables Limited, New Southgate, London, N.11*

*Trustworthy  
Friends...*



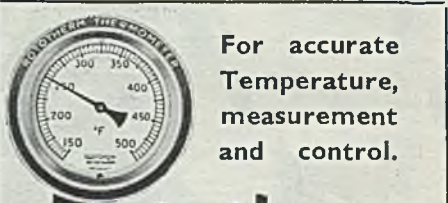
Oil Proof Petrol Proof Non-Inflammable Non Ageing  
**DURATUBE & WIRE LIMITED**  
Faggs Road · FELTHAM · Middlesex



EMERALD STREET, W.C.1. HOLBORN 9722

Relays for all purposes  
**TEMPERATURE CONTROLLERS**  
**PRECISION RESISTORS**  
EARTH PROTECTION  
Butcher—Black & Decker system

**ELECTRO METHODS LTD**  
112 BRENT STREET · LONDON · N.W.4  
TELEPHONE: WINDON 1844-5



For accurate  
Temperature,  
measurement  
and control.

**Rototherm**  
DIAL THERMOMETERS

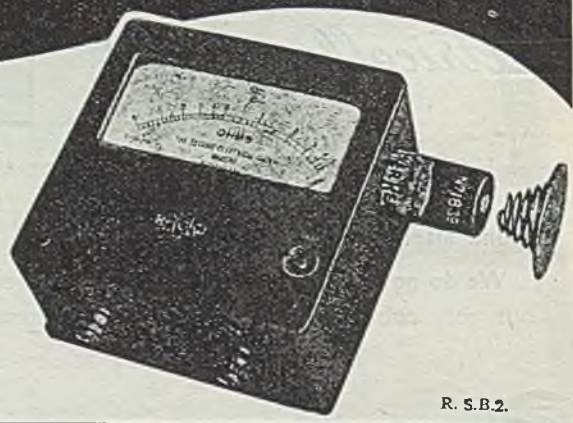
THE BRITISH ROTOTHERM CO., LTD.,  
Merton Abbey, S.W.19. Liberty 3406.



*Exact TEST results*

**CONTINUITY  
TEST SETS**

This Record Instrument  
gives exact test results,  
unaffected by variation in  
the battery voltage.



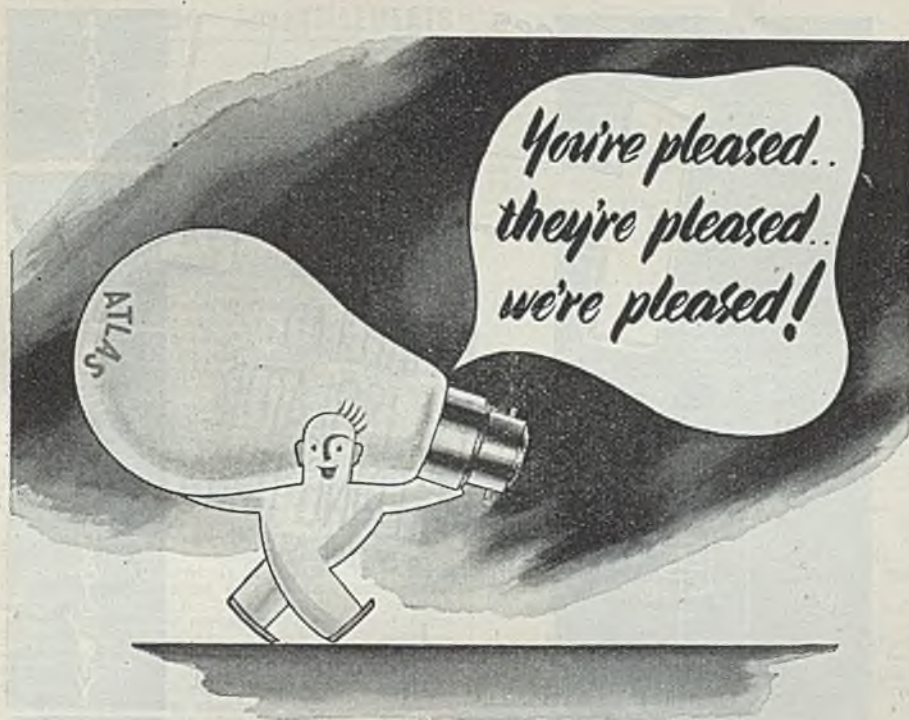
R. S.B.2.



**THE RECORD ELECTRICAL CO. LTD.**  
BROADHEATH · ALTRINCHAM · CHESHIRE  
'Phone: Altrincham 3221/2 'Grams: "Infusion" Altrincham

London Office: 28 Victoria St., Westminster, S.W.1. Phone: Abbey 5148.





Everyone's 'sold' on Atlas Lamps! There is extra profit for you in every sale. There are extra good discounts too, attractive sales aids, and perfect freedom to stock other makes of good lamps if you like. Your customers like Atlas because they are obviously such excellent lamps and

last so long. We are proud of the perfection of Atlas Lamps and our advertising is saying so everywhere—in every main thoroughfare, regularly in the national and provincial daily and evening papers and magazines. Get in on Atlas—write today for terms.

# ATLAS LAMPS

*Nothing better has come to light*

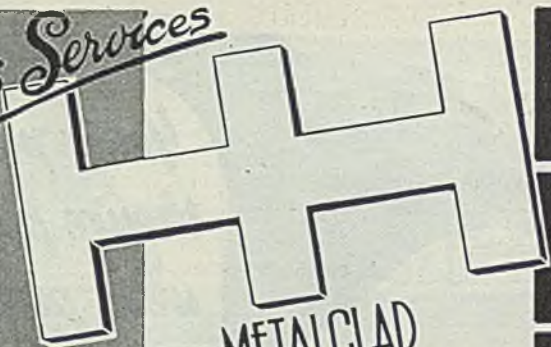
THORN ELECTRICAL INDUSTRIES LTD., 105-109 JUDD STREET, LONDON, W.C.1. Phone: EUSon 1183

Northern Branch: 55 Blossom Street, Manchester. Phone: Central 7461

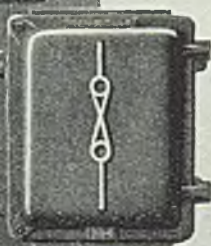
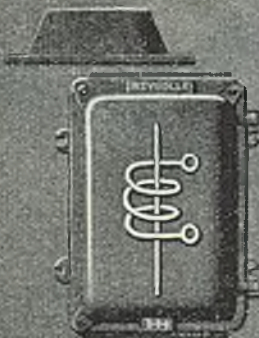
N.-E. Depot: 45 Sandhill, Newcastle-on-Tyne, I. Phone: Newcastle 24068

101

*For  
Consumer's Services*

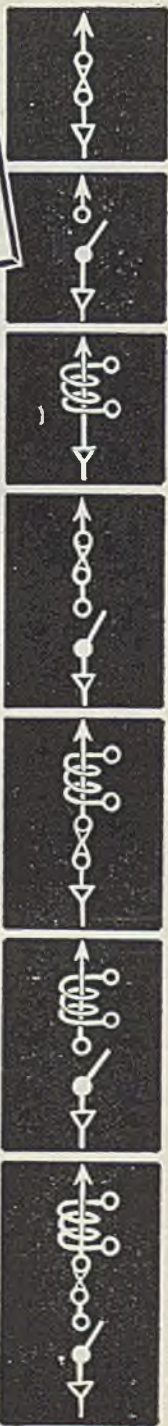


METALCLAD  
FUSE, ISOLATOR,  
AND METERING UNITS  
*SINGLY OR IN COMBINATION*



INTERCHANGEABLE  
UP TO  
600 AMPERES  
AT 660 VOLTS

*Service  
with  
Safety  
by using  
Reyrolle Units*



**REYROLLE**

MEMBERSHIP: CIG-TYME

ENGLAND

PARTICULARS ON APPLICATION

## MISCELLANEOUS ADVERTISEMENTS

None of the situations advertised in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 or 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1945, or the vacancy is for employment excepted from the provisions of that Order.

### SITUATIONS VACANT COUNTY BOROUGH OF SOUTHAMPTON.

#### ELECTRICITY DEPARTMENT

##### Appointment of Chief Assistant Engineer.

APPLICATIONS are invited for the above-named position, at a salary for Class "H," Grade 1, of the National Joint Board Schedule of £226 per annum, subject to the National increments and adjustments and a deduction for superannuation. The successful applicant must pass a medical examination.

Applicants should each possess an Engineering Degree and/or be a Corporate Member of the Institution of Electrical Engineers, and must have held the appointment of Deputy Chief Official, or an executive position of considerable responsibility, in a large Undertaking operating a selected generating station, and be possessed of sound administrative ability. Previous experience in all engineering matters appertaining to generation and distribution and in the commercial administration of an Undertaking is essential.

Applications, on forms to be obtained from Mr. W. G. Turner, Borough Electrical Engineer, Civic Centre, Southampton, and accompanied by not more than three testimonials, and endorsed "CHIEF ASSISTANT ENGINEER," must reach the undersigned not later than noon on 28th September, 1945.

Canvassing, directly or indirectly, will disqualify.

R. RONALD H. MEGGESON,  
Town Clerk.

Civic Centre, Southampton.

**ELECTRICITY MASTER** required in the London area for teaching adult women students elementary domestic Electricity. Teaching experience essential. Time 4 days per week: 3 Terms of approx. 12 weeks' duration. Duties to commence January, 1946.—Apply, stating age, experience and salary expected, to Box L.P.Z., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

**INSULATING VARNISH**.—Technical Representative with sound knowledge of Electrical Insulation required as assistant in Sales Dept., to operate mainly in the North and Midlands.—Please state age, experience and salary required, Box L.Q.A., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

**MANAGER** required, with general experience in the manufacture of lead storage batteries. State experience and salary required.—Write Box L.P.O., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

**TRANSFORMER WINDER** required, to take charge of small Winding Shop, winding Transformers of all types up to 100 KVA.—Write, giving all details, age, experience, salary required, etc., to Box L.Q.B., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

#### PATENT AGENTS

**KINGS PATENT AGENCY, LTD.**, B. T. King, A.I.Mech.E. (Patent Agent), 146A, Queen Victoria Street, London, E.C.4. **ADVICE**, Handbook, and Consultations free. Phone: City 6161.

#### TENDER

### ATHERTON URBAN DISTRICT COUNCIL. ELECTRICITY DEPARTMENT.

**TENDERS** are invited for the supply and delivery of a 220 K.V.A. Scott Transformer Group, particulars of which may be obtained on application to the Electricity Department, Factory Street, Atherton.

Tenders in plain sealed envelopes endorsed "Transformer" must reach me not later than Tuesday, the 18th September, 1945.

W. BALSON,  
Clerk of the Council.  
Town Hall, Atherton, Manchester.

#### FOR SALE

**SEARCHLIGHTS** (sale or hire), Carbon Rods, Ebonite, Fibre Hightensite, Porcelain House-wiring and other Cleats, Reels and Knobs, Mirrors, Lenses, Lamp Lowering and Suspension Gear, T.R.S., lead and other Cables, Winches (hand), hundreds of thousands in use, etc.—London Electric Firm, Croydon.

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

#### WORK WANTED AND OFFERED

**WE** will gladly undertake the making of component parts, etc., on our Lathes, Millers, Drills, etc.—London Electric Firm, Croydon. Phone: UPLands 4871.

## VULCANIZED FIBRE.

### EBONITE, BAKELITE

Sheets, Rods, Tubes and Machined Shapes.

LEATHEROID Sheets, Rolls, etc.

"CLIFTEX" Insulating Tapes.

Insulating Staples, Jointing, Presspahn.

## MOSSÉS & MITCHELL LTD.

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

research  
production  
and  
supply

brass, copper, bronze.

victoria rolling mills.

emery brothers ltd., aston, b'ham.



## **NIFE STEEL BATTERIES STOOD UP TO IT**

CRASH went the enemy bombs on the aerodrome. The big stores hangar received several direct hits and was completely burned out. Later, a Wing Commander, after inspecting the havoc, wrote:

- ‘No attempt had as yet been made to tidy up the wreckage . . . I found a pile of these batteries (NIFE). The wooden crates, insulators and stoppers were burnt right out, but the cases had not been distorted and the steel plates seemed to be still pretty good. . . . We made up some stoppers and on test the batteries proved practically as good as new after a couple of charge-discharge cycles.’

## **NIFE STEEL BATTERIES**

The all-steel construction of NIFE Batteries withstands shocks and stresses and their unique electrical principle, free from sulphation and corrosive fumes, is proof alike against the extremes of overcharging or long periods of idleness.

# THE ELECTRICIAN



Established 1861. The Oldest Weekly Illustrated Journal of

**Electrical Engineering, Industry, Science and Finance**

*Bouverie House, 154, Fleet Street, London, E.C.4. Telegrams: "Benbrotric, Fleet, London."*

*Telephone: Central 3212 (Ten Lines).*

*Midlands Office: Daimler House, Paradise Street, Birmingham. Telephone: Midland 0784.  
Glasgow Office: 116, Hope Street, Glasgow, C.2. Telephone: Central 3970.*

*The Offices of THE ELECTRICIAN are closed on Saturdays in accordance with the "Five-day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations. Until further notice the offices will be open between the hours of 9 a.m. and 5.30 p.m. from Monday to Friday.*

No. 3511. [Vol. CXXXV]

September 14, 1945

Annual Subscription 25s  
Overseas 30s

## CHIEF CONTENTS OF THIS ISSUE

<i>New Plug Standard</i> ... ..	257
<i>Views on Current Affairs</i> ... ..	258
<i>Public Lighting Conference</i> ... ..	260
<i>Lighting of Road Bends</i> ... ..	261
<i>Street Lantern Design</i> ... ..	262
<i>A.P.L.E. Exhibition</i> ... ..	263
<i>Radar in Production</i> ... ..	265
<i>Plastic Materials</i> ... ..	267
<i>Current Transformer Errors</i> ... ..	269
<i>Cape Town Electricity Undertaking</i> ... ..	271
<i>Domestic Plugs and Sockets</i> ... ..	272
<i>News in Brief</i> ... ..	273
<i>Lamp Sales Publicity</i> ... ..	274
<i>Electrical Personalities</i> ... ..	275
<i>Electricity Supply</i> ... ..	277
<i>Industrial Information</i> ... ..	279

plug and socket, the difference of opinion as to whether this could best be achieved by the adaptation of an existing standard or by an entirely new design, non-interchangeable with any existing standard, grew broader and broader.

It will be remembered that we suggested at various times to the industry, that it should so prepare itself for a resumption of house installation work, that when peace came to the world, the re-designed or up-rated wiring components would be ready for the installation of electricity in the new housing schemes as they materialised, but the arguments for and against a new plug and socket standard so obsessed the industry that there was a time when it looked as though post-war housing would need to be installed with the old standards in order that electrical service might be enjoyed at all. As it is, the promised housing schemes are still a long way short of being ready for the electrical installation contractor to move in, and the industry is thereby still in the position, even at this late date, of being able to look forward to all new building incorporating a convenience of interchangeability of appliances, enjoyed by relatively few dwellers in houses built prior to 1939.

Some indication of the form in which this interchangeability will be possible is to be found in a statement on plugs and sockets which the B.S.I. issued last week, though it is not suggested that the decision made is likely to be willingly accepted by all parties—in fact many of the points covered in the statement, are those about which so much argument in the past has developed. The B.S.I. has, for instance, chosen as the standard, a plug and socket of the

## New Plug Standard

A CONTROVERSY which has claimed the attention of the electrical industry for the last few years, looks like reaching its end. We refer to the liveliness which has centred about the arguments respecting a standard for domestic plugs and sockets, and the fact that the British Standards Institution has now substantially endorsed the recommendations made by the Electrical Installations (Study) Committee in paragraph 92 of their main report—to the exclusion of the supplementary suggestions given in the appendix to the same report—and the uprated 5 A plug has been adopted.

The electrical industry is made up of so many interests, covers so wide a field and is so individualistic in its outlook, that when the question of a new standard for domestic plugs and sockets was put to it, there were few who expected an answer acceptable to everybody. As it was, however, while there was universal agreement that there should be a single all-purpose domestic

same dimensions, as regards interchangeability, as the 5 A size in B.S. 546 but rated at 3 kW, with a local fuse housed in the fixed part of the installation and an additional fuse in the plug, if need be, for the protection of small current appliances; a design which many may possibly criticise, both with respect to the uprating and the fusing arrangements.

### B.S.I. Change of Viewpoint

IT is not within the scope of this journal to take sides in so controversial a subject, but it is common knowledge that both the I.E.E. Study Committee and the Codes of Practice Committee supported the claim for a new fused plug to the exclusion of uprating. The B.S.I., too, at first accepted the suggestion of a new design of plug and socket rated at 13 A with a fuse in the plug, but as explained in the official statement this decision was later reversed. The statement offers no reason for this change of front, but it is interesting to note that there are already at least two manufacturers making a 13 A fused plug and at least one large local authority installing it in the housing schemes just started. The claims for acceptance of a newly designed plug and socket or for the uprating of the 5 A counterpart, are largely wrapped up in technical considerations, but for the moment post-war housing with the fullest possible electrical convenience to the consumer should be the industry's chief concern. The question of whether the new B.S.I. standard will meet this condition better than would a completely new design of plug and socket, time alone can tell. A modified B.S.546 is in any case now a fact and the industry's reaction to it, is awaited with interest.

### Public Lighting

THE conference of the Association of Public Lighting Engineers, which opened at Glasgow on Tuesday and concluded yesterday, Thursday, was voted by those who attended as being among the most successful ever staged by the association. Due to its date it has not been possible to include in this issue details of the whole of the proceedings, but the discussion of the papers will be given next week. One of the most attractive features of the conference was the

exhibition, for in spite of the difficulties of the times, the exhibitors somehow managed to put up as representative a show as any might reasonably hope to see. The demonstrations staged by Glasgow Corporation were particularly appreciated by the delegates, for, realising the extra work which their arrangement must have thrown upon the shoulders of the already over-worked staff, the various features were doubly enjoyed. The papers were delivered before large and enthusiastic audiences, and the discussions which followed brought about an exchange of opinions and experiences which will be valuable in the designing of future street lighting. For staging the first large-scale post-war conference the A.P.L.E. is to be congratulated, while for the success which attended it every credit is due to the Council and officers.

### E.D.A. Area Conference at Scarborough

WHAT promises to be a lively two-day conference has been arranged by the Mid-East England Area of the E.D.A. to take place at Scarborough on September 26 and 27. Mr. D. BELLAMY and Mr. W. H. DUNKLEY, general manager and deputy, respectively, at Hull, are scheduled to speak, together with Mr. W. K. FLEMING, borough electrical engineer at Scarborough. The conference is confined to the area covered by the branch, but even so, there are even at this early date bookings approaching 100. Scarborough has been the scene of many a successful electrical conference, but to the Mid-East England E.D.A. Area goes the distinction of having staged the first conference in the town to deal with post-war electrical development.

### U.S. Foreign Trade

SOME indication of the competition to be set up by the United States industry was given last week by Mr. MILO PERKINS, who will be best remembered as director of the Board of Economic Warfare, for while the home market is expected to absorb more than 90 per cent. of the country's total production of goods, it may not be able to absorb more than half of the production of heavy machinery. The United States must, maintains Mr. PERKINS, sell abroad great quantities of machinery,

transport equipment and machine tools in order to avoid a large-scale closing of the country's workshops, and as such descriptions will be in competition with the output of our own electrical industry, the stage is set for what may be a battle royal. At the moment, United States industry has the advantage of a large measure of freedom of control both with regard to materials and labour, while at the same time at no period during the last six years has the American engineering industry been so completely geared to the war machine as has our own.

#### Electrical Industry's Example

**L**AST week responsible Ministers warned the country of our need for export trade, of the privations we at home may be called upon to endure in order that we may assist that trade, but nowhere have we heard of any material means whereby British industry may be encouraged to enter the arena for winning the overseas buyer to its side. It is obvious that the United States will put up a fight worthy of the cause, and the time for British industry to be permitted to prepare its machine shops, replace its worn-out equipment, and generally brace itself for the fray, is long overdue. Last year British electrical exports were valued at £24 848 409, of which generators accounted for £2 526 380, motors £1 773 697, transformers £1 375 029, and unspecified electrical machinery £4 451 867. Compared with the year 1938, these figures are impressive, for they show the potential value of the electrical industry as a contributor to our export trade to be particularly high, even at a time when the industry was also engaged in war production. The 1944 total compares with £21 647 048 in 1938, while shipments during that year of the machinery named above were also smaller, indicating thereby the industry's ability to more than hold its own if only it might be freed from the fetters which keep it in check.

#### Electric Road Vehicles

**T**HERE are indications that the electric road vehicle may be much more in evidence in the immediate post-war years than in 1938. According to a communication from the Ministry of Supply to the Electric Vehicle Associa-

tion, a number of individual manufacturers have applied for authority to produce electric vehicles in 1946, and programmes have been agreed with an output totalling more than four times the number manufactured in the year before the war. It is understood that the vehicles will be for the home market and will be mainly of the types used by tradesmen, by local authorities, for refuse collection, etc. That there is a potential export market, too, is shown by the fact that inquiries have been received by the association from firms in South Africa, India and elsewhere, seeking to establish agencies for the purchase and distribution of the vehicles in overseas countries.

#### Electric Kitchen Popularity

**W**HEN the Post-war Homes Exhibition closed at Dorland Hall, London, on Saturday last, the box office figures recorded the fact that 211 552 visitors had paid for admission, which means in effect that the E.D.A. kitchen and laundry exhibits had been inspected by that number. The reactions to the exhibits were good, and, coupled with the touring exhibition now travelling the country, the publicity thus accorded the electrical idea should prove assisting to a wider adoption of the designed kitchen in future housing schemes. There is no possible doubt of the popularity of the electric kitchen among housewives, and given their own way no house, new or old, would be without one.

#### An Official Handicap

**U**NFORTUNATELY there are still building authorities, architects, and so on, who need to be further educated before they realise the simplicity, convenience and economy which electrical service offers, and the sooner the industry is permitted the man-power and materials to parade its new appliances before their eyes the better. So far, the E.D.A. and its supporters have made remarkable progress with the scanty equipment available, but before the public can fully appreciate the merits of post-war electrical service a full-scale exhibition with appliances in abundance must be staged. At the moment there is little the industry can do in the matter save to concentrate its efforts in an attempt to wake the Supply Departments from their war-time dream to a realisation of peace-time necessity.

# Public Lighting

## Opening of A.P.L.E. Conference at Glasgow

THIS year marks the 21st anniversary of the Association of Public Lighting Engineers, and reference was made to the fact at the conference of the association which opened in Glasgow on Tuesday and concluded yesterday, Thursday. The proceedings opened in the morning with a meeting of the Council, followed by an address of welcome to the city, and the annual general meeting. In the afternoon the presidential address of Mr. Edward J. Stewart, inspector of lighting, Glasgow, was read, followed by a paper entitled "Glasgow's Street Lighting" by Mr. J. M. Ward. In the evening a civic reception was held at the City Chambers.

Wednesday's business included a paper, "Lighting of Bends, Junctions and Roundabouts," by Mr. Francis F. Middleton, in the morning, a conference luncheon and an address by Dr. J. W. T. Walsh in the

afternoon, on the work of the drafting sub-committee responsible for the B.S.I. specification on Street Lighting, to implement the 1937 Ministry of Transport Report. In the evening a reception was held at the Glasgow Lighting Department in Trongate followed by a visit to the exhibition. The extent of the exhibition will be appreciated from details given in our last issue and continued in this, and during the evening visitors were given the opportunity of witnessing demonstrations in the Corporation's lighting laboratories and inspecting the street lighting installations in and around the city.

Yesterday, Thursday, was devoted to the reading of a paper entitled "Engineering Principles in Street Lantern Design" by Messrs. J. S. Smyth and J. G. Christopher, and another, "The Commercial Aspect of Public Lighting," by Mr. E. S. Harris.

## Glasgow Street Lighting System Covering 685 Miles of Public Highway

AT the Royal Technical College on Wednesday morning, a paper on "Glasgow's Street Lighting," was read by Mr. J. M. Ward, assistant inspector of lighting at Glasgow. He mentioned that there were 685 miles of lighted streets in the city and 25 000 common stairs giving entrance to flats or tenement dwellings. Street and stair lighting was the responsibility of the local authority. To meet the statutory enactments involved the lighting, extinguishing and maintenance of 126 500 lights varying, pre-war, in consumption from .7 cu. ft. of gas to 1 000 W electric. Following the relaxation of the Lighting Restriction Order in September, 1944, Glasgow was probably the best let of the larger towns in Great Britain. This was made possible by a number of factors: (1) the extensive control system; (2) the general use of the 25 ft. mounting heights in main streets; and (3) the long-standing policy of a simplified lighting fitting, "gadgets," being kept to a minimum. The present street lighting was not by any means a return to pre-war wattages.

The results certainly made one think seriously of pre-war wattages. Streets which before black-out days had been lit with either 300 or 500 W lamps, gave amazingly good visibility with the "moonlight" 100 W. Allowance must be made

for the absence of normal competition from signs, shop windows and headlights, but one awaited the long dark nights to continue at greater length observations and tests.

The Ministry of Transport Committee's recommendations for street lighting, which, it was hoped, would soon be embodied in a new street lighting specification, give the mounting height for Class A roads as 25 ft. and the spacing at 40 yards; that arrangement had been much the practice in Glasgow since 1908. Many interesting examples of span mounting with two units per span could be seen, employing the 15 in. St. Mungo reflector, with no glass-ware. In such installations, the mounting height dropped to 22 ft., and delegates would find the installation satisfactory. In Glasgow many miles of lighting fell between Class A and Class B of the recommendations, by the large use of a 28 ft. pole which gave a 20 ft. mounting height, but Glasgow was not repentant. So largely committed to overhead cables, the department could not usefully employ the lower mounting height suggested, but in any case it was generally agreed that low-mounted installations were unsatisfactory although circumstances—generally financial—might make them "evils to be borne."



Many large housing schemes completed between 1920-1930 were lit with the 9 ft. cast iron pillar to which was fitted a swan-neck carrying a 12 in. St. Mungo fitting giving 10 ft. 6 in. to light source.

The 37 ft. 6 in. steel pole had held full sway so far as 25 ft. mounting was concerned, but in a war-time housing scheme at Penilee concrete poles had been tried.

The Glasgow lantern generally employed for installations where lamps from 300-1 500 W used, had evolved, and the result of many years' testing and trial were to be found in its present form. All lanterns were fixtures, raising and lowering gear being used only in a few positions unsuitable for the tower wagon.

The lantern, of which there were over 9 000 in use, had a 24 in. external reflector and was fitted either with a 12 in. pear-shaped clear globe or a 12 in. by 5 in. opal cylinder. The latter gave best results where a 500 W lamp was used. Focussing was by means of a movable bridge-plate carrying the holder, travelling on three vertical rods. On this bridge-plate was mounted a fuse which had been introduced to cut down the number of dark sections

experienced with "premature" lamps which previously blew the circuit fuses, darkening anything up to 15 lamps.

There were a large number of 28 ft. poles, giving 20 ft. to light source and employing the G.2 lantern, which was just a small edition of the G.3. Constructed on very similar lines to the Glasgow lantern it was used with either 150 or 200 W lamps. On the present "economy" lighting it is housing a 60 W E.S. lamp. It could be used either with an 8 in. pear-shaped globe or an 8 in. by 4 in. cylinder.

In a city such as Glasgow, covering 39 725 acres with 675 miles of lighted streets and a switchable load of over 4 000 kW the idea of a master switch controlling street-lighting would be absurd. The Glasgow plan had been to divide the city into seven control areas and in each of the existing five control stations switch boards were in operation controlling large numbers of street and stair lamps. The cabling being overhead and all under the department's care and maintenance, it was natural that the control should be developed on the relay system, subject always to new developments.

## Lighting of Road Bends

### Problems Set by Junctions and Roundabouts

THE subject of a paper by Mr. Francis F. Middleton, read on Wednesday afternoon, was "Lighting of Bends, Junctions and Roundabouts."

The author expressed the opinion that there was a tendency to give too much importance to the formation of bright regions and the merging of the reflections from successive sources, and too little regard to those other parts of the backgrounds which the Final Report on Street Lighting made clear should be as uniform in brightness with the carriageway as possible. While admitting that these bright regions produced efficient silhouette contrasts, he thought it was necessary to provide similar contrast values against those other surfaces which were a more important and more essential part of the background. Backgrounds were too varied to attempt to evaluate their reflection ratios, and they would have to assume some average value based on their experience of the conditions as they were found to exist. Trees and hedges, for example, required considerably more light to equal the brightness of a light-coloured building.

Those boundaries adjacent to the carriageway at bends and junctions should be provided with a brightness approximately equal to that of the carriageway, for they

constituted nearly all the background that objects would have at those situations.

If they desired to produce for a specified point of view an appearance of uniform brightness on any surface or series of surfaces, they must, therefore, compensate for the disparity by graduating the light intensity which was reflected by them. It was obvious that they could apply this theory to the lighting of bends and junctions as well as to any other situation, and their success would depend on how efficiently the light was distributed by the lantern in relation to the types of surfaces normally to be found there.

Light sources had only a fixed amount of flux which limited the extent of the area on which a single source could produce a uniform brightness, particularly as very high intensities were required for more distant parts. Therefore they must design their lantern to produce a reasonable uniformity on the greatest area permitted by the usable output of the lamp.

It was quite practicable to design lanterns of this type and to site them appropriately at bends and junctions as well as on straight roads at spaced intervals not less than those recommended in the Final Report, and give satisfactory effect to the requirements of distribution as laid down there.

# Street Lantern Design

## Main Developments Concerned with Materials—Construction Problems

ON Thursday morning a paper on "Engineering Principles in Street Lighting Lantern Design," by Messrs. J. G. Christopher and J. S. Smyth, was read before the A.P.L.E. conference and discussed.

The authors of this paper, written for presentation to the A.P.L.E. in 1939, set out to analyse the fundamental mechanical requirements of a street lighting lantern, and to show how far those requirements were satisfied in the equipment available at that time. The past six years had been notable for many astonishing engineering achievements, and it could well be that new materials and processes now available might considerably modify the conclusions reached in 1939. In fact, no startling changes need be expected.

It was thus only in the sphere of materials that real developments need be considered at the moment. Plastics and other synthetics were much in the news these days, and a short section discussing them had been added to the original paper; also some new lantern designs were shown. However, the greatest addition to relevant knowledge was in the protection of equipment from corrosion, and the original discussion of this subject had been rewritten.

For the modern lantern, with its carefully controlled distribution, the casual treatment of earlier years was no longer adequate. There was little advantage in evolving an optical system which could control the light distribution within close limits, unless the mechanical design ensured that those limits were regularly attained in production and maintained in service.

### Heavy Demand for Equipment

Fortunately, besides introducing more stringent requirements, recent developments had made more efficient manufacture possible. The demand for equipment had increased so rapidly that old methods of construction and manufacture, apart from their technical shortcomings, would make it difficult to supply the needs of the market. The solution was the production of a range of lanterns, each with a specific application, rather than a multiplicity of types differing only in their external appearance. Such a range could be produced in large quantities by modern production methods and engineering principles could be incorporated in the designs. However, the cost of the tools involved in this quantity production made mistakes expensive, and before undertaking a new design the practical requirements dictated by experience must be clearly defined.

The methods of construction and consequent appearance of lanterns might vary with available manufacturing facilities, price, optical design and other factors. Nevertheless, there were certain fundamental requirements which any satisfactory lantern must fulfil. These requirements could be analysed as follows:—(A) Precise rigid assembly and a construction which will enable (B) and (C) below to be satisfied and which will ensure uniformity of initial performance. (B) Resistance to weather, resistance to corrosion, ability to withstand shaking and vibration, satisfactory operating temperatures. (C) Simple erection and wiring; ease of cleaning and freedom from dirt collection; unvarying performance without adjustments. (D) Unobtrusive and attractive appearance.

Experience had shown that all those requirements must be considered simultaneously in design.

The authors went on to discuss those relevant factors separately.

### Corrosion Difficulties

Dealing with the subject of resistance to corrosion, they said that bronze, brass and copper, cast-iron, steel and aluminium alloys could all be used for the construction of the body of the lantern. Castings in the first three metals were expensive and, like those in iron, were heavy. Sheet copper would withstand corrosion, but was not mechanically strong, and sheet steel was liable to rust. The merits of die-castings for lantern bodies had encouraged the use of aluminium alloys, which had the additional advantages of light weight and good mechanical properties, but some of those alloys were subject to corrosion and electrolytic action, and careful selection of alloy, surface protection and components was necessary. A great deal of useful knowledge had been obtained during the war, both from planned exposure tests and from the behaviour of equipment exposed without much maintenance in street lighting installations; it was now clear why occasional distressing experiences in coast-wise districts had been encountered. As a rough guide, in the authors' experience, zinc-aluminium alloys were not satisfactory for the worst coastal conditions, while the specialised alloys were too expensive for general use in lighting equipment. Not only was the alloy important; material for screws and other components must be carefully selected, or interaction between casting and components would result in seized or broken screws and serious attacks on the casting. Discussing plastics, the

authors said that at first sight, the transparent plastics, such as Perspex, seemed to have great possibilities in the optical system, and were indeed used to some extent in decorative fittings for interior work. In street-lighting, however, some parts of the optical system frequently operated at temperatures of the order of 100°C., which was above the softening temperature of the plastics of a suitable nature now available; in addition, such plastics were far more expensive than glass.

For the construction of lantern bodies, there appeared to be no easily moulded plastic which combined in itself the strength, toughness and machinability of metal at an economic price. Another disadvantage of plastics for the bodies of high-power lanterns was their low heat conductivity, which exaggerated the already severe problem of heat dissipation. Never-

theless, for a small lantern required in large quantities, a plastic body was a distinctly interesting possibility, but there was no point in departing from metal merely for the sake of novelty.

It was very likely that plastics might prove useful in the design of small components for lanterns, although at present little use was made of them. For example, Silicone rubber, a synthetic material resembling ordinary rubber in its mechanical properties but having far greater resistance to heat and ultra-violet radiation, might be a very valuable material for gaskets when it was available at a reasonable price.

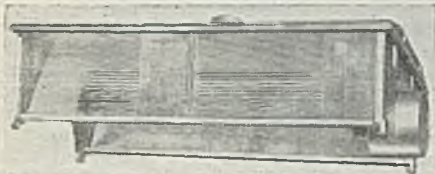
Whatever conditions might arise in the future, concluded the authors, the broad mechanical requirements of a street-lighting lantern would remain unchanged for many years.

## The A.P.L.E. Exhibition

### Further Review of Equipment Shown at Glasgow

Below are described some further exhibits of electric street lighting equipment shown at the exhibition held in connection with the conference.

**Brighton Lighting and Electrical Engineering Co., Ltd.** demonstrated an in-

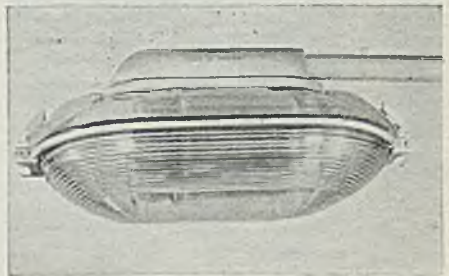


**Golden Ray fitting for 80-140 W sodium discharge lamp made by the Engineering and Lighting Equipment Co. and described in our last issue**

teresting development devised by Mr. H. Pryce-Jones, engineer and manager of the Brighton electricity undertaking, in the Multilite lantern, produced by them, employing a selected number of medium power gas-filled electric lamps in line instead of a single high-power lamp. Such an arrangement, besides giving the type of colour-corrected light emission most desirable for street lighting, has advantages in regard to flexibility of power and con-tion, and elimination of "chokes" and similar ancillary equipment. The lantern has a substantial cast iron rectangular hood with two side panels of clear plate glass. The interior is fitted with three Holophane single-piece refractors in line, designed to give a two-way non-axial light distribution for side-of-carriage mount-

ing. The refractors are fixed to the hood by internal copper clips for easy removal.

The **Electric Street Lighting Apparatus Co.** showed a range of AL type 60/200 W, single light, Bi-Multi reflectors, glazed to show variations of glazing to suit specific conditions of installation; AL type 60/200 W, single light, Bi-Multi wide angle reflectors; AL type 60/200 W, twin lamp Bi-Multi reflectors; two special types of reflectors designed for unusual installations; the Whitehead circular distribution reflector (adjustable—dispersive or concentrating); types of fuse and switch fuse boxes; and ESLA line fuses. The reflectors, in the majority of cases, are one-piece castings, glazed with silvered glass

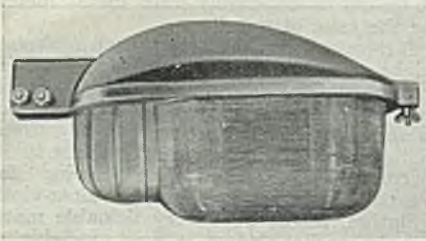


**A new double dish lantern shown by the General Electric Co., Ltd.**

facets cut from flat sheet and embedded in a special cement.

The **Horstmann Gear Co., Ltd.**, had on view representative models of H.B.E. electric time switches. The limitations

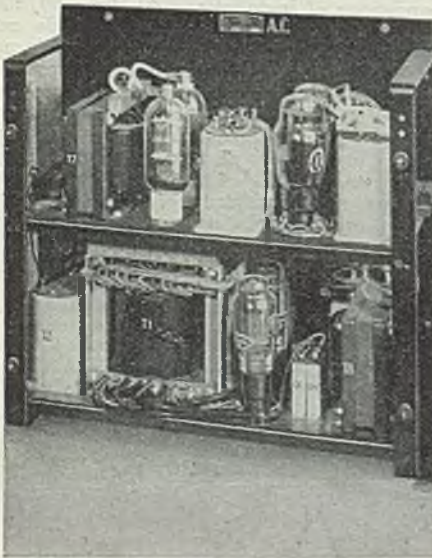
with regard to manufacture imposed by the necessity for continuing certain vitally



The Metrovick Trafford lantern

important productions made it necessary for the company to limit the manufacture of electrical control equipment to the models displayed, viz., types U, K synchronous, E and W, together with an appropriate range of all-metal housing boxes. All-time switches on view were taken from the production lines and were fully representative of normal output. Detailed improvements have been incorporated without interfering in any way with interchangeability.

The principal exhibit of Falk, Stadelmann and Co., Ltd., was a range of eight Efesca lanterns, which, with variations covering the different wattages and light



A typical G.E.C. amplifier for ripple control, mentioned in our last issue

sources used, meets most of the requirements for Group A and Group B roads. To obtain the necessary illumination characteristics, and to comply with the

findings of the M.O.T.'s Committee on Street Lighting in their Final Report, every design, with but one exception, incorporates a bowl or dome type prismatic refractor.

The display of the Metropolitan-Vickers Electrical Co., Ltd., consisted principally of three street lighting lanterns—two of the bracket-mounting pattern and one designed for suspension from an arm. With these were shown a large detailed drawing and a light distribution iso-candle diagram relating to each. Three other street lighting lanterns from the Metrovick range were represented by corresponding drawings and diagrams and also by mounted photographs. The three lanterns exhibited were the Trafford, Poplar and Ealing. Chief interest was centred in the Trafford model, which has an optical system of a new design that makes use of an unusually large proportion of the total lumens emitted (in all directions) from the light source—a Metrovick mercury discharge lamp. A part of one wall of the stand was occupied by a large advertisement design (in colour) setting out some applications of the Metrovick Ripplay system of pilotless centralised control, which employs high-frequency "ripple" currents superimposed on the e.h.v. system, and permits the centralised and selective control of any desired number of Ripplay switches scattered over the l.v. cable network.

**New E.L.M.A. Publications.**— The E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, has just issued a booklet entitled "Street Lighting by Electricity" and a technical supplement on fluorescent lamps. As it is over five years since the majority of engineers were concerned with planning street lighting, it was felt that a booklet covering the salient points of electric street lighting would fill a need, to supplement the Final Report of the Ministry of Transport Departmental Committee on Street Lighting, 1937, and because a revised B.S.S. based on the report is not yet ready for publication. The booklet states the main object of public lighting and goes on to discuss classes of roads; what good electric street lighting does; its effect on crime; the principles of good electric street lighting; the Government recommendations; lighting of traffic routes; street lighting control; co-operation between departments as to road surface; maintenance of lighting installations and lamp quality. Technical Supplement No. 1 summarises some of the salient features of fluorescent lamps in the belief that all those concerned with industrial or commercial lighting will wish to investigate the possibilities of fluorescent lighting. It also gives design and technical data and servicing notes.

# Radar in Production

## The Development of Centimetric Equipment

**A** MOSQUITO aircraft speeding through a cloudy sky was the "target" for a demonstration of centimetric radar equipments before representatives of the technical Press at the works of the British Thomson-Houston Co., Ltd., at Rugby, on September 7. One of the sets was the G.L.3, widely used for A.A. fire control since it was first produced in the company's Leicester works in 1942, and the other was Glaxo, representing the latest development in fire control radar, also a B.T.H. product. A radar-controlled search-

which opened in 1942, is devoted entirely to the production of radar equipment. It has already completed many hundreds of G.L.3 equipments, and is now busily engaged on Glaxo, and searchlight contracts.

The company has played a prominent part in the development and production of radar, and while aspects of research and development work still proceeding cannot be revealed, the B.T.H. contribution as disclosed, is most impressive.

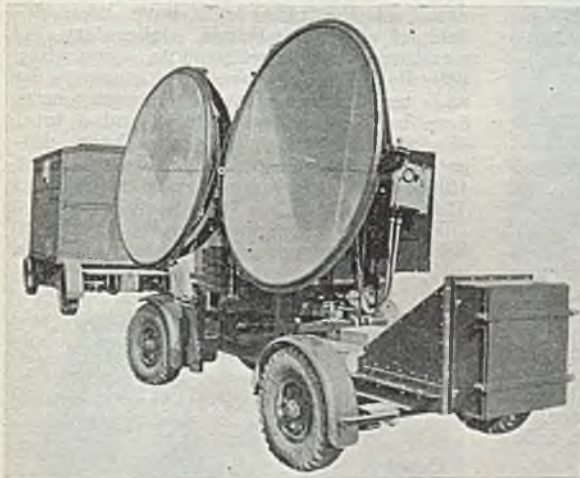
In November, 1940, the company was called upon to carry through a research

programme leading to the development, design and construction of the first centimetric radar set for A.A. fire control, in collaboration with representatives of the M.O.S. and M.A.P. Research Establishments. By March 1, 1941, the first experimental model was ready for test. Three months later it was despatched with an increased output of 50 kW for field trials. The tests at Rugby and the field trials established the claims made for centimetric radar and showed the possibility of following fast moving targets with almost optical accuracy at all times and in all weathers.

Following the successful trials of the first model, the design of the operational equipment known as G.L.3 was undertaken. This oper-

ates in the 10 cm. band with very high power in the radio beam. The first of the six models of this design was despatched in December, 1941, and during 1942 preparations were made for large scale production at the company's factory at Leicester. This factory delivered its first equipment in October, 1942. The manufacture of G.L.3 was shared with the Gramophone Co., Ltd., Hayes, who made the "presentation unit," and the cabins and trailers were supplied by Metropolitan-Cammell Carriage and Wagon Co., Ltd., and Joseph Adamson and Co., Ltd. Many other firms contributed.

Experiments started at the M.O.S. Research Establishment in 1941 on the automatic following of aircraft by radar equipment led to the design of the equipment designated Glaxo. With the assistance of A. C. Cossor, Ltd., and Nash and



Experimental radar height-finding equipment

light with servo drive was also inspected. This was but one item in a full programme embracing research and development in the laboratory, and the actual manufacture of radar sets and their components in the factories at Rugby and Leicester.

Sound films showing the basic principles of radar and its application to A.A. fire control by means of G.L.3, and projected in the acoustic theatre, provided a helpful prelude to the tour. The reels had been made in the company's film laboratory which, during the war was called upon to make instructional films on the applications of radar, many of them highly secret, for the Services and has turned out 5 000 000 ft. of finished 16 mm. film in twelve months.

The journey to Leicester was made by motor coach. Here the factory, with an area of approximately 125 000 sq. ft.,

Thompson, Ltd., three experimental models were built, and in 1943 B.T.H. were asked to complete the development and undertake the engineering design for production.

To counter the flying bomb attacks in 1944, the company undertook the development and manufacture of a small radar unit, named Cupid, in which the transmitter-receiver is mounted above the pre-



**Glaxo, the latest development in A.A. fire control radar, made by the B.T.H. Co.**

dictor. The low inertia of the moving parts makes this set most suitable for high-speed targets, and, working in the 10 cm. band with a 4 in. diameter reflector, the radio beam is very narrow and can follow targets close to the ground.

A number of height-finding equipments built by the company provided cover from low-flying aircraft at vital points along the coast.

The electric remote position control servo has been extensively applied to radar installations enabling A.T.S. operators accurately to position large aerials with little muscular effort. An electronic-amplidyne servo-mechanism controls the movement of the aerial system of Glaxo. The standard Army searchlight is also equipped with electronic-servo control. Radar equipment, mounted on the searchlight in connection with the servo control, automatically holds the light beam on the target.

The company has designed and manufactured many units for airborne radar, including the transmitter-receiver unit for the H2S system used in pathfinder aircraft. Several thousands of these units were built in the B.T.H. Peterborough factory.

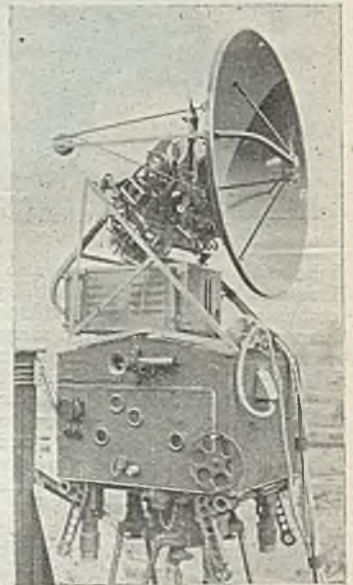
The B.T.H. industrial high-voltage thyatron Type BT9 was the first of such valves to be used in modulators in the

early days of the war. As the power requirements increased and pulse lengths decreased to give improved accuracy, new designs of thyatrons were rendered necessary. The operating voltage in some applications is up to 20 000 V. The company manufactured over 200 000 mercury vapour thyatrons for radiolocation service during the war.

The company developed a new form of totally enclosed safety spark gap, to suppress high voltage surges which are liable to occur with the new pulsing techniques; two main types of the safety spark gap have been standardised, and approximately 25 000 of these gaps have been manufactured for Service use.

Many types of the magnetron valve, which is the generator of the radio frequency oscillations transmitted from the aerial of the radar set, have been developed in the B.T.H. laboratory to meet service requirements, including valves for airborne equipment. In all, ten different valve designs have been handled in the factory, and a total of some 70 000 valves have been despatched. A peak production in excess of 4 000 valves per month was reached in 1944.

Welding of plastics, especially polythene, has been developed by the company into a



**Cupid, the small radar unit developed by the B.T.H. for selective searching and following V1 bombs**

regular production operation, using electrically heated devices which provide jets of hot air to melt the plastics. An example is the joining by welding of hemispherical polythene mouldings which protect the transmitting aerial against rain, sun, etc.

# Plastic Materials

By JAMES TAYLOR, B.Sc., F.R.I.C.

THE aniline-formaldehyde type of plastic materials is of especial interest to the electrical man. If aniline is condensed with formaldehyde in the presence of an acidic catalyst, a dark brown resin-like material is formed. With equimolecular quantities of the two ingredients, the product is brittle, fusible and soluble, but with increasing the proportions of formaldehyde the insolubility and infusibility of the product increase until a practically infusible material is produced.

## Exothermic Reaction

The two ingredients and the catalyst are brought together and heated gently to start the reaction as a result of which a reddish brown liquid is produced. The reaction is exothermic, i.e., it generates heat, so that once started it goes on by itself without the application of further external heat until an almost insoluble solid material is formed. Whilst the mass is still liquid, fillers are introduced, and, after impregnation, the resin is precipitated with alkali, washed and dried. The fillers used may be cellulose, e.g., wood flour, or cotton, or mineral, e.g., asbestos or mica. The final product is a material which is thermoplastic, but not sufficiently so to enable it to be injection moulded. It can, however, be moulded by compression under heat. The moulding temperature used is about 155° C. and the pressure about 2 tons per sq. in., depending upon the shape of the moulding and the exact nature of the material. The mould is usually cooled by water before removing the article from it.

Alternatively, the material may be worked, that is to say, a blank is prepared and worked to the final shape by machining, sawing, or turning. It can be drilled and tapped, sawn, and, if necessary, polished. The only precautions necessary are that both the material and the tools must be kept cool and the tools must be sharp and the speed should be fairly high.

Below are average physical properties of the unfilled resin:—

- Impact strength 33 (BSS 771);
- Tensile strength 9 000 lb./sq. in.;
- Volume resistivity  $10^{12}$ - $10^{13}$ ;
- Water absorption .01% (24 hours)

It will be seen that the aniline-formaldehyde materials compare very well in physical properties with other synthetic plastics, and for many electrical purposes they are better. For instance, they are not affected by ultra-violet light and they withstand weathering very well. They do not exhibit cold flow like some plastics.

They have a low power factor, a low dielectric constant and a low loss factor, and these properties do not vary a great deal over quite a wide range of frequencies as will be seen from the table below:

Frequency.	Power Factor.	Dielectric Constant.	Loss Factor.
100 cycles	.0025	3.73	.0086
1 kilocycle	.0039	3.71	.0145
100 kilocycles	.0070	3.65	.0256
100 megacycles	.0033	3.57	.0118

Furthermore, the total immersion of the resin in water at 25° C. over a prolonged period results in the following measurements made at 1 megacycle:—

Time of Immersion.	Power Factor.	Dielectric Constant.	Loss Factor.
0	.0065	3.66	.0237
2 days	.0070	3.77	.0264
4 days	.0066	3.73	.0246
7 days	.0068	3.70	.0252
21 days	.0085	3.83	.0326

Aniline-formaldehyde resins are attacked by strong acids, but they stand up to alkalis and to most of the common organic solvents.

As is to be expected from its properties, it finds many interesting electrical applications. Many radio components are made from it and also parts of television sets. During the war it has been found in aircraft as coil formers, tube bases, terminal boards, strips and blocks. Its weathering properties make it good for electrical components exposed to the weather, e.g. aerial spacers, etc.

## Glycerol-Phthalic Anhydride Resins

Although classed as thermosetting, these resins are not suitable for moulding work; their main outlets lie in varnishes. During the war, phthalic anhydride and glycerol have both been in very short supply, particularly the former, so that new developments have only taken place where the application was essential to the prosecution of the war and where no alternative material was available.

Phthalic anhydride is manufactured from naphthalene by oxidation, and naphthalene in turn, comes from coal tar. The demand for coal tar products was, and still is, extremely heavy, so that the amount of naphthalene available is limited. In addition to its use for glycerol-phthalic anhydride resins (glyptals), phthalic anhydride is the basis of various phthalates which are used as plasticisers in the plastics and paint industries. There was, therefore, a tremendous call for phthalic anhydride. On top of all this, it was discovered that one of the best materials for repelling mosquitos

was dimethyl phthalate and immediately another huge demand was made for phthalic anhydride.

The first class of glyptal resin to be developed was the "unmodified type," i.e., those which are straight compounds of polybasic acids, such as phthalic acid, with polyhydric alcohols, such as glycerol. They have been used for bonding various materials, for coating, for insulation purposes and also as sealing compounds. However, they are only soluble in a limited range of organic solvents, and they are not compatible with other ingredients used in varnishes and lacquers. What is known as the "saturated type" is produced by modifying glyptals with a non-drying oil or a fatty acid. This type finds considerable outlet in replacing natural resins in lacquers, giving finishes of good durability such as are used on the body work of motor cars.

"The oxidising type" is produced by the use of a drying oil as the modifying agent, and this type is now the most important commercially. They are used in the manufacture of quick drying enamels, for baking enamels and in printing inks. They dry very quickly, they possess good adhesive properties and retain colour very well. They have contributed very largely to the war effort, but not on the electrical side.

Apart from these three main types, glycerol-phthalic anhydride resins are frequently modified by the inclusion of other synthetic resins to impart special properties to the final product. For example, the inclusion of a phenol-formaldehyde condensation product in the mix will improve the resistance to water, but, of course, the colour will be darkened by the presence of the phenolic material.

Another type of mixed resin which has been produced is one containing a glyptal resin, which is dispensable in water, and a water soluble urea-formaldehyde resin. This type finds outlet mostly for impregnating textiles to give improved resistance to heat, alkalis and acids.

Instead of using phthalic acid, sometimes maleic acid or sebacic acid is used. In the case of the former, resins which form hard films on stoving are produced, while the latter gives rise to a rubbery compound which can be used to produce a flexible film.

#### Alllyl Resins

The production of thermosetting synthetic resins from allyl alcohol was started in America in 1942 but, owing to the fact that the resultant materials had important war-time application, very little detailed information has been made public.

All the thermosetting materials which have been discussed above have been

produced by the combination of two different molecules, e.g., phenol and formaldehyde, to form a condensation product and the subsequent polymerisation of this condensation product to form a resin-like material. In the formation of the allyl resins this is not the case. An allyl derivative is, in a sense, combined or polymerised with itself, usually by the use of an organic peroxide as a catalyst, to produce a resin-like material. The technique is, therefore, analogous to that used in the formation of certain thermoplastic materials, e.g., the polymethyl methacrylates of which a well-known form is Perspex.

#### Contact Moulding

The main use of allyl resins has not been so much for the production of mouldings made of pure resin, but, on account of their great powers of penetration, they have been used to impregnate textile and other materials. It has also been found that only very low pressures are needed to mould laminated materials made from allyl resins. In fact, the only pressure necessary is that required to keep the finished article to its desired shape. This process is known in America as contact moulding. The fact that a low pressure, only a few pounds per square inch, is necessary, has enabled these materials to be used for the construction of large laminated parts for aircraft as the total load pressure over the whole article does not need to be very much. In America these resins are known as CR39.

In addition to using CR39 for impregnating paper and textile fabrics, it has been found that it can be used with glass fibre materials and some of the products so obtained have very interesting properties, sometimes superior to those of light metals and alloys. By varying the material impregnated from paper to textile or to glass, materials can be produced with varying tensile and impact strengths. By varying the resin used, different flexural and compressive strengths are obtainable. So far most of the allyl resins used commercially have been those used in various laminated materials, but it is understood that experimental work has been done in the use of these resins for protective coatings.

By themselves, these resins are colourless and transparent, so that they may be used as glass substitutes. One use of this nature in America has been for the inner panels of heated de-icing windows of aircraft. They have been used for gauge glasses and for lenses, but full details are not available. Similarly, they have been used for adhesive purposes, but detailed information has not been published.

With regard to their future, the prospects seem fairly good. Although allyl alcohol



is not available at present in large quantities, it is not expensive to produce, so it seems likely that peace-time developments should be on a fairly large scale. The end of the war, both in Europe and the Far East, will no doubt lift the veil of secrecy from most of the development work and the results will thus be available for adaptation to peace-time requirements. At present the price is high, but only because production has been on a restricted scale. It appears probable that increased production should bring about a considerable reduction in the price.

With these resins we conclude the summary of the thermo-setting plastic materials, and it is now proposed to review similarly the thermo-plastic materials. During the war, many new types of thermo-

plastic materials have been developed commercially, and many of them have interesting properties for the electrical industry. Although thermo-plastic materials were produced and used to a good extent in this country prior to the war, the main development, especially for electrical purposes, had been in the thermo-setting materials. Their use had been developed electrically to a fine art and, apart from matters of detail, new uses and applications are difficult to find. However, with the thermo-plastic materials the position is quite different. New materials, e.g., polythene, have been produced commercially since 1939, and many new applications of thermo-plastic materials have been worked out. It is hoped to give details of these in future articles.

## Current Transformer Errors

By G. W. STUBBINGS, B.Sc., A.M.I.E.E.

IF the turns ratio and the nominal ratio of a current transformer are equal, then it is well known that the ratio of the secondary exciting current  $I_e$  corresponding to a given value  $I$  of the secondary current is a measure of the inaccuracy of the transformer; for, if  $r$  is the fractional ratio error of transformation and  $\alpha$  the phase error in radian measure

for the secondary current  $I$ , then  $\frac{I_e^2}{I^2} = r^2 + \alpha^2$ ,

very approximately;  $I_e$ , corresponding to  $I$ , is the exciting current required to produce the secondary e.m.f. which forces the secondary current through the impedance of the whole secondary circuit, and, to a first approximation,  $I_e$  is proportional to this e.m.f. with a fixed primary current. For given values of  $I$  and of the total secondary impedance,  $I_e$  depends upon the design of the transformer and upon the permeability of the material of the core.

The errors of a current transformer at any given values of the primary current and secondary circuit impedance can be reduced in two ways. First the transformer can be provided with an additional primary winding supplied from an auxiliary compensating transformer with a current which increases the primary ampere-turns by an amount approximately equal to those required to excite the core. In the second method a compensating transformer is used to produce in the secondary circuit of the main transformer a voltage approximately equal to the voltage in this circuit but opposed to it in direction, so that the resultant voltage which has to be induced by the core flux, and hence the value of the exciting current becomes very small relative to its uncorrected value. In effect, the second method of compensation is one whereby the effective total burden of the transformer is made very small.

The simplest application of this latter method of compensation is illustrated in Fig. 1.  $T_1$  is the main transformer to be compensated and  $R_1$  represents the whole impedance of the secondary circuit including that of the winding, which is assumed to be non-inductive.  $R$  is the compensating resistance which is common to the secondary circuits of  $T_1$  and of the compensating transformer  $T_2$  which carries the same primary current as  $T_1$ . If the nominal value of the secondary current of  $T_2$  is  $n$  times that of  $I_1 T_1$  then, as these two currents flow in opposite directions through  $R$  the voltage drop in  $R$  is opposite in direction to that in  $R_1$ . These two voltage drops will be equal when

$$I_1 R_1 = I_1 (n-1) R \text{ and } R = \frac{R_1}{n-1},$$

and the resultant voltage in the secondary circuit of  $T_1$  will be zero. In this condition the exciting current  $I_{e1}$  of  $T_1$  will be zero, and its errors, both of ratio and phase will disappear. This statement means that if the compensating transformer  $T_2$  is free from errors, the core of  $T_1$  could be removed

and a fraction  $\frac{1}{n}$  of the output current of  $T_2$  would then flow in the burden resistance  $R_1$  of  $T_1$ ; a result which follows from elementary considerations. The idea of using a perfect auxiliary transformer to compensate the errors of a second imperfect transformer is, of course, absurd. Actually  $T_2$  cannot be free from error, so that when the ohmic

value of  $R$  is equal to  $\frac{R_1}{n-1}$  there will be a small resultant voltage in the secondary circuit of  $T_1$ . It is evident, however, that this resultant voltage will be much smaller than the uncompensated voltage, and that the effect of the compensation is to reduce the errors of  $T_1$ .

If we make the assumption that the effect of the compensation is to make these errors of  $T_1$  negligible relative to those of the auxiliary transformer  $T_2$ , then we can illustrate the conditions in the circuit of Fig. 1 by the vector diagram Fig. 2.  $OA$  is

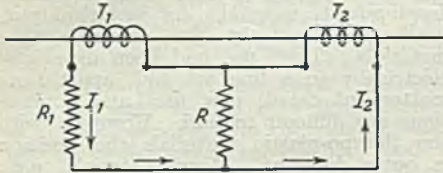


Fig. 1

the vector of the voltage drop due to the current  $I_1$  from  $T_1$  in the resistance  $R_1$ , and  $AB$ , in phase with  $OA$ , represents the voltage drop due to  $I_1$  in the resistance  $R$ , which is equal to  $\frac{I_1 R_1}{n-1}$ ;  $BC$  is the vector of the drop due to the flow of the current  $I_2$  from  $T_2$  in  $R$ , which drop, due to the phase error of  $T_2$ , is leading on the total drop  $OB$  due to the current  $I_1$ . As the vector sum of the secondary current of  $T_2$  and its secondary exciting current  $I_{e2}$  is equal to a current  $nI_1$  in phase with  $OB$ , it follows that the closing side of the voltage triangle  $OBC$

will have a length equal to  $\frac{I_{e2} R_1}{n-1}$  and this will be the resultant voltage in the secondary circuit of  $T_1$ . The uncompensated voltage of  $T_1$  is  $I_1 R_1$ , and if to a first approximation secondary exciting currents are taken as proportional to secondary voltages, then the exciting current of  $T_1$  will be reduced from its uncompensated value  $I_{e1}^1$  to  $\frac{I_{e1}^1 \times I_{e2}}{I_1 (n-1)}$  and the exciting current ratio indicative of the inaccuracy of the transformer will be  $\frac{I_{e1}^1}{I_1} \times \frac{I_{e2}}{I_1 (n-1)}$ .

As the voltage drop in the resistance  $R$  is approximately  $I_1 R_1$  the total  $VA$  output of  $T_2$  will be the sum of the  $VA$  absorbed in  $R$ , which is equal to  $nI_1 \times I_1 R_1 = n I_1^2 R$ , and the  $VA$  absorbed in its secondary winding. If the  $VA$  absorbed in the secondary windings of the two transformers are equal for equal primary currents, and this  $VA$  value for the main transformer  $T_1$  is a fraction  $K$  of the total  $VA$  in the resistance  $R_1$  then the total  $VA$  output of  $T_2$  will be  $I_1^2 R_1 (n+K)$ . If we assume that the errors of  $T_1$  and  $T_2$  in similar conditions are equal, and, hence that the exciting current ratios are equal, then  $\frac{I_{e1}^1}{nI_1} = \frac{I_{e1}^1}{I_1}$  for a  $VA$  output of  $I_1^2 R$  from  $T_2$ . Assuming that with constant primary current the exciting current of  $T_2$  is proportional to its  $VA$  output, it follows that this current  $I_{e2}$  for a  $VA$  output

of  $I_1^2 R_1 (n+K)$  will be  $I_{e1} n (n+K)$ . The exciting current ratio  $\frac{I_{e1}^1}{I_1}$  of the main compensated transformer  $T_1$  will therefore be  $\left(\frac{I_{e1}^1}{I_1}\right)^2 \times \frac{n (n+K)}{n-1}$  where  $\frac{I_{e1}^1}{I_1}$  is the uncompensated ratio which fixes the uncorrected errors. The minimum value, of the ratio, corrected by compensation is found by differentiating the factor  $\frac{n (n+K)}{n-1}$

and equating to zero. The condition for minimum value of the exciting current ratio is that  $n=1+\sqrt{1+K}$  and the actual minimum value is  $\left(\frac{I_{e1}^1}{I_1}\right)^2 \times \left\{2+K+\sqrt{1+K}\right\}$ . Thus, if  $K=\frac{1}{2}$ , so that half of the resistance  $R_1$  is contained in the secondary winding of  $T_1$ , and the uncorrected ratio  $\frac{I_{e1}^1}{I_1}$  is 1 per cent., the condition for the best

compensation is that  $n=1+\sqrt{1+\frac{1}{2}}=2.2$  approximately, so that the number of secondary turns on  $T_2$  is  $1/2.2$  that on  $T_1$ . In this condition  $2+\frac{1}{2}\sqrt{1+\frac{1}{2}}=5$  approximately, so that the exciting current ratio will be reduced from 1 per cent. to  $1 \times \frac{5}{100} = 0.05$  per cent. It is evident that as the compensated exciting current ratio depends upon the square of  $\frac{I_{e1}^1}{I_1}$  the effectiveness of the compensation diminishes rapidly as the uncorrected errors increase.

It is possible to carry the compensation to a further stage of refinement by adjusting the characteristics of  $R$ , the common part of the two secondary circuits, so that, with the erroneous value of the secondary current of  $T_2$ , the voltage drop represented in Fig. 2 by  $BC$  is equal to and in phase with  $OB$ .

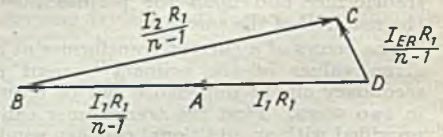


Fig. 2

To do this the ohmic value of  $R$  must be slightly greater than  $\frac{R_1}{n-1}$  and it must have a small phase angle. As the actual current in  $R$  is  $\frac{n-1}{n}$  times the current from  $T_2$ , it follows that the fractional increase in the ohmic value of  $R$  must be  $\frac{n}{n-1}$  times the ratio error of  $T_2$  and its phase angle must be  $\frac{n}{n-1}$  times the phase error of  $T_2$ . As it would be very

difficult in practice to make the phase angle adjustment with nicety, this possibility of further compensation is only of theoretical interest. If it were complete the errors of  $T_1$  would completely disappear for the primary current corresponding to the errors of  $T_2$  for which the adjustment of  $R$  was made, and at other primary currents the residual errors of  $T_1$  would depend only on the change of the errors of  $T_2$ .

It is seen from the vector diagram, Fig. 2, that the resultant voltage in the secondary circuit of  $T_1$  is lagging on the secondary current, the phase of which is the same as that of the voltage drop represented by the vector  $OA$ . The power factor of the residual effective burden of  $T_1$  is therefore leading.

In this condition the ratio error will tend to be relatively small compared with the phase error, and this ratio error may have a positive sign giving an actual secondary current greater than the nominal value.

The compensating resistance represented by  $R$  in Fig. 1 can, if desired, be connected to the secondary of  $T_2$  only, and this voltage drop in  $R$  can be transferred to the secondary circuit of  $T_1$  by means of a tertiary winding on  $T_2$  which is connected in the  $T_1$  circuit, as is explained by Mr. A. Hobson in his recent I.E.E. Paper. In this condition the actual burden of the main transformer will be increased by the impedance of the tertiary winding carrying its secondary current.

## The Cape Town Undertaking Engineer's Report On Three Years' Working

THE report of the Cape Town city electrical engineer, Mr. H. A. Eastman, for the three years ended December, 1943, shows that the total number of units generated by the pooled power stations at Table Bay, Salt River and Dock Road was 491 039 757 in 1941, 528 920 590 in 1942, and 531 801 770 in 1943. The overall thermal efficiency on units sent out was 22.5 per cent., 22.0 per cent. and 22.1 per cent. respectively. The maximum system demand (2 min. peak) was 123 500 kW in 1941, 133 000 kW in 1942, and 136 500 kW in 1943. The domestic service for the three years consumed 177 208 240, 190 237 577 and 201 831 777 units, respectively. The revenue from the sale of electric energy was £1 101 333 in 1941, £1 162 900 in 1942 and £1 150 979 in 1943, and the gross profit in each of those years was £394 732, £428 858 and £349 706. Contributions of £160 224, £217 037 and £135 707 were made to the rates. The average price per unit sold was 0.9276d. in 1941, 0.9282d. in 1942, and 0.8885 in 1943.

The Engineer states that there has been no alteration in the plant installed in any of the power stations. For a number of years the average increase in the system maximum demand was constant at approximately 10 000 kW per annum, and to meet this increase additional plant was scheduled to be available for service by the winter of 1945 or 1946. It was agreed in 1943 to complete the Council's Table Bay power station to its ultimate designed capacity by installing two additional 40 000 kW turbo-alternators with their associated boilers and other equipment, and at the end of 1943 negotiations had begun in connection with the purchase of the additional machines. Conditions directly attributable to the war, which apply to all sources from which

heavy electrical plant might be obtained, were such that the earliest date by which any of the new plant would be available for service was the winter of 1947, and permission was received during 1944 from the British authorities for the manufacture of plant and equipment sufficient for the installation of one additional 40 000 kW turbo-generator, steam-raising plant, etc., for installation during that year. Questions involved in town planning arrangements in the vicinity were the cause of considerable delay. As in previous years the greatest volume of sale is reflected under the domestic service tariff and, notwithstanding the almost complete cessation of residential building activities, the increase in sales under this tariff has been very satisfactory. The units sold per annum per room increased from 674 in 1940 to 780 in 1943.

All factors indicated that the tendency which first became noticeable in 1943 for the margin between costs and revenue to shrink is likely to continue in the immediate future. For some years past the whole of the net profits of the electricity undertaking was relegated to the relief of rates. In the three years covered by the report the amount so allocated amounted to no less than £547 729, equivalent to 16 per cent. of the revenue from the sale of electricity. The electricity undertaking is thus being used as a taxing machine. The policy of the Council in this matter was at variance with the generally accepted policy in the conduct of electricity undertakings that the supply of electricity was a service which should be rendered at a minimum profit, and that the need to conserve their resources at the present time was all the more important on account of present abnormal conditions.

# Domestic Plugs and Sockets

Statement by the B.S.I on its Decision

THE standardisation of plugs and socket-outlets has been a matter of keen discussion ever since the use of electricity for domestic and industrial purposes first became established. These discussions have passed through many phases, the views held at any particular period being influenced by the prevailing system voltages, forms of tariff and methods of installation. Experience prior to the war had shown that the existing B.S. 546, which provided three standard ratings of 2, 5 and 15 A, was not wholly satisfactory from the standpoint of the convenience of the consumer, for with the wide extension of two-part tariffs a growing need had arisen for a rating intermediate between 5 and 15 A which could be used for all domestic purposes.

The large programme of house-building envisaged for the post-war period made it urgent to consider this question so as best to meet future conditions, and the cessation of house-building during the war gave an opportunity for such consideration. With the encouragement of the then Ministers of Reconstruction, Works, and Fuel and Power (Lord Woolton, Lord Portal and Major Lloyd George) the question has been intensively studied during the past two or three years with the assistance of all those concerned with manufacture, installation and use.

## New and Existing Standard Controversy

In all these discussions, there has been universal agreement that there should be a single all-purpose domestic plug and socket-outlet, but there has been a difference of opinion as to whether this could best be achieved by the adaptation of one of the existing standards or by an entirely new design, non-interchangeable with any existing standard.

A final decision has now been reached by the Electrical Industry Committee of the British Standards Institution who, feeling that on balance the complicated needs of the situation will thus be best met, have decided to standardise an all-purpose domestic plug and socket-outlet of the same dimensions (as regards interchangeability) as the 5-A size in B.S. 546 but rated at 3 kW (13 A at 230 V). This decision also embraces the decision that a local fuse shall form part of the fixed part of the installation but that an additional fuse rated at not more than 3 A may be fitted in the plug when required for the protection of small-current appliances. Plugs suitable for the accommodation of 3-A fuses are already

available, and are included in B.S. 546.

Except that the rating of the new plug and socket-outlet is to be 13 A instead of 10 A, this decision conforms with the majority recommendation made in paragraph 92 of the Main Report of the Electrical Installations (Study) Committee (Post-War Building Studies No. 11) whose other detailed design requirements will be adopted.

This decision reverses a previous decision of the Electrical Industry Committee of the B.S.I. which endorsed the recommendations made by the Electrical Installations (Study) Committee in their supplementary report which is contained in the Appendix to Post-War Building Studies No. 11.

A new British standard specification embodying modifications to the present B.S. 546 will be prepared at an early date. The modifications relate to matters of comparatively small detail and will leave existing 5-A plugs interchangeable with the new plug.

## TOWN PLANNING ACT

IN a circular letter to all electricity undertakers in England and Wales, the Electricity Commissioners draw special attention of undertakers to the regulations made on August 18 last, by the Minister of Town and Country Planning.

The forms of orders and notices contained in the schedule to the regulations are those to be used by authorities in connection with declaratory and compulsory purchase orders to be made or authorised under the Act, and by bodies desiring to make representations in regard thereto. Forms 4 and 11 to 17 inclusive are relevant to applications, notices and representations in respect of land belonging to statutory undertakers, but the only forms with which electricity undertakers appear to be directly concerned are 4 and 11.

## ELECTRICAL VICTORY BALL

An attractive programme has been arranged for the electrical industries' victory ball on behalf of the Electrical Industries' Benevolent Association, which is being held at Grosvenor House, Park Lane, London, on Friday, November 9.

Jack Payne and his band will provide the music, and a brilliant cabaret will include Jack Train, Michael Howard and Margaret Eaves.

Owing to war conditions there has been a six years' gap since the last electrical industries annual ball.

## News in Brief

**Trolley-bus Scheme.**—The Eston U.C. is to approach the Regional Transport Commissioner concerning the refusal to allow the Tees-side Railless Traction Board to extend its services to the Cleveland resorts. The Commissioner stated that transport arrangements for the resorts were already sufficient.

**Clyde Firm's War Record.**—During the period from the outbreak of war until June 30, 1944, Yarrow and Co., have been responsible for the completion of 27 vessels including machinery and boilers. In addition, Yarrow land-type boilers were supplied for home and abroad. Twenty-four of these boilers were for employment in this country, including power-stations, Royal Ordnance and other factories, and 29 for power-stations and factories overseas.

**Leighton Buzzard Lighting.**—For the first time in its history, Leighton Buzzard will shortly be illuminated by electricity. Electric light standards are now being erected throughout the town, and it is expected that the lights will be switched on within a month.

**Australian Telephone Service.**—The telephone service with Australia and New Zealand has been reopened for commercial calls. The

service will be available from 6 a.m. to 9 a.m. on weekdays only. The charge for three minutes will be £3 instead of the £4 10s. charged before the war.

**Town and Country Planning.**—Among the lunch-time meetings in the autumn programme of the Town and Country Planning Association at 28, King Street, Covent Garden, W.C.2, at 12.45 p.m., are included one on October 25, when Mr. Donald V. H. Smith will speak on "Town Planning and District Heating" and one on December 6, when the speaker will be Mrs. Gillian Harrison, her subject being "Heating the Family Home."

**Street Lighting Decisions.**—The Reading T.C. has decided to have a reduced street lighting scheme throughout the night rather than switch all lights off at midnight. The Watching and Lighting Committee of Aberdeen T.C. has decided to continue the peace-time standard of lighting in all the main traffic roads in the city up to midnight, and that between midnight and dawn the lighting on these roads

should be restricted to half the peace-time standard. The remainder of the street lighting in the city it was decided should be restricted to approximately one-third of the peace-time standard and that the lamps should remain lit from dusk to dawn.

**Appointment Vacant.**—Applications are invited by the Southampton electricity department for the post of chief assistant engineer.

**Liverpool and German Labour.**—A discussion took place at the City Council meeting last week, on a proposal of the Electric Power and Lighting Committee to employ prisoners of war on the laying of electric cables. The recommendation was adopted after it had been explained that no German war prisoners would be employed if local labour was available.

**Telegraph Service with Poland.**—The Post Office and Cable and Wireless announce that a public telegraph service with Poland has been restored.

**London Power Company's New Steamer.**—It is announced that an up-to-date 2450 tons deadweight steamer, Sir Joseph Swan, has been launched at Aberdeen, built for the London Power Co., Ltd., under the direction of Stephen Clarke. The ves-

sel is specially designed to transport coal from coast ports direct to Battersea power station.

**Indian Dam Project.**—At a conference of the Central Government of India with the Governments of the two Provinces in Calcutta recently, a project for the economic development of the Damodar river in the Bihar and Bengal district was discussed. The project, as presented to the conference by the Central Technical Power Board, involves the construction of eight dams and a barrage on the Damodar river and its tributaries. It would cost at a rough estimate 55 crores of rupees (about £41 000 000), and should, in the opinion of the Board, be completed in not more than 10 years. With flood control is combined the utilisation of the river for irrigation and the generation of electrical power, and there will also be possibilities of navigation. The Central Government has agreed to advance the funds necessary for preliminary investigations.

### TWENTY-FIVE YEARS AGO

*FROM THE ELECTRICIAN of September 10th, 1920: The large electrical concerns in Berlin are said to have adopted a very accommodating attitude to English inquiries, not only quoting fixed prices, but also guaranteeing deliveries, no doubt with the intention of regaining their position.*

# Lamp Sales Publicity

## Further Window Displays and Advertising Programmes

**T**HE first post-war Osram lamp scheme will follow closely on the lines of its immediate predecessors. The scarcity of



Window display installed by G.E.C. dealer service

materials and labour preclude the issue of display material of the kind and variety to which dealers were accustomed pre-war. Nevertheless, during the next few months the Osram lamp dealers will be assisted by a very comprehensive advertising programme.

This will embrace all the national and provincial newspapers, with a supplementary scheme of advertising in the popular magazines, the Press of all religious denominations and in the technical Press of every industry.

More direct help for dealers consists of two window displays, the installation of which will again be in the capable hands of the G.E.C. dealer service. One is illustrated on this page. Each is carried out in bright colours, carefully chosen and blended to form a bright and most attractive display.

\* \* \*

In the interests of national economy the publicity scheme of Siemens Electric Lamps and Supplies, Ltd., for 1945-46 is of necessity curtailed, but subject to limitations on space, display advertisements will appear from time to time in the national and provincial Press and periodicals, in order to keep Siemens' lamps in the mind of the public.

In view of the urgent necessity for speeding up output in all essential industries, special attention will be devoted to improved lighting in factories with

Siemens' lamps and lighting equipment, and to this end display advertisements will appear in the principal trade journals, which will stress the economy of good lighting in making possible increased production, and, at the same time, offering without obligation the skilled advice of the company's lighting engineers on all matters appertaining to scientific factory lighting.

There is available an attractive hanging display of Big Ben in four colours with the slogan "Siemens' Lamps Used For Lighting Big Ben and Just as Reliable," size 20 in. x 30 in. with metal rims the 20 in. way. In order to comply with the control of paper regulations these display bills are printed on linen and present a very colourful arrangement.

The company are prepared to dress dealers' windows with a Siemens' lamp display using the above as the central feature.

No broadcast of price-lists will be made as it is felt it is not in the national in-



A striking Siemens' hanging display

terest to use large quantities of paper for this purpose, but price-lists are available to the trade, on request.

# Electrical Personalities

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

The General Electric Co., Ltd., announce that **Mr. H. P. Wells**, general manager of their telephone and radio works, Coventry, is retiring this month. He will be succeeded by **Mr. R. E. Robinson**, who has been deputy general manager of this section of the company's organisation for the last two years. Mr.



**Mr. R. E. Robinson**

Robinson joined the company as chief engineer of their Telephone works, in 1908 and has been connected with this and

the sales side ever since.

**Mrs. Germaine de Ferranti**, wife of **Mr. Denis Z. de Ferranti**, has given birth to a son.

The Ministry of Supply announces that **Mr. L. P. B. Merriam**, is being released from his appointment as Controller of Plastics.

**Cieut.-Colonel H. H. Vost**, who served with R.E.M.E. throughout the war, has resumed his position of sales engineer with the Electric Construction Co., Ltd.

**Mr. J. A. Wimshurst** has now returned from war service, and is resuming the management of the Portsmouth branch of Johnson and Phillips, Ltd.

**Mr. H. D. Parsons** has relinquished his position as publicity manager to Johnson and Phillips, Ltd., after nearly 23 years' service with the company, and has joined Enfield Cables, Ltd., in a similar capacity.

Mr. Parsons commenced his engineering career with William Geipel and Co., Ltd., and after serving in the Honourable Artillery Company during the last war, became a member of the drawing office of the India Rubber Gutta Percha

**Mr. H. D. Parsons**

and Telegraph Co., Ltd. In 1923, he joined the sales staff of J. and P. as assistant to the late Mr. Edward H. Reeves, advertising consultant to the company, and was appointed publicity manager in 1930.

**Mr. Parsons** took up his new duties at Victoria House, Southampton Row, W.C.1, on September 3.

**Mr. A. J. Gosling** has returned to his pre-war post of chief radio engineer to Edwards and Godding, Ltd., after completing five years of radio war service.

**Sir George E. Bailey** entertained **Mr. D. G. Borisenko**, trade delegate of the U.S.S.R. in the United Kingdom, at luncheon at Claridge's Hotel on September 7. The other guests included **Sir Stafford Cripps** and **Mr. I. R. Cox**.

Blackburn Electricity Committee proposes setting up a new sales and development section of the undertaking with **Mr. J. Ashworth**, consumers' engineer as the new technical engineer in charge.

**Miss Caroline Haslett**, director of the E.A.W., represented Great Britain at a meeting of the International Federation of Business and Professional Women in London last week to discuss the position of women in industry.

The Association of Scientific Workers has appointed **Mr. Roy Innes** as general secretary in succession to Mrs. Reinet Fremlin, who resigned for personal reasons after eight years' service, during which the membership of the association increased from 1 000 to 17 000 and the paid staff from one to 27.

In announcing the resumption of Thermovent heating activities after a break of five years, during which period production capacity was turned over to war needs, **E. K. Cole, Ltd.**, state that **Mr. C. B. Cleland**, who was technical manager of Unity Heating, Ltd., has been appointed technical sales manager. He will operate from 5, Vigo Street, W.1.



**Mr. C. B. Cleland**

**Mr. C. A. Britton**, borough electrical engineer at Maidenhead since July, 1941, has tendered his resignation in order to take up an appointment with the Sudan Light and Power Co. Before going to Maidenhead, Mr. Britton was deputy electrical engineer and manager to the City of Chester electricity department.

The Minister of Fuel and Power has agreed to release **Colonel Sir John Dalton** as a Regional Controller for the London and South-Eastern Region. Mr. Shinwell has

appointed **Mr. H. O'Halloran** as Regional Controller (London), and **Mr. G. le B. Diamond**, who has been Deputy Regional Controller (South-Eastern), to take charge of that region.

**Mr. Reynolds-Davies** has been appointed to the position of deputy secretary of the Institute of Fuel, and will take up his duties in a few weeks' time. He received his technical education at University College, Cardiff, and the South Wales School of Mines. He has had a wide experience as a chemical engineer and fuel technologist for several years.

**Mr. W. R. Herod**, formerly executive vice-president of the International General Electric Co., of New York, Ltd., has been elected president and a director. He succeeds **Mr. Clark H. Minor**, who is retiring after twenty years as president. Mr. Minor will continue as a director of both General Electric and International General Electric.

Two retiring employees of the English Electric Co., Ltd., at the Stafford works, were last week presented with long service testimonials. The recipients were **Mr. J. F. Powell**, with 47 years' service, and **Mr. F. Ryell**, with 42 years' service. The presentation was made by **Mr. Milligan**, manager of the Stafford works, who expressed to the recipients the company's sincere appreciation of their long and loyal service.

For his part in scientific research for Anti-Aircraft Command, **Mr. L. H. Bedford**, of A. C. Cossor, Ltd., received special praise from General Sir Frederick Pile in his broadcast on Sunday night. His research work had played a prominent part in the development of a radiolocation set giving height, range and bearing of enemy aircraft that was available during the first blitz period. He also helped to work the equipment on gunsites before soldiers were trained in its use.

The Coventry Electric Club held its first meeting of the session at the electricity showrooms on Tuesday, September 4, Mr. S. C. Dain, presiding. It took the form of an open forum on "The future of the Electrical Industry." Mr. F. W. Godden, city electrical engineer, spoke for the electricity supply industry; Mr. G. S. Nott for the contracting and installations section; Mr. T. R. Marson had a great deal to say on retailing and marketing; and Mr. N. M. Hill submitted manufacturers' point of view. A discussion followed.

**Mr. R. Alan Crook**, managing director of the Alan Crook Electrical Co., Pty., Ltd., St. Leonard's, New South Wales, is visiting this country for the purpose of ascertaining what are the latest developments and to extend the company's importing business. He may be contacted c/o the Bank of New South Wales, 47, Berkeley Square, London. Mr. Crook is

president of the Sydney division of the electrical branch of the Institution of Engineers, Australia.

Sixteen Government officials and industrialists left London on September 9, as a British delegation to the Conference on Unification of Engineering Standards which opens in Ottawa on September 24, and will deal with the subject of screw threads. The delegation is headed by Mr. Stanley J. Harley, Technical Controller, Machine Tool Control, and consists of seven government officials and nine industrial representatives. They are Mr. Frederick H. Rolt (Director of Jig, Tools, and Gauges, Machine Tool Control), Captain G. C. Adams, R. N. (Ministry of Supply and Admiralty), and Messrs G. Howard Nash and Norman R. K. Wheatley (Ministry of Aircraft Production), J. E. Sears and Douglas G. Soppwith (Department of Scientific and Industrial Research), on behalf of the Government; Sir William A. Stanier, F.R.S. (British Standards Institution), Mr. Percy Good (B.S.I.), Miss G. E. Harrison (B.S.I.), and Messrs. James E. Baly (B.S.I.), George A. Whipple (Scientific Instrument Makers' Association), Theodore K. Affleck (Society of Motor Manufacturers and Traders), Clement M. Holloway (Society of British Aircraft Constructors), Henry E. Lane (Ground Thread Tap Association, and Cut Thread Screwing Tool Manufacturers' Association), and James S. Blair (Stewarts and Lloyds, Ltd.), representing industry.

### Obituary

**Mr. Percy Wilson**, chief electrical and mechanical engineer at the north-east group of collieries of Pease and Partners, Ltd., for many years.

**Mr. Ernest Osborn Walker**, on September 7, aged 70 years. He founded the firm of E. O. Walker and Co., Ltd., of which he was managing director.

**Mr. Max Falk**, director and late chairman of Falk Stadelmann and Co., Ltd., on September 9, aged 79 years. The funeral took place at the Willesden Jewish Cemetery on September 11.

**Mr. E. C. Coote**, lamp sales manager of the British Thomson-Houston Co., Ltd., on August 27, aged 81 years. Mr. Coote began his association with the present A.E.I. group of companies when he joined the accounts department of the Edison and Swan Electric Co., in the 1880's, subsequently becoming general manager. He went to the B.T.H. Co. on November 1, 1901, as the London supply department manager, later taking over the management of the company's lamp sales throughout the country. This position he held until his death.



# Electricity Supply

**Swindon.**—Sanction to borrow £6 800 for supply to housing estates has been obtained by the Electricity Committee.

**Salford.**—The Light Heat and Power Committee is seeking sanction to borrow £2 262 276 for extensions at Agecroft power station.

**Swindon.**—The Electricity Committee has arranged to provide additional supply to the Great Western Railway works at a cost of £12 000.

**Bradford.**—The Electricity Committee is to provide supply to the Eccleshill housing site at a cost of £13 000 and to the Clayton estate at £14 175.

**Glasgow.**—The Corporation has arranged for the electricity department to instal six lamps at the swimming pools at the Greenhead baths at a cost of £95.

**Chesterfield.**—The Electricity Committee has asked the Housing Committee to collect from the tenants of the temporary houses the standing charge of 7d. per week per house.

**Watford.**—Sanction to borrow £2 750 for the extension of the feeder from Apsley sub-station to Marlowes sub-station, has been obtained by the Electricity Committee.

**Glasgow.**—Permission has been granted to the Strathelyde Electricity Supply Co., Ltd., to provide supply to temporary houses in Mill Road, Gorget Avenue, and Kelso Street.

**Chesterfield.**—The Electricity Committee is to provide street lighting at the temporary housing estates at a cost of £426, and provide supply to a brickworks at Hasland at a cost of £820.

**Watford.**—The Northmet Power Co. has suggested that in connection with the supply to the Elstree housing estate at Boreham Wood, no objection be raised to the company being granted a fringe order. The Electrical Engineer stated that reciprocal arrangements in respect of various fringe orders were in being, and recommended that no opposition be made to the granting of a further fringe order or orders to cover the area in question on the usual terms. The Committee agreed.

**Permanent House Equipment.**—The Bradford Housing Committee has come to the following decisions in regard to the equipment of permanent houses:—Houses to be so serviced that the tenant has choice of gas or electricity for cooker, copper and refrigerator, where provided. All lighting to be by electricity. If the Ministry will not agree to houses being serviced by both gas and electricity power, then half of the houses to be provided with gas appliances and half with electrical, the houses being grouped in

blocks to minimise the expense. A small gas appliance or an electrical immersion heater to be provided for the purpose of affording a supply of hot water in the summer. In the case of houses provided for people with very low incomes, cooking to be by solid fuel, but even in this case, a gas ring or electric boiling point to be provided. Cookers, coppers and refrigerators where provided are to be supplied by, and remain the property of the Corporation. Electric points to be provided for wireless, vacuum cleaner and iron in all houses.

**Hackney (London).**—In the report of the borough electrical engineer, Mr. E. A. Mills, for the year ended March 31, 1945, the result of the year's trading shows a net surplus of £30 549, compared with a surplus of £3 089 for the previous year. It is suggested that this surplus, together with the unappropriated balance of £2 359, totalling £32 908 be carried forward on appropriation account to provide additional working capital, of which the undertaking is likely to have need when the anticipated expansion in trading materialises. In spite of the set-back resulting from the destruction of property, and evacuation due to flying bomb and rocket attacks, the number of units sold amounted to over 73 million compared with 69 million units for the previous year. The revenue (excluding bulk supplies) reached a figure of £462 530, an increase of approximately £30 000 compared with 1943/44. It is interesting to note that if public lighting is excluded, the number of units sold in 1944/45 exceeded those in 1938/39 by about 1½ millions, and this in spite of the fact that the number of consumers is now about 9 000 fewer than in 1938/39. The total number of units generated in 1944/45 was 179 087 000, and the total units sold in Hackney's area of supply, including units used in offices, showrooms and workshops, numbered 74 024 768. The maximum load on the generating station during the financial year was 71 100 kW, and the load factor 27.11 per cent., as compared with a load of 72 350 kW, and a load factor of 24.77 per cent. for the previous year.

**Sheffield.**—The report and statement of accounts for the year ended March 31, 1945, shows that the capital expenditure of the undertaking is now £11 788 100, and of this sum £85 066 has been expended during the year, the chief items being mains, services, sub-stations £36 325, Neepsend power station, £31 699, and Blackburn Meadow power station, £17 042. The amount of debt outstanding is £4 883 915. The total revenue for the year was £2 173 469, working costs £1 821 816, and the gross surplus

£351 653. The total plant installed and in commission during the year was 292 000 kW. Building and civil engineering work is in progress for the new 50 000 kW set and three 190 000 lbs. per hr. boilers at Neepsend, and the installation has commenced of the two 190 000 lbs. per hr. boilers at Blackburn Meadows. 7 678 installations have been purchased by consumers and 47 119 have become the property of consumers by reason of having consumed 800 units. The number of assisted wiring installations connected under the scheme is 59 695.

The total units sold for all purposes amount to 834 956 392, against 908 440 903 the previous year, a decrease of 73 484 511. The average price obtained per unit sold

was .605d., as compared with .563d. for the previous year, while the total cost per unit sold is .652d. (.572d.). Consumers connected now number 165 303, an increase of 152, or 0.092 per cent. over the previous year. The mileage of mains laid has been slightly reduced during the year, from 2 520 to 2 518 miles, owing to the recovery of cables no longer in use. The total load connected to the system for all purposes now amounts to 669 033 kW, an increase during the year of 20 639 kW. The total number of meters now installed is 188 560, an increase of 646. For street lighting purposes, etc., a total of 13 035 lamps are now in use, a decrease on last year's figure of 70. This is largely due to the reduction in street lighting such as shelter signs, etc.

## Contracts Open

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

**Girvan T.C.**—Electrical installation work in connection with the erection of 70 houses on the Roxburgh Road site. Schedule from the Town Clerk, Town Clerk's Chambers, Girvan.

**Atherton U.D.C.**, September 18.—Supply and delivery of a 220 kVA Scott transformer group. Particulars from the Electricity Department, Factory Street, Atherton.

**Burton-upon-Trent B.C.**, September 19.—(a) Supply and laying of 18 600 yards, 25 sq. in. 11 000 V cable; (b) supply and laying of 6 750 yards, 3 sq. in., 3 300 V cable; and (c) supply of 6 500 yards, 25 sq. in., l.t. cable. Specification from Mr. T. Hall, Electricity Offices, Horninglow Street, Burton-upon-Trent.

**Brierfield U.D.C.**, September 20.—Supply, delivery and placing into position, of two 250 kVA three-phase 6 600/400 V transformers. Specification from Mr. N. Ashton, "Electricity House," Colne Road, Brierfield; deposit, £1 1s.

**Brierfield U.D.C.**, September 20.—Supply, delivery and erection of 6 600 V metal-clad switchgear. Specification from Mr. N. Ashton, "Electricity House," Colne Road, Brierfield; deposit, £1 1s.

**Burnley T.C.**—September 20.—Supply and delivery of e.h.t. cables. Specification from The Borough Electrical Engineer, 43, Grimshaw Street, Burnley.

**Dumbarton B.C.**, September 20.—Electrical installation work in connection with the erection of 122 houses at Round Rid-

ing Road, Dumbarton. Applications to Mr. W. Wilson, Municipal Buildings, Dumbarton.

**Inverness B.C.**, September 22.—Electrical work in connection with 40 houses to be erected at Dalneigh. Specification from the Burgh Surveyor's Office, Inverness; deposit, £5.

**Oban B.C.**, September 24.—Electrical work in connection with 60 houses to be erected at Dalintart. Specification from the Burgh Surveyor's Office, Municipal Buildings, Oban.

**Birmingham Electric Supply Department**, October 4.—Supply, delivery and erection of 132 kV double-circuit steel tower overhead transmission lines, approximately 19 miles; deposit, £2. Particulars from Mr. F. W. Lawton, 14, Dale End, Birmingham, 4.

**North of Scotland Hydro-electric Board**, October 15.—Supply, delivery and erection of 132 000 V transmission lines. Specification from Mr. T. Lawrie, 16, Rothsay Terrace, Edinburgh, 3; deposit, £5 5s.

**Woolwich B.C.**, October 9.—Supply, delivery and erection of one 750 kW Diesel alternator and four 30 MVA outdoor reactors. Specifications from the Borough Electrical Engineer, Electric House, Powis Street, Woolwich, S.E.18; deposit, £1 1s.

### Overseas

**Eire Electricity Supply Board**, December 14.—Civil construction work in connection with the hydro-electric development of the River Erne, Co. Donegal, including, (1) Power development at Cathleen's Falls, for installation of about 40 000 kW; (2) power development at Cliff for installation of 10 000 kW. Particulars from Mr. P. J. Dempsey, Electricity Supply Board, 60/62, Upper Mount Street, Dublin; deposit, £21.

## Industrial Information

**Exports to Turkey.**—By agreement between London and Washington the British-American Co-ordinating Committee in Ankara ceased to operate in its present form on September 8. In future control over the export of scarce commodities will be exercised directly by London and Washington.

**A.E.I. News.**—The current issue contains an article on mobile power stations produced by the Metropolitan - Vickers Electrical Co., Ltd., for the U.S.S.R., particulars of official staff appointments, reports from the various works of sporting and social activities, and matters of personal interest.

**Portuguese Contract for Marconi's.**—The first important civil radio contract to be placed since the end of the European War has been awarded to Marconi's Wireless Telegraph Co., Ltd., by the Portuguese Ministry of Colonies. It provides for the establishment of a complete system of radio communications in the Portuguese East African colony of Mozambique, at a cost of approximately £120 000.

**Borough Polytechnic.**—The outline prospectus for the 1945-46 session commencing on September 24, includes courses in heating and ventilating engineering; production engineering; arc welding; electrical engineering; radio engineering; electrical installation work; electric cable jointing; telephony; telegraphy; and physics. Students will be enrolled for evening classes on Sept. 17, 18 and 19, between 6 and 8 p.m.

**From Aircraft to Irons.**—Clifton Aircraft, Ltd., have made a quick change-over from munitions to household goods. For three years they have been engaged on sub-contracts in aircraft production. Now the plant has been turned over to furnishing and electrical devices for the home, including irons, cookers, washing machines and fires. It is hoped to erect a model factory, electrically operated, giving employment to 600 workpeople. An output of 2 000 electric irons a week is planned.

**A Request from Cyprus.**—Mr. Melcon Alepian, electrical and radio engineer of Nicosia, Cyprus (P.O. Box No. 19) wishes to contact some firm manufacturing electrical goods, such as small motors, radios, electric domestic refrigerators, household appliances, electric bulbs and wiring materials. He states that he has 15 years' experience on the market and is well equipped to handle this line. He gives as reference his bankers, the Ionian Bank, Ltd., Nicosia, Cyprus.

**A Jubilee.**—Originating in a workshop set up to provide apparatus needed by a

Cambridge University laboratory, the Cambridge Instrument Co., Ltd., which was registered on May 11, 1895, has marked its jubilee by the publication of an attractive brochure entitled "Fifty years of Scientific Instrument Manufacture." It outlines the history of the company and its development of scientific instruments to meet the needs of science and industry. Copies may be obtained from the publicity department of the company on application at 13, Grosvenor Place, London, S.W.1.

**A.S.E.E. Branch Merit Competition.**—The Examining Board of the Association of Supervising Electrical Engineers has awarded the silver cup, presented to the branch achieving the best all-round record for the year 1944/5, to the Leeds branch. In their report the examiners refer to the unusual difficulties experienced by several branches, due to enemy action, and the efforts made by local officers to overcome these, and to the work done in connection with branch programmes, and educational and technical lectures and visits, and the general enthusiasm toward the progress of the association. The runners-up in the competition were Birmingham and Manchester, and special mention was made of the Sheffield and Liverpool branches.

**Holidays With Pay.**—The secretary of the N.F.E.A. advises members that the holidays with pay agreement as now established between the Electrical Trades Union and the National Federated Electrical Association, applies to all journeymen electricians and adult males engaged in the electrical contracting industry. The operation of this agreement supersedes any arrangement which existed previously. It is *ultra vires* to supplement the payment made under the agreement by any system whatsoever, e.g., the giving of bonuses, *ex gratia* payments, Christmas boxes, etc. Any payments in excess of that stipulated in the agreement, would constitute a breach of members' obligations to the association, and it is the opinion of the Council that such payments would be a breach of the terms of the licence which is issued by the Ministry of Works, without which no electrical contractor can carry on business.

**New B.S.S. for Electro-plating.**—The British Standards Institution has recently issued a new British standard (No. 1224—1945) covering electro-plated coatings of nickel and chromium on steel and brass. This specification has been drawn up with the object of providing the essential qualities of electro-plated coatings, but it is realised that it is impossible, in the present state of the art, to specify completely

every factor affecting the performance in service of such coatings. The Institution was pressed to publish its present findings since it was felt that these would form a workable basis between manufacturer and purchaser. The Committee is continuing its investigations and hopes to provide a more complete specification later. Price 2s. net, post free, from Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1.

**Air Pollution.**—Speaking at the Manchester Planning Exhibition recently, Mr. Charles Gandy, chairman of the National Smoke Abatement Society, said that the raw coal we were burning in this country just before the war sent into the air as much as 9 million tons of pollution, including sulphur acids, 3 million tons of which were in the form of acid-laden smoke and soot. Those 3 million tons meant that we were wasting the work of a million miners for three days in each year. Dealing with the remedy, Mr. Gandy said that the Manchester Corporation was to apply to Parliament for power to create smokeless zones in the city where soft, bituminous coal could not be burned. With regard to new houses, schemes were being worked out for district heating from a central source for 8 000 dwellings. This would mean a constantly heated house and hot water, with no fuel bill, for 5s. a week.

**British Clock Manufacturers' Association.**—The report, presented at the twelfth annual meeting, stated that the supply departments of the Government and the Board of Trade had shown for some time that they were anxious to see the industry built up and maintained as a strategic reserve for the manufacture of all forms of instruments and mechanisms for war purposes, apart from the obvious economic value of this country making its own clocks and, to a lesser extent, watches, and, if possible, having a surplus to export. As from July 4, 1945, the Ministry of Aircraft Production became the production authority for the industry for the purpose of aiding its development. Sir Allan Gordon Smith (S. Smith and Sons (England), Ltd.) was re-elected president.

**Sound Reproduction.**—The Reliance Telephone Co., Ltd., have published two new leaflets relating to sound reproduction. One gives brief details of the Reliance automatic intercommunicating telephones, and the other describes the various applications for amplifying and sound reproducing equipment, some of which is illustrated, for industrial and commercial premises. The automatic telephone system described provides lines for executive's right-of-way, secret communication, staff

code calling, secretary's service, conference and loud speaking facilities, without the use of multiple cable or the aid of a switchboard operator.

**Australian Import Licences.**—Amendments to the Australian Customs (Import-Licensing) Regulations exempt the following goods from licensing:—Storage batteries and electric trolley locomotives for mines; motor mechanism including motors with or without magnetic pick-up, etc., record changing devices, etc.; dynamos and generators of the type used in lighting sets for bicycles; main reduction gears imported for use with steam turbo-generators or steam turbo-alternators; hydro-extractors; machinery, boilers and auxiliaries, for use in the manufacture of vessels, as prescribed by departmental by-laws; motive power machinery and appliances except internal combustion engines and replacement parts for motor vehicles, motor cycles and tractors; turbines, steam or water, not exceeding 2 000 H.P.; parts of steam turbines exceeding 2 000 H.P.; water tube boiler parts; enclosed-type elements, imported separately for stoves, ranges, ovens, cookers, grillers, etc.; circuit-breakers or switch units, metal-clad or otherwise, for use at voltages above 15 000 or at any voltage if the rated rupturing capacity is 250,000 kVA or higher; electrically operated thrusters and time switches except those controlled by master clocks; fuses for voltages less than 1 000 and having a rupturing capacity in excess of 5 000 kVA; heating elements of enclosed type for use with electric stoves; X-ray apparatus and accessories; X-ray transformers; electro-surgical combination units.

#### A.S.E.E. London Lecture Programme.

—The London lecture programme of the Association of Supervising Electrical Engineers opens with the presidential address by Mr. E. R. Wilkinson, commercial manager of the C.E.B., on October 16, and includes a varied and interesting programme terminating with the reading of the three winning papers in the Branch Papers Competition in May. On November 17, the usual joint meeting with the Institution of Engineers-in-Charge, will take place at the Connaught Rooms, Kingsway, W.C.2, when Mr. R. O. Ackerley, will speak on "Illuminating Engineering, or Putting Things in a Good Light." This meeting will follow a victory luncheon at which the two organisations will be the guests of the G.E.C., Ltd. With that exception all the lectures take place at the Lighting Service Bureau, Savoy Hill, W.C.2, on the third Tuesday in each month at 6.15 p.m.

# Company News

CLAYTON DEWANDRE Co. LTD.—Intm. div. 4% (same).

GENERAL ELECTRIC Co. (U.S.).—Qtrly. div. 40 cts. (same).

LANCASHIRE DYNAMO AND CRYPTO LTD.—Intm. div. 5% (same).

PETER BROTHERHOOD LTD.—Fin. div. 12%, mkg. 20% (same).

CRAVEN BROTHERS (MANCHESTER).—Intm. div. 5% on ord. (same).

NEWTON CHAMBERS AND Co. LTD.—Intm. div. 5% (same), payable Oct. 17.

LANCASHIRE ELECTRIC LIGHT AND POWER Co., LTD.—Intm. div. 2½% on ord. (same).

COUNTY OF LONDON ELECTRIC SUPPLY Co.—Intm. div. 3%, less tax, on ord., payable Sept. 29.

FRANCIS MORTON AND Co., LTD.—Intm. div. for yr. 7½% less tax (5%) on pref. and ord., payable Oct. 1.

BOURNEMOUTH AND POOLE ELECTRICITY SUPPLY Co.—Intm. on ord. of 5%, less tax (same), payable Sept. 29.

LOW TEMPERATURE CARBONISATION, LTD.—Div. on ord. 4% (same) for yr. ended Mar. 31, 1945. Net pft. for that period, £51 444 (£66 734).

METAL INDUSTRIES ELECTRICAL GROUP.—Co. has been reg. in Scotland with a cap. of £1 000 in £1 shs. as a private coy., to carry on business as electrical engineers.

NATIONAL POWER AND LIGHT (U.S.).—Subsidi. operatg. rev. yr. to Apr. 30 \$85 993 860 (\$84 223 918), net (after taxes, etc.) \$17 951 824 (\$17 898 516), net inc. \$4 244 271 (\$4 205 784).

BABCOCK AND WILCOX (U.S.).—Consd. net earnings. 1944, \$13 786 256 (\$15 370 809). Taxes \$9 855 000 (\$10 804 000). Net pft. \$2 931 256 (\$3 066 809), earned per sh. \$4.36 (\$4.56) on 671 970 shs.

BALDWIN LOCOMOTIVE WORKS (U.S.) and wholly-owned subsidi.—Sales yr. to June 30 \$199 953 975 (\$227 486 889). Pft. after chgs. \$30 992 432 (\$29 389 666), taxes, re-negotiatn., etc., \$26 590 000 (\$24 430 000), net pft. \$4 402 432 (\$4 959 666).

PHILADELPHIA ELECTRIC.—Cons. rev. yr. to June 30, \$100 487 753 (\$96 434 278). Net after taxes and deprecn. \$24 541 328 (\$22 881 837), net inc. \$17 653 748 (\$15 540 454), earned per com. sh. \$1.60 (\$1.35), pref. divs. \$2 168 768 (same), blee. for com. \$15 484 980 (\$13 371 686).

THORN ELECTRICAL INDUSTRIES.—Combined trdg. pft. to Mar. 31, £80 063 (£84 850). To dir.'s. fee nil (£125), addnl. mgt. rem. £3 085 (£2 080), taxn. £50 000 (£58 000), lvg. net pft. £26 978 (£24 645). To pref. div. £1 500 (same), to gen. res. £15 000 (£12 000), div. 20%, less tax, on

ord. £10 000 (same), fwd. £10 713 (£10 235).

BRITISH VACUUM CLEANER AND ENGINEERING Co. LTD.—Total rev. to Sept. 30, 1944, £187 685 (£183 049). To inc. tax £49 275 (£55 406), N.D.C. £4 876 (£5 822), deprecn. £31 937 (£27 990), pension fund £10 000 (£7 500), bank int. £6 643 (£4 191), dir.'s. fees £1 000 (same), leav. net pft. £83 954 (£81 140), plus £12 202 (£11 687) brot in. To pref. div. £4 125 (same), fin. ord. div. 17½% (same), mkg. 30% (same), to inc. tax res. £57 000 (£54 000), fwd. £12 531.

VERITYS, LTD.—1944 tradg. pft. after prov. for est. price revisions and taxn., £28 120, (£45 192). To bank int. £1 012 (£3 094), dir.'s. fees £250 (same), deprecn. £5 200 (same), leav. £21 658 (£36 648), plus £13 876 (£6 941) brot in. Deduct war risk insur. £2 346 (£3 500), W.D.C. £927 (£1 356), off replacment. expend. nil (£4 081), A.R.P. £712 (£4 026), spec. deprecn. £2 500 (same), war contng. res. £7 500 (same), avail. blee. £21 549 (£20 626). Fwd. £14 799 (£13 876).

## COMPANY MEETING

### Thorn Electrical Industries

#### Dividend of 20 per cent.

The annual general meeting of Thorn Electrical Industries, Ltd., was held on September 7 in London.

Mr. Jules Thorn (chairman and managing director), dealing with their Atlas lamp business, said that the year had been marked by increased labour supply difficulties. Furthermore, their factories had suffered the onslaught of flying bombs and rockets. Despite those difficulties they had again maintained a satisfactory level of sales. A large part of their production had been supplied to the Services. During the war they had developed and made many types of special lamps for airborne and seaborne equipment and for important ground installations.

During the year the Ferguson Radio Corporation, whose products were distributed by the Thorn Company, had been authorised by the Board of Trade to manufacture a limited number of civilian war-time radio receivers. During the war the radio factory had been responsible for the design and manufacture of large quantities of communications equipment of numerous types.

Despite the company's very great contribution to the war effort, they had striven hard throughout the war to main-

tain the goodwill of their product in almost every part of the Empire and in many foreign countries. Their export department was ready to take an active part in helping to build up the nation's exports.

The net profit for the year, after providing £50 000 for taxation, amounted to £26 977. The directors recommended a dividend of 20 per cent. on the ordinary shares.

The report was adopted.

## Commercial Information

### Mortgages and Charges

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

**BRITISH COLUMBIA ELECTRIC RAILWAY Co., LTD.,** London, E.C.—Aug. 3, trust deed dated July 1, 1945, securing \$50 000 000 4 per cent. general mortgage bonds, present issue \$5 000 000; general charge (subject, etc.). \*£2 788 170. Oct. 13, 1944.

**UNIVERSAL PLASTICS, LTD.,** London, N.—Aug. 7, mort. to Halifax Building Society, securing £2 250 and further advances; charged on land and factory at Wood Green, with fixtures, plant, etc., also 1 and 3, Lawton Road, Wood Green. \*Nil. Mar. 24, 1945.

**MORTIMER ENGINEERING Co. LTD.,** London, E.—Aug. 20, charge, to Barclays Bank Ltd. securing all moneys due or to become due to the bank; charged on moneys under order and contract. \*Nil. Dec. 11, 1943.

### Satisfaction

**PHENIX TELEPHONE AND ELECTRIC WORKS, LTD.,** London, N.W.—Satisfactions Aug. 23, £1 200, reg. Sept. 6, 1933, and £30 000, reg. July 17, 1942.

### County Court Judgments

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

**HAWKINS, Ernest C.,** 77, Wiltshire Av., Slough, welder. £81 16s. 9d. June 6.

**FEAVER, Hy. G.,** 24, Stonecot Hill, London Road, North Cheam, radio dealer and repairer. £34 15s. July 25.

**HORNER (male), I.,** Houghley Terrace, Leeds, electrician. £13 4s. 10d. July 25.

### Notice of Intended Dividends

**WILSON, Alfred Charles Ward,** Wepre, Higher West Cross Lane, Swansea, and lately residing at 7, G'lanmor Road, Sketty,

Swansea, electrical engineer. Claims to be sent by Sept. 14, 1945, to the trustee, Mr. Reginald Betts, Government Buildings, 10, St. Mary's Square, Swansea, Official Receiver.

**BRIDGMAN, Howard Cecil,** 37, Canynge Road, Clifton, Bristol, lately residing and carrying on business at 7, Abbey Road, Westbury-on-Trym, Bristol, Electrical Engineer. Claims to be sent by Sept. 19, 1945, to the Trustee, Harold Wheeler, 26, Baldwin Street, Bristol 1, Official Receiver.

## Metal Prices

	Monday, Price.	Sept. 10. Inc. Dec.
<b>Copper—</b>		
Best Selected (nom.) per ton	£60 10 0	— —
Electro Wirebars ... "	£62 0 0	— —
H.C. Wires, basis ... per lb.	9 <sup>7</sup> / <sub>16</sub> d.	— —
Sheet ... "	11 <sup>7</sup> / <sub>16</sub> d.	— —
<b>Phosphor Bronze—</b>		
Wire(Telephone)basis "	1s. 0 <sup>1</sup> / <sub>2</sub> d.	—
<b>Brass (60/40)—</b>		
Rod, basis ... "	—	—
Sheet ... "	—	—
Wire ... "	11 <sup>1</sup> / <sub>2</sub> d.	—
<b>Iron and Steel—</b>		
Pig Iron (E. Coast Hematite No. 1)... per ton	£7 13 6	— —
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ... "	£28 5 0	— —
Mild Steel Tape (Cable Armouring) basis 0.04 in. ... "	£20 0 0	— —
Galvanised Steel Wire No. 8 S.W.G. ... "	£26 0 0	— —
<b>Lead Pig—</b>		
English ... "	£31 10 0	— —
Foreign or Colonial ... "	£30 0 0	— —
<b>Tin—</b>		
Ingot (minimum of 99.9% purity) ... "	£303 10 0	— —
Wire, basis... ... per lb.	35s. 10d.	— —
Aluminium Ingots ... per ton	£35 0 0	— —
Speller... ... "	£31 5 0	— —
Mercury (spot) Ware- house ... per bott.	£69 15 0	— —

Prices of galvanised steel wire and steel tape supplied by the C.M.A. Other metal prices by B.I. Callender's Cables Ltd.

## COMING EVENTS

### Saturday, September 15.

I.E.E., S. MID. STUDENTS' SECTION—  
Botanical Gardens, Edgbaston, Birmingham.  
Victory Dance.

ASSOCIATION OF SUPERVISING ELECTRICAL  
ENGINEERS.—Engineers' Club, Manchester.

"Motor Control Gear," Mr. Mathieson. 3 p.m.  
I.E.E., N. MID. STUDENTS' SECTION.—Leeds.  
Chairman's address by Mr. Holmes, "High  
Frequency Telephone Cables." 2.30 p.m.

# MARSHALL RICHARDS WIRE-DRAWING ECONOMY

No 4

Marshall Richards Wire-Drawing Machines are designed and built to yield highest dividends in terms of lowest operating costs, and largest output of better quality wire over the longest period of time.

Experience shows, and users confirm, that Marshall Richards Machines represent the soundest long - term investment.



---

**The new standard in balanced  
Wire-Drawing efficiency**

---

THE MARSHALL RICHARDS MACHINE CO. LTD.  
BRITANNIA WORKS, GAINSBOROUGH, LINCS.

**"ASHTON"**

**8 CORE  
TOUGH RUBBER  
SHEATHED CABLE**

TO C.I.E.S.S. REQUIREMENTS  
As supplied to H.M. Government Departments  
In T.R.S. and P.V.C. (Plastics)

Made by  
**AERIALITE**  
LIMITED  
CASTLE  
WORKS,  
STALYBRIDGE,  
CHESHIRE-ENGLAND

**CERAMITE**  
CERAMIC EMBEDDED  
RESISTANCE UNITS  
★  
THE ZENITH ELECTRIC CO. LTD.  
LONDON N.W.2

**ZENITH**

(Regd. Trade-Mark)

Improved Type

**CERAMIC  
EMBEDDED RESISTORS**

of the highest quality, complying  
with all Government Specifications

*Please allow us to send you a copy  
of our descriptive catalogue*

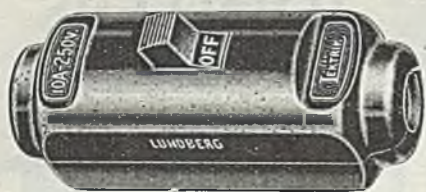
**THE ZENITH ELECTRIC CO. LTD.**

Zenith Works, Villiers Road,  
Willesden Green, London, N.W.2

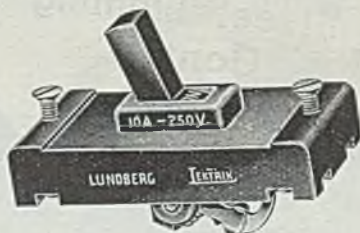
Phone : WIllesden 4087-8-9  
Grams : "Voltaohm, Phone, London"



# "SPEEDY" DOUBLE-POLE SWITCH



As Switch-in-Line  
(List No. 16350)



As Panel Switch  
(List No. 21260)

ESTABLISHED  
IN 1882  
**RECO**  
**LEKTRIK**  
TRADE MARK

**A.P. LUNDBERG & SONS**  
LIMITED  
ELECTRICAL ACCESSORIES  
TELEPHONE NORTH 3351  
491 to 493 LIVERPOOL ROAD, HOLLOWAY, LONDON, N.7  
TELEGRAMS LUNDBERG, LONDON



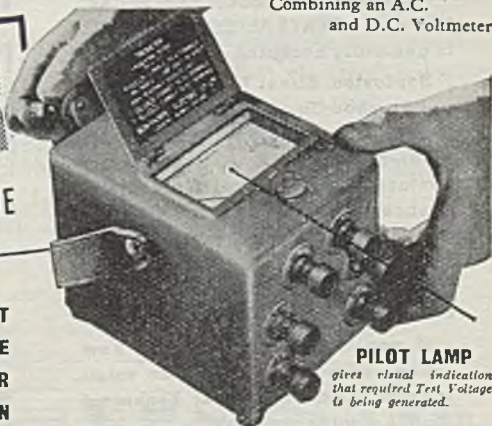
## AN ENTIRELY NEW TYPE OF INSULATION TESTING SET

Combining an A.C.  
and D.C. Voltmeter

**TRIOMETER**  
THREE INSTRUMENTS IN ONE

**NO CLUTCH • NO BRUSHES TO WEAR OUT  
NO MECHANICAL COMPLICATIONS • SIMPLE  
VOLTAGE LIMITING DEVICE • FEWER  
WEARING PARTS AND REDUCED FRICTION**

The Triometer cuts at the root of mechanical complications, usually found in normal types of Insulation Testing Sets, by using an alternating current generator without any clutch. Provided with a pilot lamp, which clearly shows required test voltage is being generated and with simple static electrical means for limiting the voltage, and rectifying it to provide the necessary direct current. The voltage limiting device is simple, dependent on the fact that frequency increases with



**PILOT LAMP**  
gives visual indication  
that required Test Voltage  
is being generated.

the handle speed. The generator voltage of the Standard Triometer is 500 volts and covers a range of 0-20 megohms. Voltmeter reads 500 volts A.C. or D.C. Write now for leaflet giving comprehensive details.

**Bowthorpe** ELECTRIC CO LTD

GOODTRIC WORKS, BREWER STREET, OXFORD. TELEPHONE: OXFORD 2403/47561



**T**HE forms of control for Street Lighting are many and varied, but now CENTRALISED CONTROL is generally accepted as essential.

Sordoviso Street Lighting control units embodying the Sordoviso non-tilting Mercury Switch with its inherent features of non-burning contacts, low energising current, silence in operation and freedom from climatic effects, provide a most efficient remote, or automatic control with low installation and maintenance costs.

If you are contemplating a new scheme or modifications to an existing one, the advice of our Technical Staff is always available.

We should be pleased to forward, on application, our brochure, "Controlled Street Lighting."

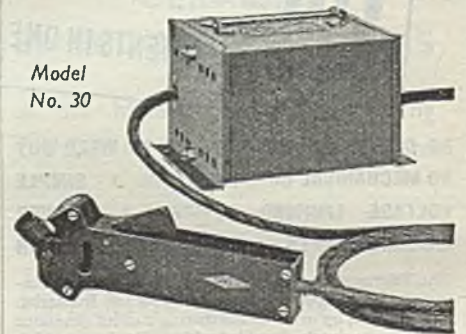
**SORDOVISO SWITCHGEAR LTD.**

Falcon Works, Loughborough  
LOUGHBOROUGH 3131



### The NEW Technique for Jointing Wires

**N**O solder or flux is required, and dry joints are eliminated. Model 30 is suitable for jointing wires between 50 s.w.g. and 30 s.w.g., including nichrome. Model 20 and other types are available for jointing heavier wires. Full particulars sent upon request.



Model  
No. 30

*Stanelco Products*

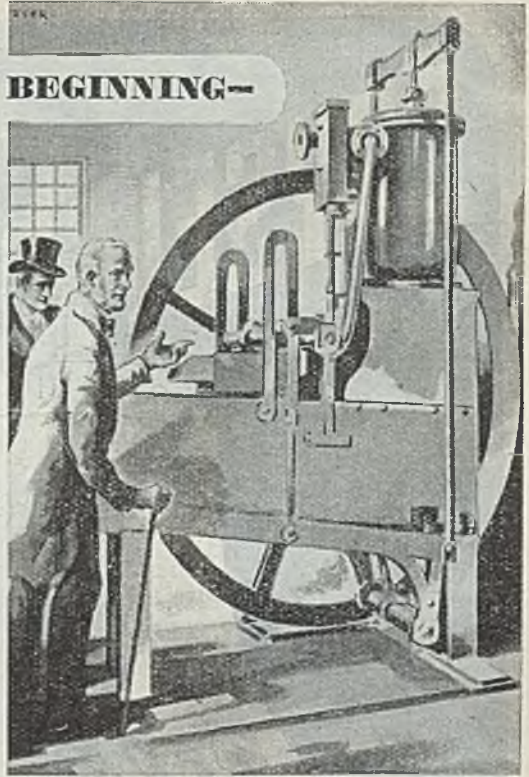
PROPRIETORS: STANDARD TELEPHONE AND CABLES LIMITED

NORTHWOOD HILLS NORTHWOOD, MIDDLESEX

Telephone: PINNER 4885

## EVERYTHING HAD A BEGINNING--

*In 1812 Henry Bell's "Comet" became the first European passenger boat and was the beginning of the great British steamship lines. Our illustrations show the boat itself and the engine which made it famous.*



And Pritchett & Gold and E.P.S. Company Limited also rank among the industrial pioneers of the nineteenth century, for they made the first electrical batteries and in 1882 lit the Royal Mint, the Law Courts and other important buildings. To-day their batteries have wider fields of application. In addition to Train Lighting they are supreme for Country House Lighting, for Motor Vehicles and Aircraft, and now are being widely used for Emergency Lighting in buildings where light is necessary when the mains fail.

P. & G. and E.P.S. Cells have also an enviable record of reliability in Central Stations, Telephone Exchanges and in every other application.

### REPLATING

Ensure long and reliable service by having your present batteries replated by us.

## PRITCHETT & GOLD and E.P.S. CO. LTD.

*Formerly the Electrical Power Storage Co., Ltd.*

**MADE THE FIRST BATTERIES**

50 GROSVENOR GARDENS, LONDON, S.W.1



Phone: SLOane 7164 'Grams: Storage, Sowest, London

P.G. 13A-44




# CRYSELCO LAMPS

*Prices Reduced*

**FULL PARTICULARS  
ON  
APPLICATION**

**CRYSELCO • LIMITED • BEDFORD**



**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**

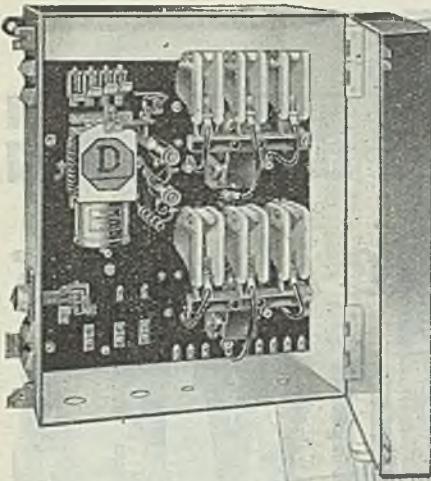
**CABLE INSULATING PAPER**



*Tullis Russell & Co. Ltd.*

Archnmuty & Rothes Paper Mills, Markinch,  
Scotland

LONDON	MANCHESTER	BIRMINGHAM
1 Tudor St.,	372 Corn Exchange	118 Colmore Row
E.C.4	Bldgs., Corporation St.	



#### D.C. AUTOMATIC REVERSING RHEOSTATIC STARTER

For automatically reversing D.C. shunt, series or compound wound motors that require armature resistance in circuit at starting. Suitable for hoists, lifts, machine tools, etc.

Let us send you full particulars.

**DONOVANS**  
 THE DONOVAN ELECTRICAL CO. LTD.  ELECTRICAL ENGINEERS AND STOCKHOLDERS  
 BIRMINGHAM, 9  
 Phone - STECHFORD 2277 (P.B.X.)  
 Sole Agents - DONOVAN, BIRMINGHAM

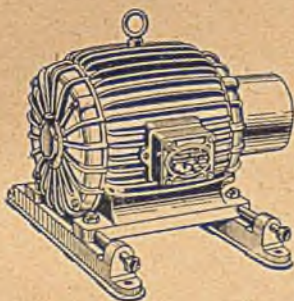


Wherever and whenever intercommunication telephones are concerned keep the name *Ericsson* in mind. Thus you will be sure of efficiency, reliability and service. For everything in internal telephones consult

**ERICSSON TELEPHONES LTD.**  
 56, KINGSWAY, LONDON, W.C.2 (HOLborn 6926)

# HOWELLS (ELECTRIC MOTORS) LTD.

HANLEY, STOKE-ON-TRENT, ENGLAND



## "Fanless" Totally Enclosed Motors

- All sizes  $\frac{1}{2}$  to 10 h.p. available
- No larger than protected type
- Supersede all fan-cooled types

LONDON: Palmers Green 5428  
MANCHESTER: Didsbury 4709

BRISTOL: 25916  
NEWCASTLE: 28617

BIRMINGHAM: Central 7909  
STOKE-ON-TRENT: 23624

## Wylex Testing



INSULATION TEST—There is a wide margin of safety built into all Wylex electrical accessories. Every Wylex product before leaving our works must satisfy a high insulation test at 1,000 volts. Another reason why.

*"Wylex must be good"*

GEORGE H. SCHOLLES & CO. LTD.  
WYLEX WORKS, WYTHENSHAW, MANCHESTER.  
Tel: Wythenshawe 2251/2.  
Grams: "Kilowatt," Manchester.



## TEST INFLATION OF AIRMEN'S DINGHIES BY HOOVER BLOWER

Inflation is the test for seaworthiness. But deflation is the test for airworthiness. That is because any air remaining after test would expand at high altitudes, and a dinghy inflating itself on the wing of his aircraft is no help at all to a bomber pilot.

However, the Hoover Blower both inflates and deflates — and deflates completely. It's one of the many jobs these versatile Hoover machines have been doing in the war.

If Blowers, Rotary Transformers, Fractional Horse Power Motors and Generators enter into your post-war plans, consult us now.

# HOOVER LTD

*Makers of the World's Best Cleaner*

HOOVER LIMITED, PERIVALE, GREENFORD, MIDDLESEX

