

THE ELECTRICIAN

Vol. CXXXV. No. 3517. Friday, October 26, 1945.

Sixpence

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



Note ample room for splaying of cores.



Completed Multicore Joint (above) and Box with top half in position (below).



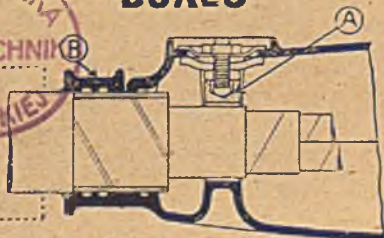
The "Cablegrip" gland and armour clamp provides two wide bearings for the cable. A highly efficient bond to the lead sheathing is effected by means of a cast iron shuttle (A) and to the armouring by means of a cast iron armour clamp (B).

**BOXES YOU CAN
BURY AND FORGET**

The design of HENLEY "Cablegrip" type Boxes is based on years of experience of practical jointing conditions, and incorporates all those features which facilitate jointing operations. Their complete reliability bears out our claim for these boxes—that you can "bury and forget."

HENLEY

"CABLEGRIP" STRAIGHT THROUGH SERVICE & BRANCH BOXES



Please ask for Catalogue UCD.2, and Supplement.

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.

51/53, HATTON GARDEN, LONDON, E.C.1.

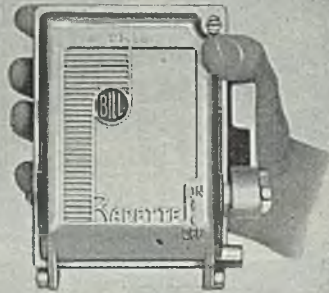
Osram

THE WONDERFUL LAMP

A S.G.C. PRODUCT

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!





THE SMALLEST TRIPLE POLE SWITCHFUSE.
EMINENTLY SUITABLE FOR MACHINE TOOLS.
BILL RADETTE. 10 AMPERES. 500 VOLTS. CATALOGUE NO. Q1438.

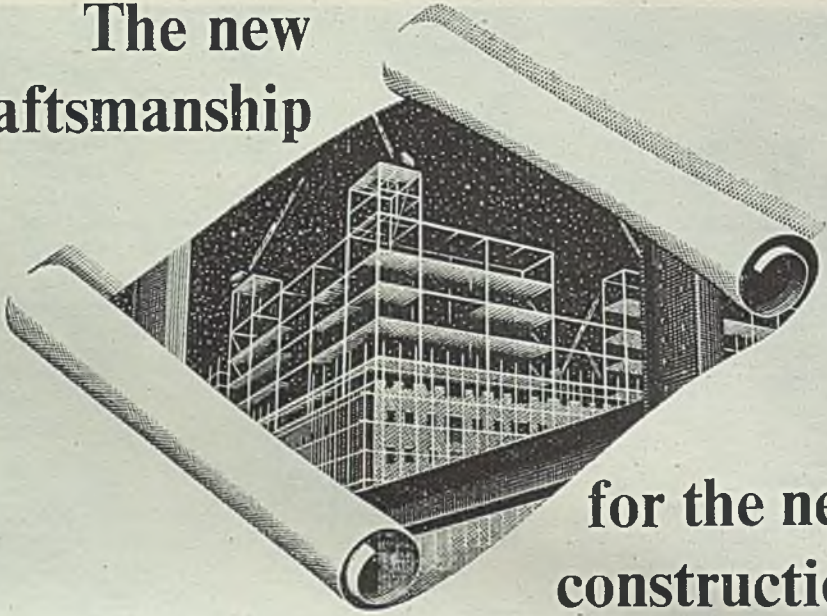
LONDON: A.W. ZELLEY
73 ST. PETER ST.
WESTMINSTER SW1

BILL SWITCHGEAR LTD
ASTON LANE, PERRY BARR
BIRMINGHAM · 20

MANCHESTER GLASGOW
BELFAST
BURTON-ON-TRENT

PHONE: BIRCHFIELDS 5011. GRAMS' BILSWITCH, B.HAM.

The new craftsmanship

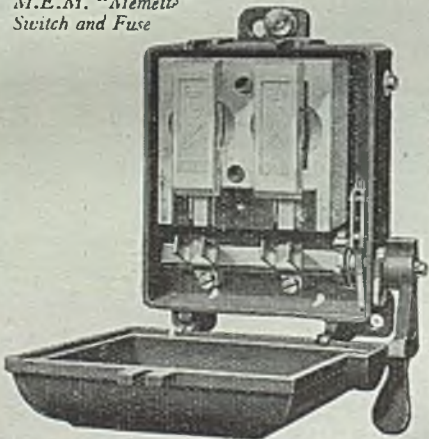


for the new construction

The post-war demand that the building industry and its suppliers will have to face will be for quality in quantities. Only the New Craftsmanship of mass production can

provide it. M.E.M. have demonstrated, in the manufacture of Switch and Fuse Gear, how the scientifically organised large-scale production of standardised designs can combine quality, quantity and low prices. With an entirely self-contained factory, organised and equipped along the most efficient lines, M.E.M. will be ready to meet all post-war demands in Switchgear, Fusegear, Motor Starters, and Electric Fires.

*M.E.M. "Memette"
Switch and Fuse*



MEM

SWITCHGEAR

MOTOR STARTERS • FUSEGEAR

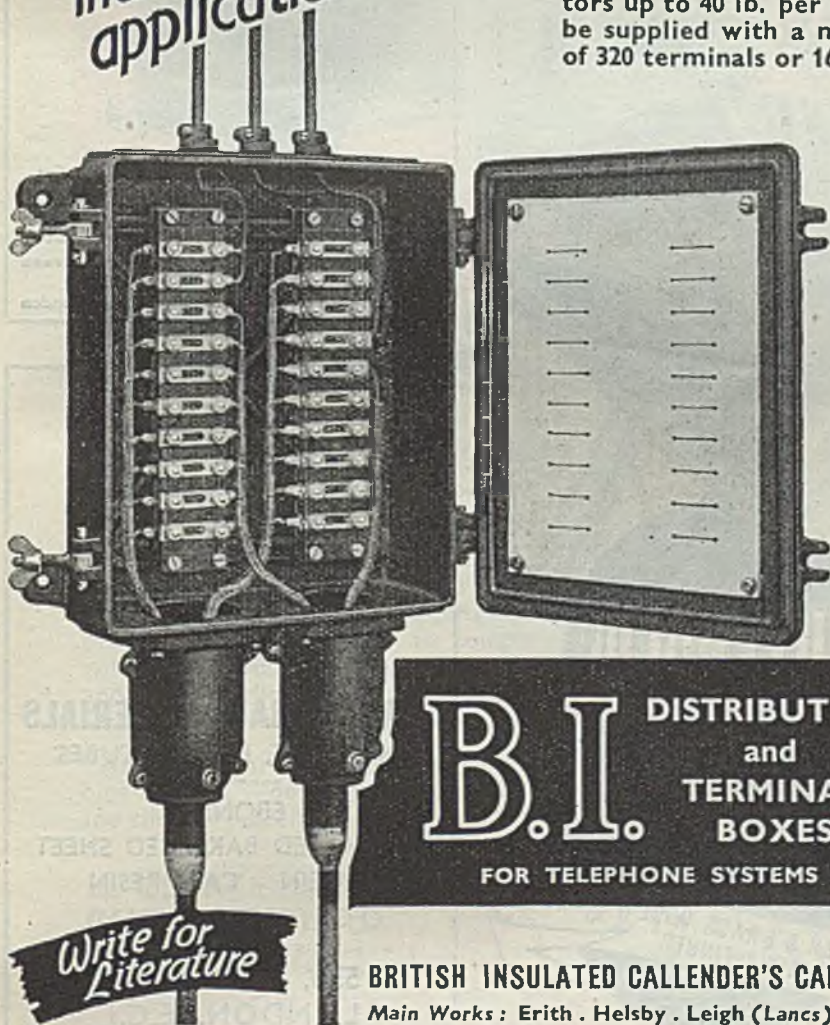
ELECTRIC FIRES

These boxes are being used extensively for telephone systems in industrial and allied applications

For sub-dividing main and branch cables at suitable points; designed to give a flexible scheme which can be readily re-arranged to meet subsequent changes in layout.

Terminals or captive sliding links are available. Chart boards are fitted to the inside of the lids, for recording the connections made.

A range of boxes for conductors up to 40 lb. per mile can be supplied with a maximum of 320 terminals or 160 links.

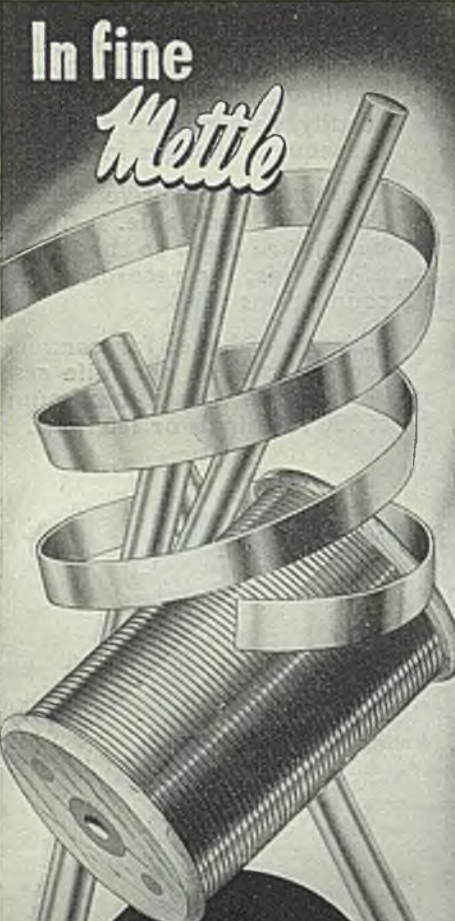


B.I. DISTRIBUTION
and
TERMINAL
BOXES

FOR TELEPHONE SYSTEMS

BRITISH INSULATED CALLENDER'S CABLES LTD.
Main Works : Erith . Helsby . Leigh (Lancs) . . Prescot

In fine
Mettle



R. H. SYMONDS
LTD.

★
39, VICTORIA STREET
WESTMINSTER S.W.I.

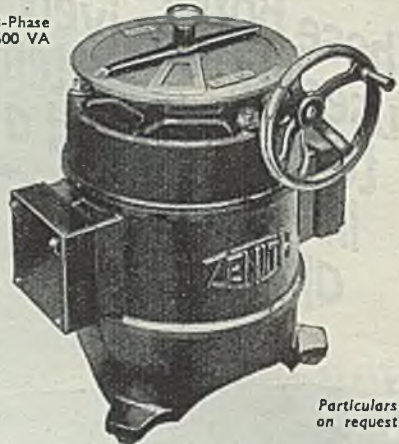
COPPER & BRASS WIRE & STRIP
PLAIN & TINNED

WORKS: ENFIELD - MIDDLESEX

ZENITH TRADE-MARK
REGISTERED


PHASE SHIFTING TRANSFORMER

3-Phase
600 VA



Particulars on request

The ZENITH ELECTRIC CO. Ltd.
Zenith Works, Villiers Road, Willesden Green
London, N.W.2. Grams:
Phone: WILlesden 4087-8-9 Voltsahm, Phone, London

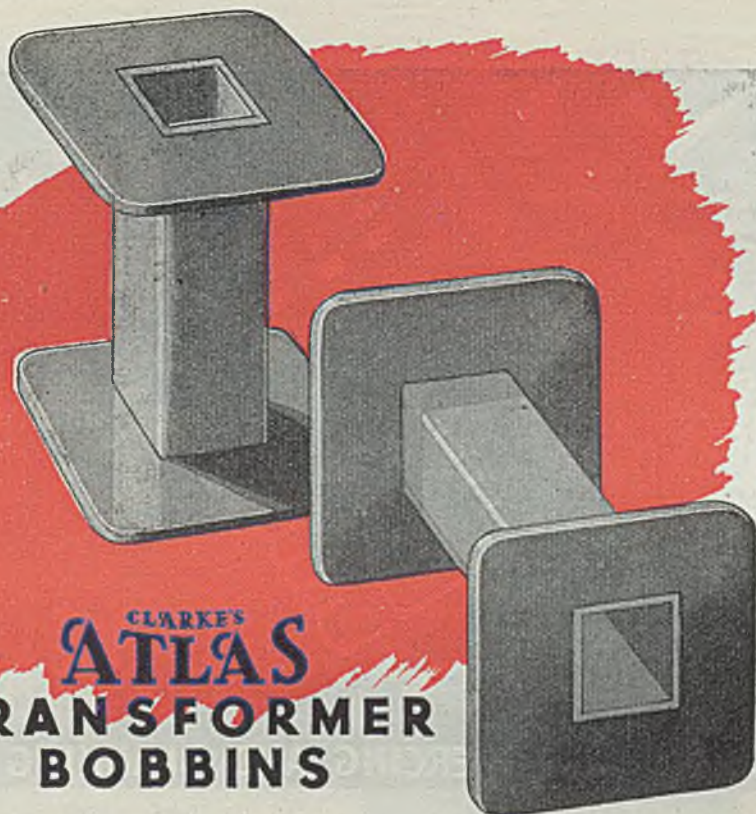


ESTABLISHED 1887

PLASTIC RAW MATERIALS
IN SHEETS, RODS & TUBES

EBOHITE
LAMINATED BAKELISED SHEET
CASEIN CAST RESIN
ETC.

53b, CITY ROAD
LONDON, E.C.1



CLARKE'S
ATLAS
TRANSFORMER
BOBBINS

Designed as a standardised Bobbin to accommodate the maximum amount of wire in the minimum space.

Made from high-grade "PIRTOID" (a laminated bakelite product) and possessing high electrical and mechanical properties. Can be made to comply with British Standard Spec. Nos. 316 and 547, Air Ministry Spec. WT. 1000, Grade 2, and Admiralty Spec. No. 12.

"Atlas" standardised Transformer Bobbins cover a wide range of stampings and simplify ordering.

We shall be pleased to send you an "Atlas" Transformer Bobbin Card on request—it shows the wide range available and the simple method of ordering.

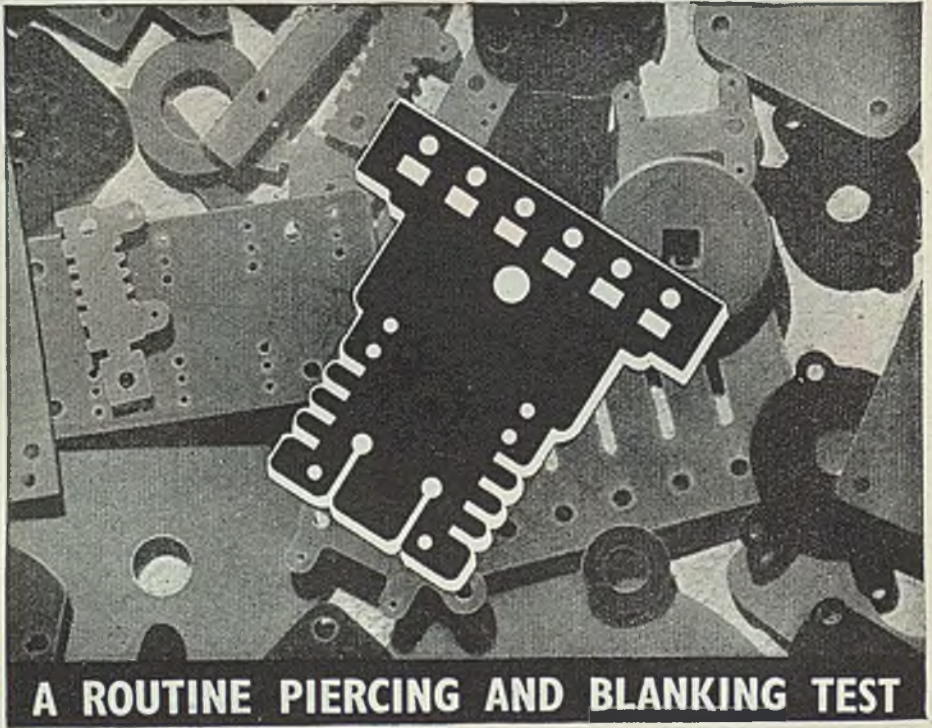
*REASONABLE PRICES.
 REASONABLE DELIVERIES.*

**H. CLARKE & CO.,
 (MANCHESTER) LTD.**

PHONE: ECCLES 2001 . 2 . 3 . 4 . 5
 GRAMS: PIRTOID PHONE MANCHESTER



**ATLAS WORKS
 PATRICROFT
 MANCHESTER**



BAKELITE LAMINATED

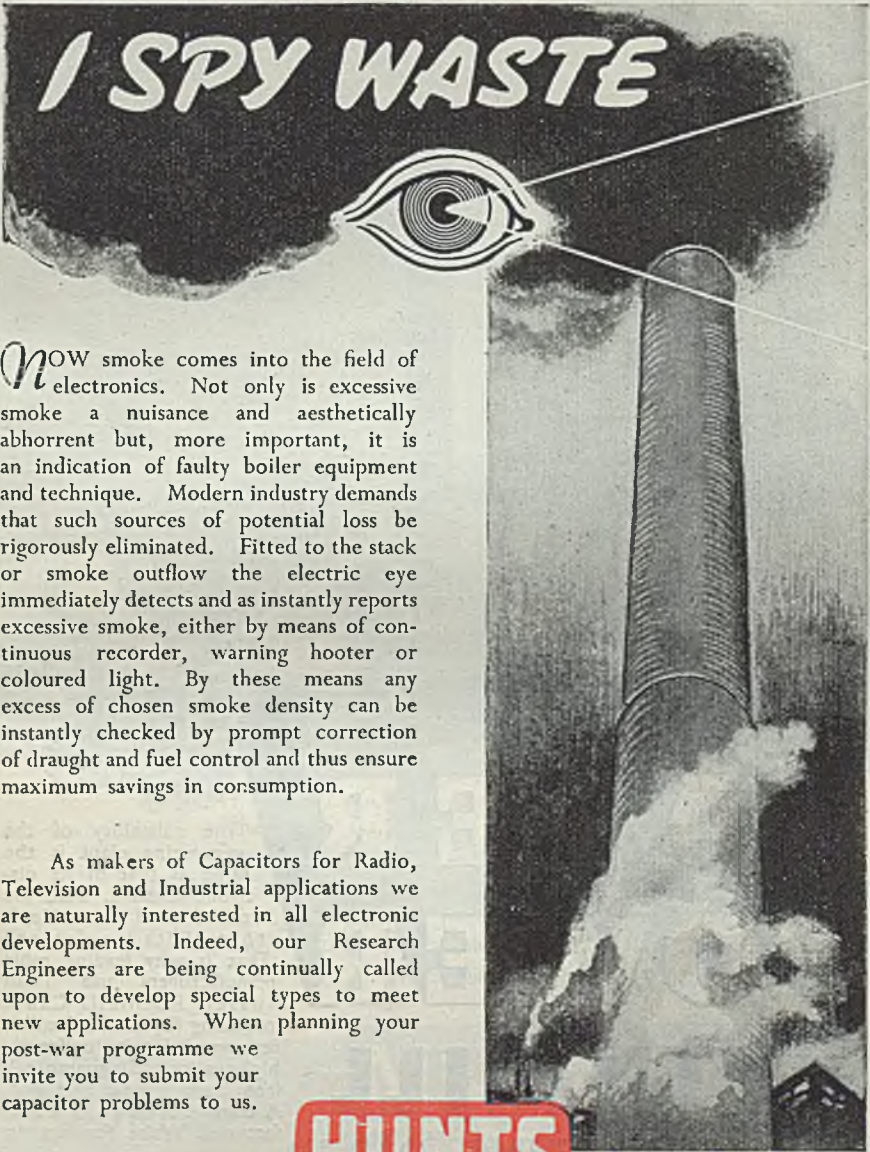
THE piercing and blanking properties of Bakelite Laminated are checked as a matter of routine. Above is illustrated a piece of the material which indicates the design of tool used. Note the clean edges and the close proximity of the holes. The design generally represents a critical test of practicability. Samples and data of special punching grades for a variety of purposes will be furnished upon request.

TREFOIL
BAKELITE  **PLASTICS**
 REGD. TRADE MARKS

Pioneers in the Plastics World

BAKELITE LIMITED · 18 GROSVENOR GARDENS · LONDON S.W.1

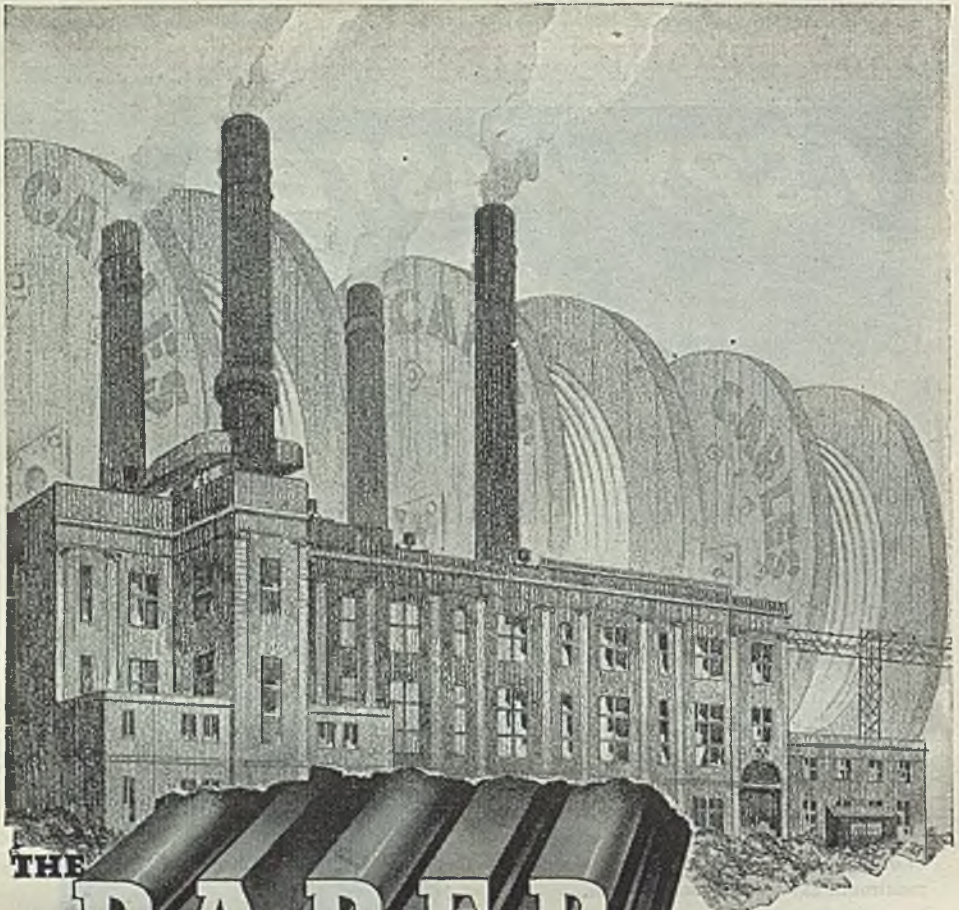
ELECTRONIC AIDS *for* INDUSTRY



NOW smoke comes into the field of electronics. Not only is excessive smoke a nuisance and aesthetically abhorrent but, more important, it is an indication of faulty boiler equipment and technique. Modern industry demands that such sources of potential loss be rigorously eliminated. Fitted to the stack or smoke outflow the electric eye immediately detects and as instantly reports excessive smoke, either by means of continuous recorder, warning hooter or coloured light. By these means any excess of chosen smoke density can be instantly checked by prompt correction of draught and fuel control and thus ensure maximum savings in consumption.

As makers of Capacitors for Radio, Television and Industrial applications we are naturally interested in all electronic developments. Indeed, our Research Engineers are being continually called upon to develop special types to meet new applications. When planning your post-war programme we invite you to submit your capacitor problems to us.





THE

PAPER
 BEHIND THE
POWER

ROTHMILL

CABLE INSULATING PAPER

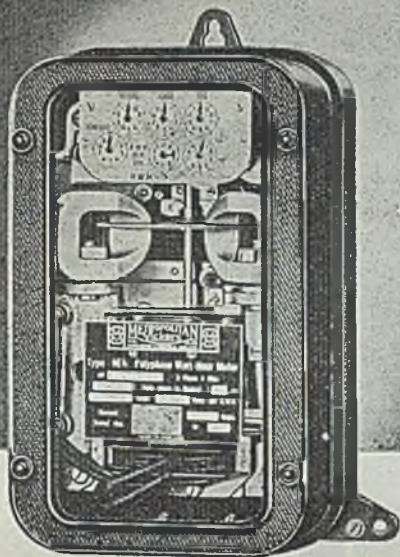
Tullis Russell & Co. Ltd.

The Pioneers of Twin-wire Papers for Printers

AUCHMUTY & ROTHES PAPER MILLS, MARKINCH, SCOTLAND
LONDON MANCHESTER BIRMINGHAM
 1 Tudor Street, E.C.4 372 Corn Exchange Bldgs., Corporation Street 116 Colmore Row

The reliability of the generating plant is the same as that of its distributive cable. And the reliability of the cable is that of its insulation! That is why leading cable manufacturers use Tullis Russell Rothmill Cable Insulating Papers. Rothmill is renowned for its uniformly high quality, and is guaranteed free from metals and grit. A complete range is manufactured. Write for details.





Type NE4 3 phase-4 wire Watt-hour METER

NOV. 10

A development of the well-known NE Meter

- **SIMPLE ADJUSTMENTS**
The NE4 Meter includes adjusting devices that are quickly and easily operated without special tools.
- **FLAT LOAD CURVE**
The high standard of performance that characterises two-element meters is also a feature of this 3-phase 4-wire meter.
- **SPACE SAVING**
Though the meter has three separate elements, it occupies no more panel space than the standard two-element meter.

Write for leaflet No. 356/8-1.



METROPOLITAN Vickers

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

G/A301

*Light aids
production*

IMPROVE YOUR LIGHTING *in consultation with*
METROVICK'S ILLUMINATING ENGINEERS



J & P.

CABLES

*united to
serve*

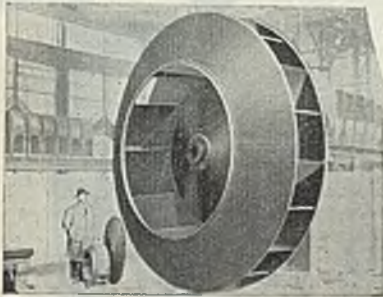
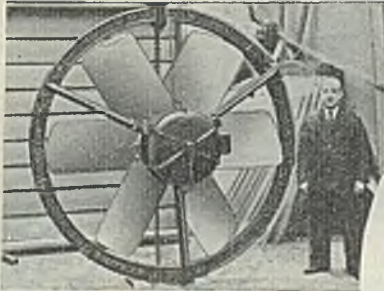
With J & P Boxes, of course!



JOHNSON & PHILLIPS LTD.
 CHARLTON LONDON S.E.7

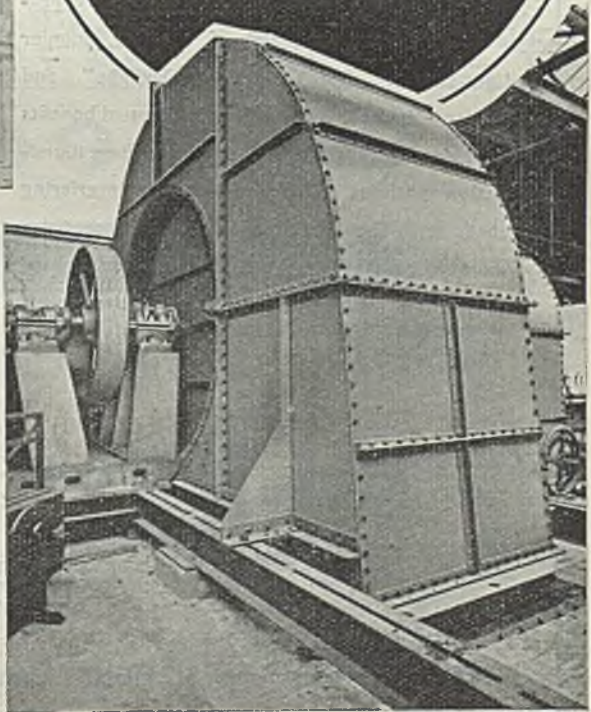
The mark that means that "little more" in quality

There is a "KEITH-BLACKMAN" FAN for every purpose for which a fan is essential.



"KEITH-BLACKMAN" FANS

- HEATING
- VENTILATION
- DUST REMOVAL
- FORGE BLOWING
- MECHANICAL DRAUGHT
- FUMES REMOVAL
- STEAM REMOVAL
- CUPOLA BLOWING
- SMOKE REMOVAL
- FURNACE BLOWING
- DRYING, COOLING,
- etc.



We invite your enquiries.

WARM WHITE

Siemens Fluorescent Tubular Lighting, the most modern lighting system, is now available for essential industrial installations at less cost—and with a choice of two colours of light. For, in addition to Sieray "Daylight" Lamps, there are now Sieray "Warm-White" Fluorescent Lamps, produced to meet the need of a softer, sunnier light-source. Both Sieray "Daylight" and "Warm-White" Lamps offer all the usual benefits of Fluorescent Lighting. They give brilliant illumination without glare and without interfering shadows. They are approximately three times more efficient than an ordinary gasfilled lamp of comparable wattage. Send for descriptive leaflet.



Siemens Lighting Engineers are at your service, without obligation.



FLUORESCENT LAMPS
"The Yardstick of Good Lighting"

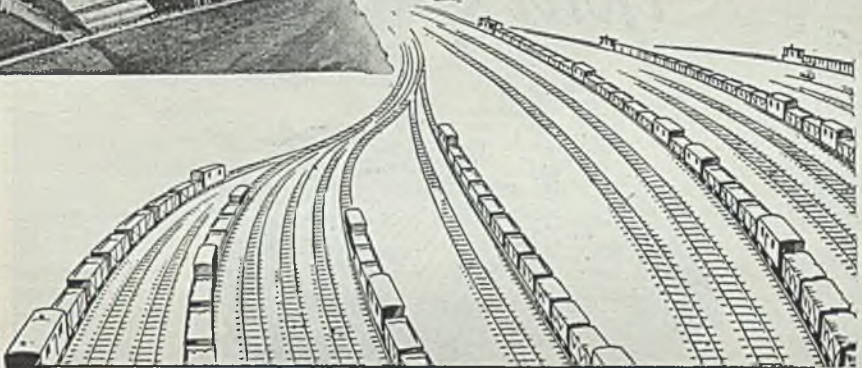
Made throughout at SIEMENS Lamp Works, Preston, Lancs.

SIEMENS ELECTRIC LAMPS & SUPPLIES LTD., 38/39, Upper Thames St., London, E.C.4

Branches at Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, Nottingham, Sheffield.



from Chippenham
ON
WAR SERVICE
1939 to 1945



115,000,000



METAL RECTIFIER

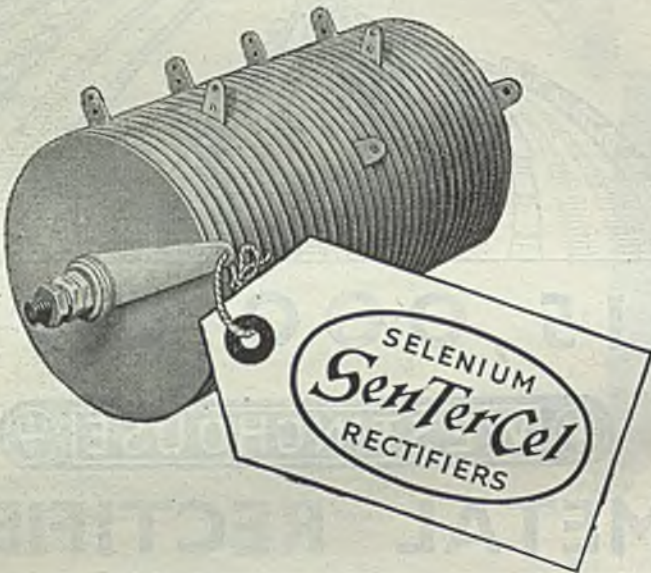
ELEMENTS, BUILT INTO MILLIONS OF RECTIFIER UNITS AND 76,500 RECTIFIER SETS, INCLUDING 120,000 TRANSFORMERS AND CHOKES,

which explains why it has not been possible to give you the services you were accustomed to receive up to the outbreak of war. Our knowledge and skill have been greatly enhanced during this period and we shall shortly be in a position to meet all your needs with prompt deliveries of even better designs.

WESTINGHOUSE BRAKE & SIGNAL CO., LTD.,
Pew Hill House - Chippenham - Wilts.


SELENIUM
SenTerCel
RECTIFIERS

Your Guarantee



WHEN we were the only manufacturers of Selenium Rectifiers in this country there was no need to give a special name to our product.

The many advantages of the "Standard" Selenium Rectifier over other types has inevitably introduced competition, and we have therefore adopted the name of "SenTerCel" as our trade mark, so that our customers may know that rectifiers bearing this name will have the high standard of performance to which they have become accustomed.

The name "SenTerCel" combines the idea of centre-contact construction, which is an exclusive feature of our rectifiers, with the S.T.C. registered trade mark which is known all over the world as the symbol of the highest quality in tele-communication equipment. 

Standard Telephones and Cables Limited
NEW SOUTHGATE, LONDON, N.11

A few of the products of

SANDERS

WEDNESBURY



The examples of Sockets, Plugs, and Switch Sockets shown are indicative of the quality offered by Sanders Socket and Plug products.

Sanders exclusive "Shutterlocked" feature is incorporated in the Switch Sockets —the shutter covering the live contacts being locked or unlocked according to the position of the switch dolly, which is always free to operate. This ensures that no object can be inserted in the socket tube while the switch is 'on' though the plug may be withdrawn, but not re-inserted with the switch in that position.

WRITE FOR LIST 137

Wm. SANDERS & Co. (WEDNESBURY) Ltd., FALCON ELECTRICAL WORKS, WEDNESBURY, ENGLAND

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

MALVERN URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

Appointment of Mains Assistant Engineer.

APPLICATIONS are invited for the above appointment, at a salary in accordance with Class B, Grade 6, of the National Joint Board Schedule (£361 to £375 per annum).

Applicants must have had a sound technical training and practical experience in the installation, maintenance and operation of E.H.T. and L.T. underground cable systems and sub-stations, and be able to undertake work of layout design and planning and the keeping of records.

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

The selected candidate will be required to provide his own motor vehicle, and the Council will pay a travelling allowance in accordance with their current scale.

Applications, endorsed "Mains Assistant Engineer," stating age, full particulars of experience and qualifications, together with copies of three recent testimonials, must be received by the undersigned not later than Saturday, the 10th November, 1945.

The Ministry of Labour and National Service (Technical and Scientific Register) have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

J. BULMAN,
Clerk of the Council.

The Council House, Malvern.
20th October, 1945.

FOREMAN required to take charge of Winding Department employing approximately 100 operatives. Must be thoroughly experienced in both A.C. and D.C. windings for small machines, and also capable of winding first samples of special designs. Applicants with experience in handling labour should address their enquiries, giving full particulars of experience, salary required, etc., to Box L.Q.F., "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.

VACANCY occurs on editorial staff of a leading electrical engineering journal for enthusiastic worker with a good general knowledge of electrical industry, and desire to enter journalism. Previous journalistic experience unnecessary. Applications treated in confidence.—Box L.Q.E., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

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.

TENDER

METROPOLITAN BOROUGH OF SOUTHWARK.

ELECTRICITY DEPARTMENT.

E.H.T. and L.T. Insulated Cables.

TENDERS are invited for the supply and delivery over a period of 12 months ending 31st December, 1946, of Paper-insulated Lead-covered Steel Tape armoured and unarmoured Cables of various sizes.

Specification, Conditions and Form of Tender may be obtained from the Borough Electrical Engineer and Manager, Penrose Street, Southwark, S.E.17.

Tenders, together with Fair Wages Clause Declaration duly signed as required by the Council on the forms provided, enclosed in a plain envelope, sealed and endorsed as directed in the tender form, must be delivered to the undersigned not later than Wednesday, 14th November, 1945.

The Council does not bind itself to accept the lowest or any tender.

D. T. GRIFFITHS,
Town Clerk.

Town Hall, Walworth Road,
London, S.E.17.
19th October, 1945.

AGENCIES

FRENCH Electrical Engineer with excellent connections and references desires to get in touch with British or American firms specialising in the manufacture of domestic and industrial electrical appliances, with a view to acting as their Sales Agent in France. Please reply to C. Brachet, Ingenieur I.E.G., 69, rue Raulin, Lyon.

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 otho. 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.

REPAIRS

COOKERS.—We can give good deliveries of Sheet Metal Vitreous Enamelled Electric Cooker parts.—JOHN KING & SON (ENAMELERS), Ltd., PYRO WORKS, WHITTINGTON MOOR, CHESTERFIELD. Phone: Old Whittington 50.

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.

MISCELLANEOUS

WIRELESS AND LOUDSPEAKER CABINETS manufactured to special design of each customer.—Birney Smallwood Products, Ltd., "Swan Works," Fishers Lane, London, W.A.

CHANGE OF NAME.

SOUTHERN IGNITION CO. LTD., 190, Thornton Road, Croydon, has changed its name to Max Electric Co. Ltd. The direction of the Company and of the sister company, Max-Arc Welders, Ltd., remains in the hands of M.I.W., who served for many years in India Mr. P. S. Jackson, M.I.E.E., M.I.E. (Int.), with Cromptons, English Electric and G.E.C. The Company dropped ignition work some years ago, and the Management feels that the new name will be more suitable in view of the firm's activities as electric motor and electrical appliances manufacturers and repairers.



MICA

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

BRITISH MICA CO. LTD. - BEDFORD.

Your enquiries invited
for early deliveries of

HOTRIC

Thermal Storage Heaters
in following capacities.
1½ gallons, 3 gallons and
20 gallons "Two in One."

Also Immersion Heaters
(1, 2 or 3 k.w.) for con-
verting existing Hot
Water Systems.

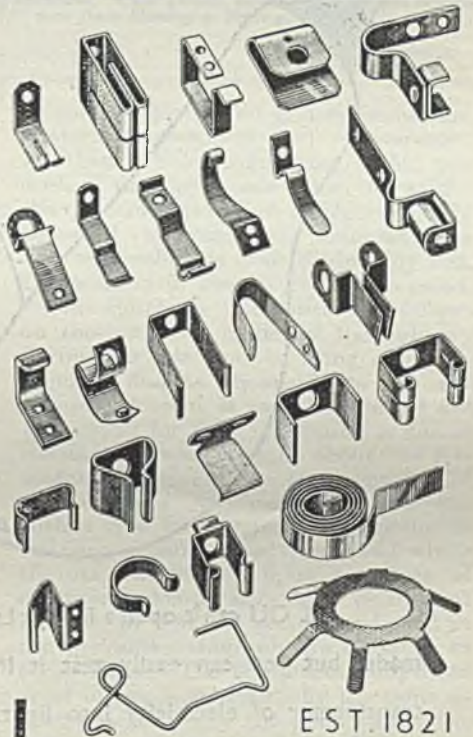
HOTRIC LIMITED

Sales Office: 198 Fore St., Edmonton, N.18

Telephone: Tottenham 1321.

Head Office: Hotric Works, Broxburn, West Lothian, Scotland

SPRINGS
FOR EVERY POSSIBLE
ELECTRICAL NEED



EST. 1821

by **RILEY**

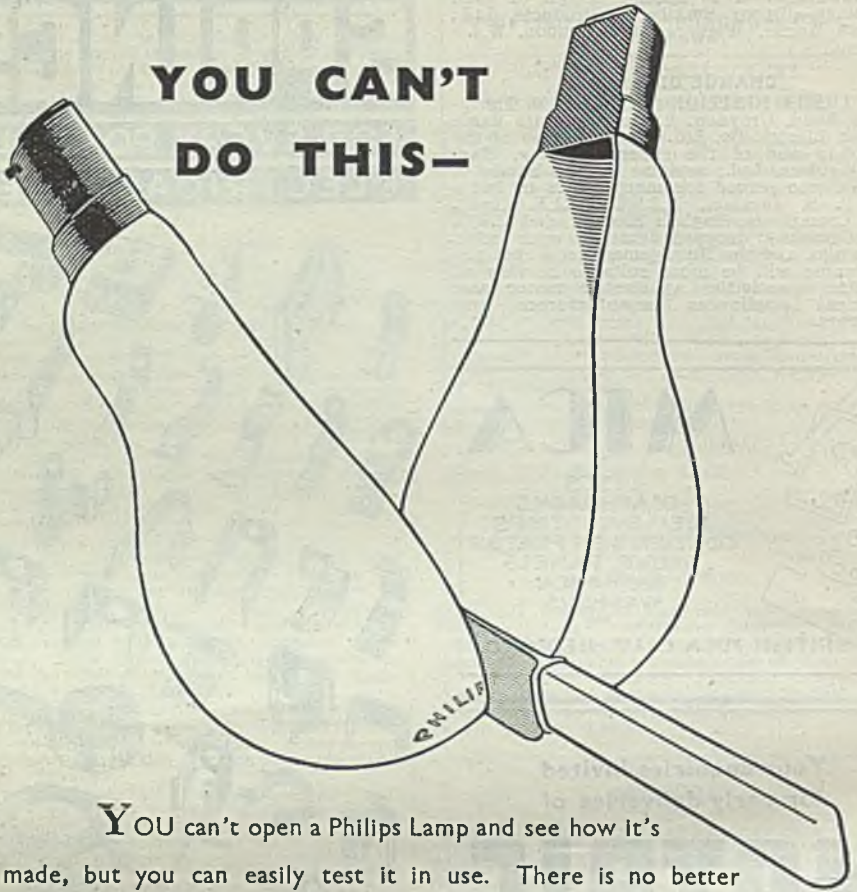
That little more in perfection and
quality that means so much in performance.
Technical leaders since 1821.
On Admiralty, War Office and Air
Ministry Lists

ROBERT RILEY LTD.

MILKSTONE SPRING WORKS, ROCHDALE.

Telephone: Rochdale 2237-8.

Telegrams: "RILOSPRING."



YOU can't open a Philips Lamp and see how it's made, but you can easily test it in use. There is no better transformer of electricity into light. You will find that Philips Lamps give a maximum of clear, bright light for a minimum of current.

Sell

PHILIPS



—the Lamps the Public like

Makers of Good Lamps for over 50 Years

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."
Telephones: 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. 3517. [Vol. CXXXV]

October 26, 1945

Annual Subscription 25
Overseas 30s.

CHIEF CONTENTS OF THIS ISSUE

Tax Concessions	425
Views on Current Affairs	426
Imperial College Centenary	428
E.D.A. Service Unit	429
Electrical Personalities	430
Future of Coal Mines	432
Exhibition Impressions	433
Electricity and Smoke Abatement ...	434
Pump Drive for Waterworks	435
E.D.A. Progress Report	436
Communication Developments	437
Relations Between Maker and User...	439
A.S.E.E. Diploma Scheme	441
Weather and Power Systems	444
Contracts Open	448
Electricity Supply	449
Industrial Information	451
Company News	453

Tax Concessions

WHILE the Budget proposals announced on Tuesday may not be as generous or as helpful to industry as many may have hoped, the provisions relating to Excess Profits Tax, flanked by the 1s. reduction in the standard rate of Income Tax, will have some beneficial effect upon the promotion of trade and permit at least some rebuilding and expansion to be carried out. Along with the reduction of the rate of E.P.T. Mr. DALTON promised to make provision for, and to speed up, repayment of the 20 per cent. refund, while legislation which will provide for allowances for income tax purposes in respect of various kinds of capital expenditure, including expenditure upon research, will become effective as from April next.

So far as the electrical industry in general is concerned, the most outstanding taxation change concerns Purchase Tax, for Mr. DALTON has decided to abolish forthwith the tax applicable to a number of domestic electric appliances, including cookers, fires, radiators and con-

vectors, hotplates and grillers, immersion heaters, wash-boilers and refrigerators. All these articles were taxed at 33½ per cent. of their wholesale value, but as the change came into effect as regards goods delivered by registered manufacturers and wholesalers as from Wednesday last, the position in the future will be eased.

This Purchase Tax concession follows on the activities made by the industry during the last year to bring about its removal, and as these efforts are not generally known, it may be pointed out that credit for their instigation is due to the E.D.A., who brought about the formation of a committee, representative of the coal, gas, and electricity interests, with a view to bringing to the notice of the Government the adverse effect which the tax was having upon the cost of equipping temporary and permanent housing, in that the goods mentioned in the previous paragraph are essential to every home. The equipment subject to relief of tax is substantially the same as that referred to by the joint committee, but in our view such appliances as vacuum cleaners, lamps, and the dozen or more small electrical aids to be found in the average home should also be freed from tax.

The reason for this opinion is based on the fact that, apart from the increased purchases of those non-luxury goods which removal of the tax would permit in the lower income groups, the increased demand would allow of our workshops to start production on a more satisfactory basis, which would in turn enable industry to better absorb the non-skilled man-power being released from the Services. Again, with housing so short that the Government is contemplating billeting several families in the larger properties, it is reasonable to sup-

pose that the people making up those families are entitled to average comfort. That being so, increasing the availability of electrical appliances to the lower income groups by removing Purchase Tax would seem both sensible and just. The electric iron, the vacuum cleaner, the electric lamp are essentials which the average household should not be called upon to do without, and their purchase should be as free from taxation as are now cookers and heaters.

Exhibitions and the Electrical Idea

A WOMAN visitor to the exhibition organised by the E.D.A. at Dorland Hall, London, while recognising that it was designed as a tribute to the E.A.W. and the eight million women in the Services, industry and other spheres of activity, who helped to win the war, voiced the opinion that the elaborate setting and equipment tended to obscure the primary object of directing the attention of visitors to the labour-saving appliances which, as the DUCHESS OF KENT so aptly stated, could make housework a part-time pleasure instead of a full-time burden. If this critic is right, the possibility of which she speaks should not be overlooked, because it is to the women of moderate means that the electrical industry must look to use the bulk of its domestic apparatus. She must be encouraged in every possible way in the belief that cookers, washing machines, refrigerators, cleaners, small appliances, and so on, are well within the scope of the average family income, as in fact they are.

Engineers and the Call-Up

THE Engineering Industries Association have sent a protest to the Government against the call-up of technicians needed for the re-equipment of industry, their complaints being much the same as those ventilated in these columns in the May 18 issue. In spite of our pleas, there has been no recognition of the fact that the main industries of the country are in large measure dependent on engineering in order to re-equip for new production, and that no industry can be expected to resume its peace-time momentum until an urgent process of re-tooling has taken place; it is this process which is being retarded by the present policy. The reply of the Government that those technicians who were

reserved from military service throughout the war years, must now take their turn in the Forces, will not stand critical examination. There are only a few thousands of these men in all and, trained as they have been during a period of highly concentrated production, they are versed in the very latest workshop practices. None of the grades being demobilised from the Forces can take their places because no such men were ever taken into the Forces. In many of the smaller firms the whole labour force depends for its employment on only a few skilled men, and yet the Government propose to absorb them in Service enlistment at a time when the national need is to get some thousands of men and women back to work.

E.D.A. Interim Progress Report

THE main activities of the E.D.A. which form the subject matter of an interim report sent to us last week, indicate that the association has its fingers in contact with all the building and other interests which are at present so much attracting the attention of the public. These activities are in addition to the responsibilities of the association in connection with easing the relationship between the various sections of the industry and Government departments, responsibilities which, born during the war years, still remain to curb the enthusiasm to develop. The report makes interesting reading in many ways, but the most pleasing feature is the fact that the association is not allowing the various official housing committees, building authorities or the Ministry of Works itself, to have all their own way in questions concerning temporary or permanent housing. Another point is that the association has under review the possibility of establishing a central headquarters for itself and other electrical organisations—a sort of Electric House where all electrical association interests could be housed under one roof.

Electricity and Nationalisation

THE supply industry has as yet received little indication from the Government of the future which awaits it, but Mr. SHINWELL, Minister of Fuel, when speaking at the Institute of Fuel luncheon last week, led his hearers to believe that there may, after all, despite General Election speeches, be something

worthwhile in the industry as at present constituted. This impression is formed from the fact that the new organisation of the industry, whatever it may be, will include in it all the business and technical ability which has built it up to its present creditable dimensions. The Government has received a mandate to proceed with a declared policy, and whether one agrees with it or not, the fact must be accepted. In the circumstances, Mr. SHINWELL should not for one moment forget, however, that the administrators and technicians of the supply industry as it exists to-day know more about running the industry than can anyone else, and they must at all costs be assured of that freedom which will permit them to get on with the job in the way they think best. The industry is already overburdened with legislation and, it must not be overlooked, it is, too, due to the attention of the Government that the generating capacity of the industry is to-day in so low a condition. No industry is so efficient that there is not room for improvement, not even electricity supply, but in order that deterioration may not set in, Mr. SHINWELL will need to use every bit of the "reason and discretion" of which he spoke last week.

Combined Service Unit

THE subject of a combined service unit has occupied the attention of the industry for something like three years, and various examples of what have been considered as desirable units have from time to time been produced. During this period of what might be called general discussion, some of the E.D.A. Area Committees considered the question and as a result of national conference the general design of a standard unit was agreed upon. This took the form of three boxes of standard dimensions large enough to contain main cut-out, main switch and circuit fuses of normal design, arranged so as to form a compact assembly, together with a sealing chamber and meter of any type; a three-piece unit being adopted, it was argued, in order to provide the flexibility needed to cater for varying requirements as to provision and ownership of the different sections and their installation. In order to define the essential dimensions for the boxes, their communicating ports and standard fixing centres for interior components, a Technical Com-

mittee was appointed to prepare a purchasing specification which, after approval by the E.D.A. Council, has now been published and is reviewed in this issue.

Houses Awaiting Service

THE discussion which has centred about the combined service unit indicates that the subject is not by any means an easy one upon which the industry can find agreement. Whether or not the E.D.A. proposal will meet the situation we do not know but the discussion has, we submit, already been long enough, if the post-war building programme is to benefit to any large extent from the adoption of the unit idea. According to the White Paper on Temporary Housing, there have already been built 4 152 houses, in which, there may or may not be installed combined service units, and the number is growing—all too slowly perhaps—week by week. In the circumstances and in order that all new housing, temporary or permanent, may be adequately fitted electrically, it is, we submit, time that the industry reached a conclusion as to the form the service unit should take; for, while there is, or has been, division of opinion as to dimensions and so on, there is solid agreement on the merit and desirability of the unit. That being so, now is the time to materialise the idea—in the remaining 160 942 houses which local authorities have been authorised to build.

The E.I.B.A. Ball Sold Out

THE popularity of the E.I.B.A. ball has always taxed the accommodation available but this year's ball, because it is the first since the war, has resulted in an even greater demand for tickets. This is just as it should be but unfortunately, owing to the large hall at the Grosvenor House still being requisitioned, this year's event is to be held, on November 9, in the ballroom of the hotel which will not accommodate so large a number. In the circumstances, Mr. FOTHERGILL is in the unhappy position of having to refuse offers to buy tickets, in that all available accommodation is sold. It is hoped that by this time next year the association will have access to the larger hall, but meanwhile Mr. FOTHERGILL can do no more than express regret for any disappointment caused.

Imperial College Centenary

Royal Participation in Albert Hall Celebrations

THE association of the Royal Family with the Imperial College of Science and Technology, South Kensington, which began in 1844, when the Prince Consort became President of the Royal College of Chemistry in which it had its origin, was continued when the King and Queen consented to take part in the centenary celebrations at the Royal Albert Hall last night. The programme included short speeches by Lord Rayleigh, chairman of the governing body and Emeritus Professor of Physics, the King, and the Rector of the college, and the signing by His Majesty of a record on vellum of the work of the college during the last 100 years. This also bore the names of the contributors to the Centenary Appeal.

Three Federated Colleges

The Imperial College of Science and Technology, constituted by Royal Charter in 1907, is a federation of three institutions that had previously become established at South Kensington, namely: the Royal College of Science, the Royal College of Mines and the City and Guilds College. The latter had its beginnings in the City and Guilds of London Institute, which was created in 1878 for the advancement of technical education. In the following year H. E. Armstrong and W. E. Ayrton were appointed to organise classes in chemistry and physics in temporary quarters in Cowper Street School, Finsbury, and from these classes arose the Finsbury Technical College, which opened in 1883. The foundation stone of the City and Guilds Central Institution, now known as the City and Guilds College, was laid on the present site at Exhibition Road by the Prince of Wales (afterwards King Edward VII) in 1881, and the college was opened to students in December, 1884. In the first instance the professorships were limited to four. These were held by Henry Edward Armstrong for chemistry; William Cawthorne Unwin for engineering; Olaus Henrici for mechanics and mathematics; and William Edward Ayrton for physics (afterwards electrical engineering). Armstrong and Ayrton transferred from Finsbury Technical College.

The department of electrical engineering has kept pace with and assisted in the development of the industry. The laboratory work, which has been under the direction of Prof. C. L. Fortescue since 1922, is divided into three sections, namely: electrical measurements; electrical machinery; and telecommunications.

To-day and to-morrow visitors will be ad-

mitted by ticket to the constituent colleges.

During a pre-view of the electrical engineering department a representative of THE ELECTRICIAN was able to see something of the equipment and the work being done in the laboratories.

In the measurements section the testing and calibration of various types of electric lamps and the measurement of illumination form an important part of the work, and the operation of the radial photometer in conjunction with a photo-electric cell, the cube photometer and other methods were demonstrated.

A device for measuring high-frequency currents and voltages and also the dielectric constants of various materials, an apparatus for determining errors in electrical instruments due to stray fields, another for demonstrating how valves behave under varying conditions of oscillation, the calibration and adjustment of instruments and meters, a watt-meter made by Duddell and used by him were only a few of the things shown. Oscillographs have been in use in the laboratory ever since they came in, and in the machinery laboratory there is a moving coil oscillograph developed by Duddell while a student there. There is one of the first alternators made by Ferranti and dated 1893. Also among the equipment is one of the first mercury arc rectifiers and a six-anode mercury arc rectifier, arranged for double three-phase and fork connections, grid-controlled, which was designed for the purposes of the laboratory.

Research Work

A considerable amount of research work is done in the laboratory. One unusual instrument shows the curious effect on oil in a small tank of opposing electrodes. Under the oil is a plate electrode, and poised above it is a needle electrode. When the current is switched on a depression forms in the surface of the oil immediately below the needle, and if the needle is lowered to the surface a small column of oil rises to it. Another instrument is the klydonograph, which produces distinctive figures by the action of negative and positive surges through an electrode on to an ordinary sensitised photographic plate without any visible light. The figures made by positive surges are distinct from those made by negative surges.

In the well-equipped telecommunications laboratory the development and application of telegraphy, telephony, radio and radar are the subjects of exhaustive study and tests.

E.D.A. Standard Service Unit

Details of Specification

THE British Electrical Development Association has issued a booklet embodying the report of the Council on the subject of service units, and the specification, with drawings and illustrations of the standard service unit for small and moderately sized dwellings, approved by the E.D.A. Council. A prototype unit was on view in the dining-kitchen shown at the First Women's Electrical Exhibition at Dorland Hall. It allows for a single meter.

The report states that in order to offer a means of co-ordinating individual efforts and to ensure that the experience of the electricity supply industry was directed to a common purpose, a national conference of representatives of the E.D.A. area committees and Council was held in London in January, 1945. Models from various parts of the country, representative of the efforts of individual undertakings, groups of undertakings and manufacturers, were examined and discussed. The conference met again in April and, after considering the report of the sub-committee, decided to recommend a three-piece unit. To carry the matter a stage further the conference appointed a representative technical committee to prepare a purchasing specification which would define fixing centres and other salient dimensions necessary to secure interchangeability of components without restricting development or the improvement of design from the manufacturing point of view. The specification was submitted in draft to all area committees. A general measure of approval was obtained and, after final revision in the light of comments received, the specification was approved by the E.D.A. Council on June 5. Points which arose during the discussion are set out in the report.

The specification includes the following provisions:—

The unit is for use on 250 V single-phase a.c. supply and is rated at 60 A.

The assemblies of fuses, contacts, terminals, main switch or earth leakage circuit breaker and protective shields are to be housed in three chambers.

The chambers will normally be fixed in a set sequence and access ports between the chambers and entry ports for circuit wires, etc., are to be provided.

The chambers, including the sealing chamber, will be of approved material. Sheet metal, where used, will be of not less thickness than 20 s.w.g. treated against corrosion. Cast metal, where used, will be of not less thickness than three thirty-seconds of an inch. Insulating material, where used, will be of not less thickness than one-eighth of an inch.

Indelible labels or transfers of approved type are required on the covers of the chambers.

The contents of the chambers will be made up as follows:—Supply intake chamber, a category 250 V a.c. 3 h.r.c. fuse cartridge of 60 A rating to B.S. 88, or any subsequent revision thereof, to dimensions (over caps) $\frac{3}{4}$ in. diameter x $2\frac{1}{2}$ in. long complete with carrier and base and terminals. The fuse carrier and base will be so mounted that the connections to the main switch can be passed under them from an adjacent terminal block. A meter connecting block comprising a block of insulating material with a slot running parallel to the base-board on which the unit is to be mounted.

In the main switch chamber will be a 250 V a.c. 60 A d.p.—switch having terminals suitable for conductors up to .04 sq. in. Also included will be a shield plate of



The unit in a similar recess, with sunk wiring and back-connection box



The unit installed in a 3 x 2 ft. recess with a large prepayment meter

committees. A general measure of approval was obtained and, after final revision in the light of comments received, the specification was approved by the E.D.A. Council on June 5. Points which arose during the discussion are set out in the report.

insulating material, which will adequately shield and protect all terminals and connections when the cover of the main switch chamber is open, but which will permit the main switch handle to be operated.

In the circuit fuse chamber will be a 9-way brass earthing connector with clamping terminals which will make good electrical contact with the base of the chamber if it is of metal; the terminals to be suitable for accepting an earthing conductor of not less than 14 s.w.g. or its equivalent; a nine-way brass neutral connector similar to the earthing connector, but having one way suitable for accepting a .04 sq. in. conductor; each other terminal to be suitable for accepting a 7/.044 cable; a "live" bus-bar having a cross-sectional area of not less than .04 sq. in. and one main terminal suitable for accepting a .04 sq. in. con-

ductor is also to be included; six sets of fuse base contacts, with provision for the addition of two further sets of contacts; six sets of fuse carriers with plain capped h.r.c. category 250 V a.c. 3 fuse cartridges of the following dimensions: 2—5 A $\frac{1}{4}$ in. diameter over cap $\times \frac{3}{4}$ in. long; 4—30 A $\frac{1}{2}$ in. diameter over cap $\times 1\frac{1}{4}$ in. long. The fuse carriers shall be so designed that fuse cartridges are to be fitted into and removed from them without the use of a special tool. Provision should be made for preventing the insertion of a 30 A cartridge in a 5 A carrier and for avoiding as far as possible the substitution of a wire or other link for a cartridge.

A shield plate similar to that provided in the main switch chamber shielding all the circuit wires and main terminals when the cover of the circuit fuse chamber is open, has to permit the insertion of the circuit fuse carriers.

Electrical Personalities

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

Mr. P. E. Warden has been appointed manager of the Rugby drawing offices of the British Thomson-Houston Co., Ltd., on the retirement of **Mr. W. Jones**, who held the position for 13 years. Mr. Warden has been with the company for 43 years, having joined as an apprentice in 1902. After a comprehensive engineering training, he was transferred to the drawing office in 1908, and became personal assistant to the manager of that office in 1939.



Mr. P. E. Warden

Mr. J. Woodhouse chief clerk in South Shields electricity department, has retired after 46 years in the undertaking.

Mr. R. W. McOwen, of Keswick has been appointed assistant mains engineer in the Stockton electricity undertaking.

The St. Marylebone Electricity Committee recommends the retention of the services of **Mr. F. Selley**, chief electrical engineer, for another year. He has reached the retiring age.

Mr. William S. Morrison, M.P., has been appointed a director of the Northmet Power Co. and of the North Metropolitan Power Station Co., Ltd. He was Minister of Town and Country Planning in the late Government.

Mr. A. P. MacAlister, borough electrical engineer of Islington, whose period of service has been extended from time to time during the war, is to retire at the end of the year.

Mr. John Kenyon, of Blackpool, has been appointed electrical maintenance engineer at Preston Electricity station, and **Mr. John Blackburn**, Preston, has been made assistant control engineer.

Erskine, Heap and Co., Ltd., announce that they have appointed **Mr. S. C. Middleton**, Suffolk House, Suffolk Street, Birmingham, as their representative covering the Midlands area.

Mr. J. R. Jones, chief electrical engineer at Hammersmith, has been appointed general manager and engineer of the Battersea electricity department. Mr. Jones has held his present position at Hammersmith since May, 1939. He was deputy electrical engineer from 1934 to 1936.

Mr. A. V. Alexander, First Lord of the Admiralty, on October 20, visited the Witton works of the General Electric Co., Ltd. He was accompanied on his tour of inspection by **Sir Harry Railing**, chairman of the company and other directors and officials.

Following the death of **Mr. J. A. E. Wells**, director and foundry manager of Edgar Allen and Co., Ltd., the directors announce the appointment of **Brigadier Arthur Levesley** as general manager of the Edgar Allen steel foundry and ancillary departments as from October 1. Brigadier Levesley was with the company from 1910 to 1928. He has been Chief Electrical and

Mechanical Engineer at the Ordnance central workshops at Chilwell, Notts.; since October, 1942.

Sir Clive Baillieu has been appointed chairman of the Central Mining and In-

and arrangements will be made for special training at technical colleges and institutes.

The directors of the County of London Electric Supply Co., Ltd., and associated



Personnel of the G.E.C. Magnet House staff, who have returned from the Services, welcomed by **Mr. Leslie Gamage**, the vice-chairman of the company

vestment Corporation as from November 1, in succession to Sir R. Sothorn Holland, who is resigning the chairmanship on October 31. Sir Clive is a London attorney of the Adelaide Electric Supply Co., Ltd., and a director of Electrolytic Zinc of Australasia, Ltd. (London board), and several other prominent companies.

Sir Edward Appleton, secretary of the Department of Scientific and Industrial Research and president of the International Scientific Radio Union, gave a lecture before the French Society of Radio Electricians on October 19, at the Sorbonne, Paris, his subject being "Recent Radio Research in Great Britain." The society had been suppressed for five years during which time its members played a prominent part in the French resistance movement. Three of them were shot by the Germans, and there is still no news of many others, including **Professor H. Abraham**, president of the Society in 1940, who was arrested and deported to Germany.

The General Electric Co. Ltd., have devised a series of refresher courses by their technical specialists to help men and women from the Forces to get accustomed to their new environment in civil life. This scheme was officially inaugurated on October 1, when 75 men and women of Magnet House staff, who recently returned from the Services, were given a hearty welcome by **Mr. Leslie Gamage**, (vice-chairman of the company) and **Mr. T. W. Heather** (director and sales manager). In addition, there are simple and more advanced courses in electricity and magnetism, book-keeping and accountancy, shorthand and typewriting,

companies have announced that, in order more effectively to meet post-war developments, a reconstruction of the administrative organisation has been decided upon. This organisation, with a capital expenditure of some £50 000 000, owns seven generating stations and contemplates the construction of two additional stations as part of its immediate post-war plans, which will entail a capital expenditure of some £28 000 000. Contracts have already been let for projects to the value of £11 000 000. Under the reorganisation scheme, **Mr. W. J. H. Wood** and **Sir John Dalton**, who are directors of the company, become joint general managers, and with **Mr. T. A. Pond**, who was recently elected to the board, will devote their specialised knowledge and experience to the business of the group. **Mr. J. M. Graham** has been appointed secretary to the companies of the group. The local administration is to be placed on a regional basis as opposed to the area basis as hitherto. Each region will embrace a number of areas and will be under the management of an engineer-manager. The overall management and co-ordination of the regions, generating stations and transmission system will be in the hands of **Mr. F. C. Fenton** and **Mr. F. M. Sayers**, who have been appointed joint managers, and **Mr. D. Gray**, the chief accountant of the county company. An engineering panel has been set up under the chairmanship of **Mr. W. J. H. Wood**, the members of which will be **Mr. H. C. Wells** as technical adviser (transmission) **Mr. J. A. Vice** as technical adviser (generation) and **Mr. F. M. Sayers**.

Future of Coal Mines

Minister of Fuel Confident of Supply Industry's Support to Proposal

THE Minister of Fuel and Power, Mr. Shinwell, spoke on the coming nationalisation of the mines at the annual luncheon of the Institute of Fuel, held in London, on October 17.

Before the speeches, the Melchett Medal for 1940 was handed by the president of the institute, Dr. E. W. Smith, to the French Ambassador, M. Massigli, for presentation to M. Etienne Audibert, the leading fuel expert of France, who could not receive the medal in person because of a motor-car accident. The Melchett Medal for 1945 was presented to Prof. C. H. Lander, of the Imperial College.

Mr. Shinwell described the country's fuel industry, with its kindred organisations of gas, electricity and oil, as the foundation of our future industrial prosperity. The Government, he said, had a mandate to proceed with a declared policy. The power they had invoked at the election to apply that policy must be used with the greatest reason and discretion, and not in a doctrinaire fashion.

In the new organisation that was soon to be created they must use all the business knowledge, administration and ability that were at the disposal of the nation, in order to run the mining industry—and perhaps cognate the other industries at a later stage—along national and efficient lines, to contribute to the national well-being.

There was ample co-operation at their disposal—the men, the management, the colliery agents, the gas and electricity industries, the Civil servants. It had never been the Government's intention to entrust the administration of the mining or any other industry to the Civil Service. That did not mean there was not great ability in the Civil Service, and, what was more, a great pride and achievement, and sometimes on very little remuneration as compared with the outside world. Because of that ample co-operation they were bound to succeed.

Dr. E. W. Smith, who presided, said that, in his opinion, it was a minor question whether an industry was publicly or privately-owned. What mattered was who ran an industry, not who owned it, and those who ran it were the administrators and technicians. If they were assured that there was freedom for the administrators and technicians to get on with their job they knew that this country would come out well. Speaking of atomic energy, Dr. Smith said he wondered if it had yet been considered sufficiently important to cause the Ministry of Fuel and Power to feel it advisable to set up some section which would keep in the closest touch with the possibility of utilising atomic energy for the production of power.

Book Review

Electricity in the House. By J. E. MACFARLANE (London: Hodder and Stoughton, for English University Press). Pp. 203. 3s. 6d. net.

This book forms one of the "Teach Yourself Building" series, and is one of the best of its kind that the reviewer has had the pleasure of reading. The author has outlined in a concise and practical manner the principles and practice of electric wiring, including layout, accessories, fittings, and all applications likely to interest the householder.

The diagrams throughout the book are in a clear and simple form, and particularly suited to the non-technical reader who desires to acquire some knowledge of technique associated with electrical installations in houses. An innovation is the inclusion of a test paper under the dust cover, not for the purpose of satisfying any official examination, but to provide added interest for the reader. Those intending to try their hand are invited to send their papers to the publishers.

Only very minor criticisms need be offered. The omission of noughts from calculations on pages 5 and 10 may puzzle the reader, as may the inclusion of an unwanted one on page 66. It is questionable if Ohm's Law should be presented as

$$I = \frac{V}{R}$$

as this may present difficulties when the reader ties up with other books. The inclusion of a chapter on "Electric Shock—Rescue and Treatment" is not calculated to inspire confidence in electrical services, but this is a book definitely to be recommended to those for whom it is intended.

BOOKS RECEIVED

"Alternating Current Motor and Control Gear.—By C. H. Claude Cook. (London: Crosby Lockwood.) Pp. viii+88. 5s. net.

Journal of the I.E.E. Vol. 92. (London: Spon). Part I (General), No. 57 (September). 5s. net; Part III (Radio and Communication Engineering), No. 19 (September). 6s. net.

Exhibition Impressions

By "SUPERVISOR"

A visit to the E.A.W. "Coming-of-Age" Exhibition, which closed at the Dorland Hall yesterday, Thursday, evoked both admiration and disappointment, as seen through the eyes of a male visitor. Admiration was boundless for the efficient demonstration of war-like equipment at the entrance to the exhibition, where A.T.S., W.R.N.S. and W.A.A.F.S showed their complete mastery over the complicated equipment on show, even if one's Service experience had not already established the fact that these women are complete mistresses of their art.

Service Equipment and the Humble Fuse

This section alone made a visit well worth while, and the demonstration was not confined to Service women. The fullest detailed explanation was offered in connection with the remote-controlled compass and some of the mysteries of communications, by civilian women, and one gained the distinct impression that electricity has bowed its head to its newest mistresses. The replacement of a domestic fuse can hold no terrors for these women, and one can see them taking the vacuum cleaner to pieces with the best mechanics. What shall we do with them now that war services are over?

After leaving that section of the exhibition, however, there was felt by a comparison a sense of anti-climax, and the remaining exhibits seemed lifeless. This was not, of course, the fault of the exhibits, but while on the point, was it not a psychological error to have in some cases men talking to the visitors about washing machines, when women demonstrators were available? A rather inept description was listened to, with a very weak explanation to a most interested woman who wanted to know just why she could not operate a washer from her radio-gram converter run from a private plant. I feel sure that any of the Service women from the early part of the exhibition could have done much better. No opportunity should be neglected at this time to advance the electrical story, and who can tell it better than these admirably trained women? The impression was gained at the exhibition that the average housewife took most interest in those exhibits demonstrated by women.

Disappointment was felt when one attempted to trace, in the exhibition, the full effects of the impact of women on the domestic electrical problem after twenty-one years. From the exhibits it might be decided that all the old drudgery of housework

remains, with the possible exception of clothes-washing, for in the absence of sample equipment, dish washing and floor polishing cannot be done electrically, nor are such handy things as food mixers available. The real labour associated with mixing a cake must be experienced to be appreciated, but in the absence of exhibited appliances, women do not again appear to have influenced the production of equipment for even this small kitchen operation. Undoubtedly there are problems of material, labour and manufacture, to be overcome, but look at what can be done for war-like purposes when the urgent need is there.

It has often been alleged, and the point was referred to by Mr. Forbes Jackson in his chairman's address before the Installations Section of the I.E.E., on October 11, that the electrical industry has been more concerned to sell units than electrical services. Even the vacuum cleaner, that boon to the busy housewife, was introduced and made popular by the manufacturers. In the exhibition this popular appliance takes a very back seat, being confined to a cupboard in the wall, whereas some of its labour-saving attributes should in my view have been brought well to the fore.

Mark of War-time Shortage

Probably the majority of housewives do not greatly care if their cooker be operated by gas or electricity, whether their rooms are warmed by gas or electric fires; some still swear by gas lighting, although these are a diminishing minority. There are, however, some duties in which electricity holds the field, chiefly those associated with small power drives; why, then, should a modern exhibition be confined to the already well-known vacuum cleaner and the clothes washer, to the exclusion of most of the other small power-operated devices? There is no answer to the housewife's appeal for relief from drudgery except through the small electric motor; in an exhibition designed to illustrate twenty-one years' progress, this appeal should have been answered, even if the machines had to be dummies. In the writer's view, electrical women should now forget the electric cooker and radiator for a bit; these are already well and truly established.

The home lighting exhibits to be seen at Dorland Hall were attractive and well carried out, but again lighting is now part of our everyday life, and most women are fully aware of just what electricity can do. The kitchen exhibit was good and a popular section of the show. The writer's eye was,

however, offended by 5-A 3-pin sockets mounted on their sides, which should not be necessary. It is considered that trouble might soon arise with the use of flush plates mounted as was shown on the walls; these plates invite frequent wiping with damp cloths, or even washing, and damp might soon penetrate behind the plates. One final criticism—there were far too few small electric fans in evidence, as housewives are now demanding these for their kitchens.

Technical interest centred itself on a problem set on the blackboard in the model school. A problem in Ohm's Law was set out as follows: "The ratio of the p.d. between the two points in a conductor to the current flowing between these points is a constant, and is called the resistance."

Probably the ordinary method and simple Ohm's Law is too easy for the modern child brought up on radar and television.

Emerging from the exhibition through the Service women's section again, one left with a feeling of admiration for just what women can do with electrical equipment, and the certainty that the generation explaining and demonstrating complicated apparatus will not for long be content with the household methods used by their mothers and grandmothers, but will see that the necessary equipment is forthcoming. These agile and receptive brains should not be condemned to hours of drudgery and hard work in their homes, when they are so urgently wanted for other duties in a wrecked world.

Electricity and Smoke Abatement

Ministry of Health Favours Coal for New Houses

CONSIDERABLE criticism of a statement by Ald. C. W. Key, M.P., Parliamentary Secretary to the Ministry of Health, that pre-war grates would have to be used in new houses until new models could be produced, was voiced at a conference of representatives of local authorities, makers of heating appliances and fuel producers called by the National Smoke Abatement Society in London on October 19. Prof. F. E. Tylecote, chairman of the Manchester Public Health Committee, presided.

Ald. Key, who opened the discussion, said the Ministry of Health was particularly interested in any practical proposal which would have the effect of reducing atmospheric pollution, but they must face up to the fact that the time was far from ripe for the departments concerned to advise the Government to promote legislation compelling the installation of smoke reducing appliances in all new houses, or even to make it a condition of any subsidy to local authorities that they should instal such appliances. They were in general agreement that ideal cooking and heating appliances were those using gas or electricity, and that the extended use of these appliances should be encouraged in areas where they might be provided at a reasonable cost compared with other forms of heating and cooking, but it would be readily realised that any great increase in the demand for and the use of gas and electricity would upset the economics of the industries. In existing circumstances it would be almost impossible to meet that greatly increased demand because of the call for labour and materials for purposes other than increasing the facilities for the production of gas and electricity. If all heating and cooking were to depend upon

gas or electricity it would be necessary to provide a very big reserve of plant to meet the peak period, much of which plant would be idle in the summer. Moreover, on the ground of cost alone, the use of gas or electricity could not compare with the facilities provided for the use of solid fuel.

Ald. Barratt, of Bath, disagreed with Ald. Key's statement that they could not produce enough electricity to meet the requirements of post-war houses, and said the peak load of electricity undertakings was never greater than during the war. Most of the munition factories were now closing down, and there should be electricity to spare. Moreover, new stations had been built and were being erected, so that within two or three years there would be no limit to the supply of electricity. In their new housing drive in Bath they were aiming to put either electricity or gas in the houses, and only a few would have fuel fires. He had had nothing but electricity in his own home for the last 25 years, and the cost in the heaviest winter quarter had never exceeded four guineas, which proved that electricity, when used in the fullest sense, was the cheapest commodity that could be had. He had been agitating for chimneyless houses for a long time. Such building would result in a considerable saving in materials. District heating was another subject that should be studied. If they had district heating in towns for space heating and hot water supply, they would eliminate nine-tenths of the smoke.

Mr. E. L. Leeming, architect, of Urmiston, suggested that large schemes of district heating should be given priority over the production of solid fuel heating appliances, and mentioned that Manchester had a scheme for a thousand houses.

Pump Drive for Waterworks

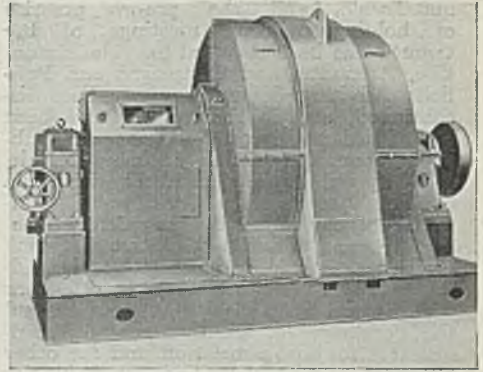
Meeting Industrial Demands in the Rand

INDUSTRIAL demands in the Rand, South Africa, have necessitated the Rand Water Board augmenting their supplies by the construction of two new pumping stations, at Zwartkopjes and Vereeniging, respectively. Both stations were required to give a daily output of 40 million gal., against a considerable head involving unusually large drives. The contract for the pumps was placed with W. H. Allen, Sons and Co., Ltd., of Bedford, who obtained the driving motors from the Metropolitan-Vickers Electrical Co., Ltd., and the following notes are published by permission of Mr. J. P. Lesley, chief engineer of the Rand Water Board.

Zwartkopjes station is worked with two pumps, each delivering 20 million gall. per day to a height of 1150 ft. They are driven, through Bibby flexible couplings, by 6 500 h.p., 11 kV, 1 490 r.p.m. slipping motors. The rating quoted above is in accordance with B.S.169/1925, with the exception that the temperature rise must not exceed 35°C. on site where the altitude is 5 000 ft. above sea level. The motor is designed to withstand 25 per cent. overload for 2 hours and 100 per cent. momentarily. On official test the motors were proved to have efficiencies, including stray load losses, of 96.09 per cent. and

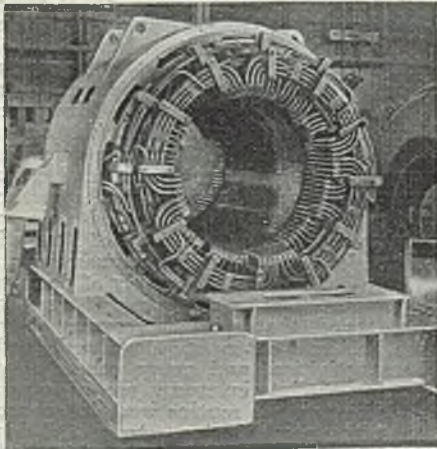
the pressure drop, due to ducting and filtering the air from outside the station. Starting is effected by liquid starters, operated by hand wheels counter weighted to facilitate adjustment.

Vereeniging station also consists of two duplicate pumps each delivering the same



One of two 3 000 H.P., 11 kV, 744 r.p.m., slipping motors for pump driving at Vereeniging

quantity as at Zwartkopjes, but in this case the delivery height is only 530 ft.; accordingly, the pumps are smaller and require slipping motors of lower capacity. In this station the motors are rated, subject to the same qualification as before, at 3 000 h.p., 11 kV, 744 r.p.m.; are similar generally in construction to the 6 500 h.p. machines, except that they have a larger number of poles; and their sliprings are mounted at the in-side of the bearings. Official works tests yielded full load efficiencies of 95.23 per cent. in both cases, with power factors 0.91 and 0.908 respectively.



Stator of one of two 6 500 H.P., 11 kV, 1 490 r.p.m. slipping motors, used at Zwartkopjes, with end bells removed to show wiring

95.94 per cent. respectively, at a p.f. of 0.895 in either case. The machines are self-ventilating, but a motor-driven fan is included in each equipment to overcome

North Wales Hydro-electric Scheme.—

At a recent meeting of the North Wales and South Cheshire Joint Electricity Authority at Llandudno, Mr. James Rankin, of the North Wales Power Company Ltd., stated that the Consulting Engineer's report on the further development of the hydro-electric resources of North Wales was still with the Minister of Fuel. Mr. Rankin mentioned that construction work was in progress on an alternative h.v. supply to the Rhyl and Prestatyn area, consisting of a new 11 000 V overhead line from Rhuddlan to Rhyl. A 33 000 V line was also being constructed from Rhydymwyn to supply Ruthin and Denbigh. The h.t. line between Caergeiliog and Holyhead had been duplicated.

E.D.A. Progress Report

Electrical Interests in Housing Being Watched by Association

IN an interim report on the activities of the association during the months of January-June, 1945, the E.D.A. points out that Huddersfield, Macclesfield, and Loughborough Corporations, Felixstowe U.D.C., the West Gloucestershire Power Co., Ltd., and the Brixham Gas and Electricity Co. have been enrolled as members. The subscription for the year 1945 was fixed in principle, at the full normal scale, and the pre-war practice of holding monthly meetings of the Council has been reverted to. The Executive, Accounts, and Campaigns and Publicity Advisory Committees have been discontinued, and in their stead have been established a General Purposes and Publicity Committee and a Finance Committee. Special subjects are dealt with by a Cooking Committee, a Cooking Sub-Committee (Technical), a Building Centre Electrical Section Committee, a Street Lighting Committee and a Rural Electrification Advisory Committee. A small committee has been set up with a view to keeping in mind the possibility of securing central headquarters for the association and for other electrical organisations interested in the scheme.

Advertising for the immediate future, both nationally and locally is under consideration, and it is interesting to note that public relations have been further increased in effectiveness by the appointment of a technical journalist, Mr. J. Rosslyn Stuart, and a woman journalist, Miss Mary Gilbert. The production of a woman's magazine is being considered.

Electrical Films

Frequent discussion has taken place with the Ministry of Works and the manufacturers concerned with the electrical installations and appliances in temporary houses, while the design of permanent dwellings of both pre-fabricated and orthodox construction has been under review with Government departments, architects and local authorities. The post-war housing film "Their Invisible Inheritance" is completed and will be available shortly for distribution. Work is continuing on two special films for cinema distribution, and it is anticipated that they will be available towards the end of the year. The association has also assisted the Electrical Association for Women in producing a film entitled "Twas on a Monday Morning," dealing, as the title implies, with domestic electric laundry work.

With a view to ascertaining the additional equipment required, investigations into the electrical equipment of established

domestic science training colleges have been continued, and, in spite of the persistence of war-time conditions in industry, it is anticipated that at least one training college will be equipped (and serve as a prototype) in the very near future. A contribution was made towards the cost of electrically equipping a national training school for hotel and restaurant cooks.

Domestic Science Scholarships

The Council has agreed to subscribe to a fund for the establishment of scholarships in electric domestic science. The immediate plan is to establish for the present at four domestic science colleges, a scholarship in electrical housecraft, and also a travelling scholarship.

The report of the Testing Committee on the establishment and operation of an electrical domestic appliance testing house has been considered and the Committee has been requested to take counsel's opinion on the legal aspect of a suitable mark.

The association is represented on the N.F.R.H.B. House Building Committee and has contributed £250 towards the cost of a campaign in connection with post-war housing on condition that the builders concerned could be approached direct on the subject of electricity service and apparatus.

Other activities mentioned in the interim report include the fact that a deputation, including the Chairman of the Purchase Tax Joint Committee and the General Manager and Secretary, met the President of the Conjoint Conference to discuss action with a view to obtaining relief from purchase tax on essential domestic apparatus; that assistance was given to the Ministry of Home Security in connection with an investigation as to the labour required in connection with the restoration and maintenance of street lighting; that steps are being taken with a view to the early re-opening of the London School of Domestic Science for short intensive courses, with a view to accelerating the supply of demonstrators to meet early post-war requirements; and that sales conferences have been held and others are already planned. These activities, and many others mentioned in the interim report, are, of course, in addition to the routine work in connection with new housing, street lighting, school-feeding centres, etc., in which notable progress is reported.

Utilisation of Prisoners-of-war.—The Lichfield Electricity Committee reports that it has obtained the services of 30 prisoners-of-war for cable trench work.

Communication Development

Address by Chairman of I.E.E. Radio Section

A REVIEW of some of the more general communication developments which had been carried out by the Post Office engineering department, or with which that department had been associated, was given by Mr. A. H. Mumford in his Chairman's Address to the members of the Radio Section of the I.E.E., in London, on October 10.



Mr. A. H. Mumford

He stated that shortly after the occupation of Western Europe in 1940, plans were made for setting up a very-low-frequency transmitter at a new station, to act as reserve in case of damage to the 16 kc/s telegraph transmitter (GBR) at

Rugby. A site was found in the West Country where three 600-ft. self-supporting towers, which had become available, could be erected on a plain and anchorages for the aerial trilaterals could also be provided on a hill with a steeply sloping side, some 800 ft. above the plain. The aerial was in the form of two equilateral triangles, each span being 1 400 ft. long. The "conductor" was a cylindrical cage, 8 ft. in diameter, formed by eight 7/14 s.w.g. bronze cables, and the whole conductor was suspended by a steel cable passing through the centre of the "spiders" of the cages. Twin up-leads were used for the purpose of reducing losses due to the proximity of the central mast. The hill was some 800 yd. from a line joining the three towers and was composed solely of dolerite.

The capacitance of the aerial was about 24 000 μ F, and the aerial and earth resistance totalled about 0.5 ohm at 16 kc/s. Visible corona had been observed at various points of the up-lead with an aerial current of 420 A, corresponding to 220 kV peak. This condition could be improved considerably by attention to certain details of construction of the up-lead, but the associated transmitter having been brought into service at very short notice during the early stages of testing, an opportunity to correct these points of detail had yet to be provided; meanwhile the aerial current had been limited to 400 A.

The aerial tuning inductor was composed of five hexagonal coils, wound on frameworks made from American whitewood and

having 11 turns per coil, with a clear distance of 3.25 in. between turns and a maximum separation between coils of 2 1/2 in. The maximum diameter of the coil was 15 ft. 9 in., and, to minimise the high-frequency resistance of the coil, a litzendraht cable of 6 561 strands of insulated 36 s.w.g. copper wire having an overall diameter of 1.5 in. was used. The coil was similar in design to that used for the original long-wave transmitter at Rugby.

During March, 1943, the 16 kc/s telegraph transmitter at Rugby was seriously damaged by fire, the main aerial tuning coil being completely destroyed. Although the standby transmitter was just on the point of completion, it was still deemed essential to restore the Rugby transmitter as quickly as possible, but, on examination, the project seemed likely to be unduly delayed by the non-availability of the special type of litzendraht cable required for the main tuning coil. It was decided, therefore, that an outdoor tuning coil, incorporating materials and components readily available, must be designed and constructed. This external coil took the form of a cage of copper wires, wound in the form of a helical hexagon with its axis vertical and having ten turns of a maximum diameter of 65 ft. The six supporting structures (braced A-poles, copper screened), height 67 ft. above the ground, were erected on a circle of 103 ft. diameter, the centre of the coil being located some 190 ft. distant from, and offset some 20 ft. from, the centre of the lead-out window of the transmitter building.

Crystal-controlled Oscillators

Since the design of transmitter GBR at Rugby was evolved 21 years ago, considerable progress had been achieved in the development of crystal-controlled oscillators, and recently the original tuning-fork drive was replaced by a crystal-controlled drive, thereby improving the frequency stability of the transmitter. Thus, whereas the tuning-fork drive was capable of a stability approaching ± 2 parts in 10^6 about the nominal frequency, the variations with the new drive could be maintained within the limits ± 1 part in 10^7 . In addition to improved frequency stability, the new equipment was appreciably smaller in bulk than the tuning-fork drive. The most stable forms of crystal oscillator produced by the Post Office had a frequency around 100 kc/s, and the new Rugby drive unit included a crystal-controlled oscillator operating on 96 kc/s, the desired 16 kc/s

output being obtained from a 6 : 1 electronic divider stage. The drive circuit was of a bridge stabilised type, and the mounted crystal was temperature controlled by a resistance bridge thermostat. The performance of the unit clearly proved that crystal control could now be successfully applied to low-frequency transmitters in fixed stations to give stabilities approaching those which could be achieved only on frequency standards some few years ago.

Fading Problems

The development of equipment capable of reproducing fading signals of specified types at will in the laboratory, had facilitated the design of short-wave receivers for use on long-distance radio circuits, and by its use the study of fading phenomena had progressed much more-rapidly than could have been accomplished merely by observations on actual radio circuits. Such observations did not provide the final criteria.

The multiple-unit steerable antenna (musa) short-wave receiving system at Cooling, Kent, came into commercial operation in July, 1942. The received signals were transmitted from Lawrenceville, New Jersey, U.S.A., on one of the group of five frequencies, 19.82, 14.59, 9.87, 7.55, and 5.08 Mc/s, the frequency employed being usually near to the optimum for the part of the sun-spot cycle, season of year, and time of day concerned. Briefly the system comprised 16 rhombic antennae spaced at regular intervals over a distance of 2 miles along the great-circle path to Lawrenceville, and connected to the receiving equipment by 16 individual coaxial transmission lines which differed in length by the spacing between the unit antennae.

Immediately the musa receiving system was brought into commercial operation, a series of subjective tests was put in hand to compare reception by means of the musa and normal single-sideband receivers. The results showed that for some 70-80 per cent. of the time, reception by means of the musa receiver was a distinct improvement over that by means of the normal type of single-sideband receiver. The very small percentage of the total time, between 2.0 and 2.5 per cent., that reception by means of the musa receiver was judged inferior might possibly be due to the comparatively infrequent occasions when the ionosphere was seriously disturbed and no regular reflection was noticeable. Under such conditions the highly directional musa system received only a fraction of the available wave energy and the use of the normal single-sideband receiver with its less directional antenna was to be preferred. Interference from other stations was generally reduced by the musa system, the extent depending upon the relative locations of the respective stations.

Dealing with the application of v.f. telegraphy to radio circuits, Mr. Mumford said that the policy of using a given frequency band to transmit several relatively slow-speed channels rather than one high-speed channel had been demonstrated to be technically sound in that it reduced the distortion of telegraph signals due to selective fading, and was convenient in that it permitted of much more flexible traffic arrangements. There was no inherent advantage in the use of very high signalling speeds concentrated into a single channel (e.g., 1 000 w.p.m.) for normal point-to-point short-wave telegraph traffic. On the contrary, signal distortion due to multi-path transmission increased very seriously as signalling speeds were raised, apart from the operational difficulties of loading a single very-high-speed channel at anywhere near full capacity. Such a conclusion accorded with modern practice in land-line telegraphy, where the link between the sending and receiving stations did not limit signalling speeds to anywhere near the same extent as did conditions of the ionosphere.

Merging Line and Radio Techniques

In the interval of some eight years which had elapsed since one of their previous chairmen delivered his Address, the development of v.h.f. radio links operating on a multi-channel basis using either amplitude or frequency modulation, and carrying 12 speech circuits, had been completed, and such links now formed part of the main trunk network to bridge gaps over river estuaries or between islands and the mainland. The development was, in fact, indicative of the merging of line and radio techniques which was so essential to the effective exploitation of the communication art both on a national and an international basis. The design of the links had been based on their incorporation as radio repeaters in the trunk network, and it was necessary to appreciate how this factor had effected the v.h.f. design.

It was, of course, essential on economic grounds that the radio link be suitable for operation on an "unattended station" basis, and also on technical grounds that the normal transmission standards laid down for land-line circuits be met by the radio link. Those two factors which called for a high grade of performance and reliability, were being met in the latest designs.

Experiments already carried out had shown that it was practicable to have v.h.f. links operating on frequency modulation capable of carrying 60 speech circuits simultaneously in the modulation band 312 to 552 kc/s (the basic supergroup band of the coaxial-cable system) which would allow an even more complete merging of line and radio techniques.

Relations Between Maker and User

I.E.E. Transmission Section Chairman's Address

FOR his inaugural address to the members in London on October 17, Mr. E. T. Norris, chairman of the I.E.E. Transmission Section for the 1945-46 session, chose the subject of "Relations Between the Manufacturer and the Purchaser of Electrical Equipment."

Mr. Norris said he believed he was the first chairman of the section representing the manufacture of machinery and apparatus (as distinct from lines and cables, and particularly transmission apparatus), and many years' direct experience of the relations between the manufacturer and the user or purchaser had resulted in analyses and conclusions which he thought would be helpful.



Mr. E. T. Norris

Incorporating individual experience into a specification frequently resulted from a tendency to argue from the particular to the general. A common instance was the prohibition of particular materials, due to the purchaser's experience of an individual failure or defect. Whilst this prohibition was natural, it ignored the fact that the trouble might have been, and probably was, due to faulty use or application rather than to defective material. Manufacturers knew how widespread was that practice. In his own experience, the aggregate of all those prohibitions would ban every known form of insulation in the construction of a transformer and make its construction physically impossible. The prohibition of wood, for example, was common and was due entirely to instances of unsuitable use or treatment. Even paper and cotton had been excluded. An illogical result of this practice was that it was the established materials of known composition that were banned whilst proprietary materials of unknown composition, having impressive trade names, were as a class permitted.

The specification should, therefore, insist as little as possible upon details of construction, and the manufacturer's own practice should be encouraged. This would avoid the implication of asking the manufacturer to guarantee the purchaser's design. It was, of course, reasonable to exclude specific materials or methods of construction, as distinct from general or class

restrictions. In many cases, the purchaser could allay any fears of that nature by a cautionary clause in the specification, instead of a prohibitive one, so that the manufacturer had, in effect, been warned. With reputable manufacturers, the general design and construction would be sound, but each product would have its particular good points. It was a temptation to wish for an apparatus incorporating all the best individual features, as in the "ideal" motor-car. This might be attractive theoretically, but such a product was not practicable to buy or make. The design of every apparatus involved a compromise of several variables, usually interdependent and frequently mutually contradictory. The specification should therefore stipulate and fix no more of these variables than was essential for the particular case, irrespective of the provisions of standard specifications.

A common instance of a purchaser's modification to the standard specifications was in calling for more onerous tests, usually in the belief that it would result in more reliable performance. The design of any apparatus from that point of view must be such that it would withstand: (a) normal working conditions; (b) abnormal working conditions, such as short-circuits and other operation faults; and (c) the specified tests.

Tests and Time Factor

If tests were perfect, they could be safely chosen to give a sufficient factor of safety over (a) and (b). The more recent development of non-destructive testing was tending towards that end, but was as yet very limited in application. The difficulty with all tests concerning satisfactory length of life was largely due to the fact that one could not accelerate the flow of time. The only proof that a switch insulation, for example, would last for 20 years was to work it for 20 years. Most standard tests endeavoured to simulate the acceleration of time by accentuation of stress. For example, a voltage test of three times normal for one minute might be regarded as equivalent to normal stress for 25 years' operation.

Those were approximate or even empirical assumptions, because in general it was not possible to determine an equivalent of time in stress. Moreover, ignoring this, the test showed only that the insulation had 25 years' life before the test was applied. The actual factor of safety was ultimately determined not so much by the tests as by experience, and was ensured by the determination and

vital need of the manufacturer to avoid failures.

The specification should essentially stipulate what the customer wanted but not how it should be done, and should leave design and construction details to the manufacturer as far as possible

A Vexed Question

Tolerances had always been, and still were, a vexed question between manufacturers and purchasers, partly because the purchaser naturally preferred a definite guarantee, and partly because tolerances were often associated with commercial astuteness or incompetence in manufacture. There was much sophistry in those discussions. Many manufacturers were in the anomalous position of insisting on tolerances through their standardisation committees and trade associations, at the same time assuring their customers that they always designed well within their guarantees. It was suggested that those attitudes were not only technically incorrect but logically unsound.

A tolerance naturally affected the risk of rejection and, in the case of losses, for example, would permit a lower guaranteed value. In fact, if properly utilised, a tolerance would permit a guarantee giving the purchaser a truer indication of the actual performance, a result in many ways fairer to the manufacturer and of more value to the customer. This was the chief justification of tolerance allowances on efficiency or loss guarantees. Since, however, their proper use could not be controlled, they were open to improper use.

A guarantee generally involved some risk to the manufacturer, even with tolerance allowances. It was, in fact, this risk which determined the actual value of the guarantee. The purchaser, by imposing penalties, introduced a commercial element so that the risk had two aspects, technical and commercial. It was often assumed by the purchaser that a guarantee had been given as a technical risk which had actually been treated by the manufacturer, or the manufacturer's association, as a commercial risk, the difference being that in the latter case the consideration was not so much the technical possibility of a value being outside the guarantee as the commercial risk of incidence combined with detection and the consequent resultant cost of correction. Those conditions applied not so much to efficiencies and losses, which were accurately measured as a routine test, but to other guarantees of performance which might only seldom be incurred.

An important application of loss guarantees was in the capitalisation of running and operating costs to determine the most economical relation between first costs and technical performance. From a series

of designs having different proportions of cost and performance, the alternative giving the lowest total capitalised cost was chosen. If the appropriate capitalisation data were given by the purchaser in his specification, then the manufacturer could put forward the most economical design for the particular conditions. Whilst the importance of capitalisation was generally appreciated, the practical application seldom seemed to induce an initial expenditure exceeding the lowest offer. It seemed important, therefore, to consider not merely capitalisation values but the limitations of their application. The most general criticism was that capitalisation essentially involved expression of the future in terms of the present, and that such prognostication could never be done with certainty or even with assurance, since the future was always unknown. Owing to those conditions, it was suggested that capitalisation be regarded as of broad and general significance rather than as a matter of specific and detailed calculation.

It should be more widely appreciated that manufacturers were entirely dependent upon operating data for experience and confirmation of their design and construction standards. For that purpose, operating experience, both good and bad, was essential, the good including lack of bad. It was desirable that the user should neither suffer in silence nor benefit in silence. So far as breakdowns or failures were concerned, it had recently been suggested that a national clearing house should be established which would collect all information of that kind, classify and analyse it. Periodically, reports would be disseminated among both manufacturers and users, thus making generally available the experience and operating data resulting from the relatively few or isolated incidents of trouble. The suggestion was commendable, and he hoped it would mature.

Cost and Safety Margin

It was commonly supposed that freedom from failure or trouble of any kind was the desirable and attainable ideal. It was certainly in most cases attainable, the degree depending upon cost, assuming skilled design and manufacture, but in general a product which never gave any trouble—and he used the word "never" in its absolute sense—had in consequence an unknown margin of strength and was to this unknown extent unnecessarily expensive and therefore wasteful. Further, even when attainable, the cost of ensuring this absolute immunity from trouble was usually so excessive in comparison with an entirely satisfactory practical performance that this realisation was seldom justifiable as a technical achievement. Such a practical service would justify all but absolute commercial claims.

A.S.E.E. Diploma Scheme

Regulations and Syllabus of the Swann Award

THE Association of Supervising Electrical Engineers has now published a brochure explaining the regulations of the association's diploma scheme and the syllabus of the Swann Diploma Examination. At a meeting last week with, among others, Mr. E. R. Wilkinson, president, Mr. H. W. Swann, past-president, Prof. R. O. Kapp, chief examiner for the scheme, and Mr. A. Brammer, general secretary, a representative of THE ELECTRICIAN discussed the background against which the brochure and the examination should be viewed.

Filling a Long-felt Need

It is felt that the need for the scheme is centred around that gap in the industry's training programme which lies between the advanced practical engineer and his professional brother, and its purpose is to provide a certificate of competency which will indicate to a non-technical employer, the ability of the holder to pass on to others the correct method of dealing with practical problems; a certificate that will prove not only technical knowledge and practical skill, but will, too, indicate the holder's competency in both at supervisory level. At present the diploma will be awarded for competence, with the possibility of credits and honours, in electrical installation and/or maintenance, but may be extended to cover special sections later.

Qualification for entry to the examination requires that entrants are not less than 24 years of age, and that the details with respect to apprenticeship and experience, to be submitted on an application form, satisfy the association that the applicant is sufficiently experienced and knowledgeable to warrant his entry. The examination is open to everybody who qualifies for entry, whether a member of the A.S.E.E. or not, and this by virtue of its independence of the association enhances the value of the diploma.

The examination will be made up of two parts with sub-divisions. Part 1 will comprise a written paper to be completed without supervision, followed by an oral cross-examination on the written answers, at an examination centre. Part 1(a) has two objects. First, to test each candidate's ability to express ideas clearly and logically, to marshal facts and present a case; second, to give a fair chance to the experienced engineer who may have long left behind his examination days and to eliminate the man whose chief

qualification may be a flair for passing written examinations. By testing the candidate's ability to put things in writing or in diagram form, and then, in oral test, probing the depths of real knowledge that may be either indicated or hidden by his written answers, it is believed that the best results will be obtained. The written paper will be answered at home and it will take about nine hours to complete. Part 1 (b) will consist of an oral test before an examiner and two advisers. The advisers will be members of the A.S.E.E. and their main function will be to inform the examiner on the implications of candidates' answers and assist him, particularly from their knowledge of the practical field, in reaching a balanced decision. The test will occupy about one hour. Under Part 1 (b)—the cross-examination on written answers to 1 (a)—the questions will be of the nature of: "Why would you act as your answer indicates?", or, "What would you expect to happen as a result of applying your answer in practice?"

Test of Personal Make-Up

Part 2 of the examination will be subdivided into a, b, and c, all of which will be conducted by oral examination. The first (a), is designed to determine candidates' ability to demonstrate to others the correct methods of approach to the solution of practical problems, and the correct methods of carrying out those solutions. Questions likely to be asked under Part 2(a) are of the type where it may be inquired: "In these (given) circumstances, what instructions would you give your men?", or "For a given contract, what type of load would you expect, what kind of tariff would you advise, and approximately how much and what grades of labour would you need?"

Part 2(b) will be an oral examination to test candidates' knowledge of which rules and regulations apply to electrical systems, installations, and plant; including such applications as are found in commercial and public buildings, hospitals, schools, theatres, and so on. It will also test a candidate's general knowledge with respect to the Factories Act, the Commissioners Regulations, I.E.E. Wiring Rules, B.S.I. Specifications, Codes of Practice and so on. Part 2(c) will determine technical ability, administrative understanding, planning of installations and organisation of work. This section of the examination, on the results of

which will depend finally the granting of honours and credits, is designed to bring out those qualities of responsibility, leadership, and grasp of subject, essential for the higher positions in the industry, and an important requirement of candidates is ability to express ideas clearly, concisely and in logical sequence. Candidates will be allowed the use of pencil and paper to illustrate their replies, and may be asked to refer to diagrams and/or ap-

paratus provided, but in general the Examiner will look for ability to marshal and present a case.

The centres for oral examinations will be decided on each occasion when the geographical spread of candidates is known.

Copies of the brochure and application forms are obtainable from the General Secretary, the A.S.E.E. 54, Station Road, New Barnet, Herts.

Merchant Aircraft Carriers

Ships of New Type for Meeting U-Boat Menace

IN the spring of 1942, when the battle of the Atlantic was at its height, Britain was in short supply of aircraft carriers and anti-submarine warships and the U-boats were able to enjoy a measure of unmolested freedom for their activities. Before these conditions developed the Admiralty had anticipated this and, in conjunction with the Burntisland Shipbuilding Company, arranged that a dual purpose type vessel be designed with the characteristics of a fleet aircraft carrier, incorporating hangar and flight deck and other 'plane carrier requirements combined with maximum internal capacity for the carriage of essential food-stuffs.

The general design, prepared by the Burntisland Shipbuilding Company in conjunction with the Merchant Shipbuilding Branch of the Admiralty, was accepted and agreed without delay.

The keel of the first of the class, "Empire Macalpine," was laid at Burntisland on August 11, 1942, and was delivered to the Admiralty on April 14, 1943—a period of only eight months which included the working out of many problems associated with this special design.

A hangar hoist is provided with a platform 42 ft. by 20 ft. for transporting the planes from the hangar to the flight deck. Electric motive power for the lift is capable of raising or lowering the platform at 30 ft. per minute at a working load of 10,000 lb. An elaborate system of telephones and voice pipes is fitted throughout the vessel for communication to strategic points.

The electrical energy required for lighting, heating and power installation is greater than that normally required in a merchant ship of this size. It is supplied from three 85-kW generators placed in the main engine room and arranged to run in parallel. Mechanically controlled heating and ventilation units are fitted throughout the vessel, and each hold is adequately ventilated by two ventilators, one of which is fitted with motor-driven supply fan. Air

heating drying units are fitted in the holds capable of being used as deep tanks. A wireless office is fitted up adjacent to the operators' cabins, and an emergency wireless office is arranged in the upper 'tween decks. Radar equipment is installed, and all the latest communication devices necessary for the operation of a ship of this class are fitted.

In Parliament

The following are replies to recent questions in the House of Commons:—

Electricity Industries.—In reply to Mr. Hobson, who asked the number of power stations built by the Central Electricity Board during the period September, 1939, to January, 1945, Mr. Shinwell stated that one station was built by the Central Electricity Board, and five by electricity supply undertakings (full details of the Earley, Little Barford, Castle Meads, and Llynfi stations were given in THE ELECTRICIAN during January and February last).

Mr. Hobson asked the Minister of Fuel and Power what consultations had taken place between the Incorporated Municipal Electrical Association and the Association of Power Companies on the future of electricity supply since July, 1945. In reply Mr. Shinwell said that neither of these associations had communicated with his Ministry since that date.

Mr. Grey asked the Minister of Fuel and Power what steps he was taking to meet the need of an electric generating station at Kepier, Durham, owing to the many industries and trades in the district and, in particular, to assist the North Eastern Electric Supply Co., to erect such a plant in the mentioned area. Replying, Mr. Shinwell said the North Eastern Electric Supply Co., in conjunction with the Central Electricity Board, were making arrangements for the provision of additional generating plant by extending their existing power stations.

News in Brief

Appointment Vacant.—Applications are invited by the Malvern electricity department, for the post of mains assistant engineer.

Street Lighting Scheme.—The North-Eastern Electric Supply Co., Ltd., has been asked by the Gateshead T.C. to prepare a scheme for lighting all the streets by electricity.

Telephony in Newcastle.—Over 6 000 applications for telephones have been received in the Newcastle-on-Tyne district of the Post Office. Owing to shortage of labour at present, only cases of high priority are being dealt with.

Trolley-bus Scheme.—A proposal that Glasgow should acquire 25 trolley-buses at a cost of £3 000 each, has been advanced to the Transport Committee. The cost of conversion of the overhead and equipment generally would be about £126 000.

Sanatorium Installation.—The Bedford Electricity Committee has arranged with the Bedfordshire C.C. to undertake the installation work in connection with the supply of electric light and power to the Moggerhanger sanatorium at a cost of £1 597.

Merz Memorial.—The Council of King's College, Newcastle-on-Tyne has accepted the gift of a memorial tablet to the late Mr. Charles Merz, from the partners of Messrs. Merz and McLellan. The tablet will be placed in the department of electrical engineering.

Royal Institution Christmas Lectures.—The 116th course of six lectures adapted to a juvenile audience will this year be given by Sir Robert Watson-Watt, F.R.S., on "Wireless," on December 27, 29, and January 1, 3, 5, and 8, at 2.30 p.m. The fee for children will be 10s. 6d., and for adults, £1 1s.

Thanksgiving Week Investments.—During Reading's Thanksgiving Savings Week investments included £5 000 each by the British Thomson-Houston Co., Ltd., the Hotpoint Electric Appliance Co., Ltd., and the Edison Swan Electric Co., Ltd. Among the contributions to Burnley's Thanksgiving Savings Week was £900 from the Electricity Department Savings Group.

Investments in Manchester's Thanksgiving Week savings included British Engine Boiler and Electrical Insurance Co., £25 000, and Metropolitan-Vickers Electrical Co., Ltd., £20 000.

Welding Tests Complaint.—Speaking at a meeting of the Tyneside branch of the Institute of Welding, Mr. J. Hogg, chairman, complained at the increasing number of tests carried out during welding. He agreed that welding should not be accepted without inspection, but if welding was not

to become prohibitive in cost, a halt would have to be called in the demand for more and more tests.

Electricity in Mines.—The Minister of Fuel and Power has published a list of electrical apparatus for which certificates of flameproof enclosure have been granted during the three months ended September 30 last. A few copies are on sale at the price of 1s. 2½d. (post free), and may be obtained from the Library, Ministry of Fuel and Power, King's Buildings, Dean Stanley Street, S.W.1.

South Australia Electricity Trust.—It is announced that the Premier has introduced a Bill in the House of Assembly for the establishment of a South Australia Electricity Trust, consisting of five members, which the Government will appoint to take over the Adelaide Electric Supply Co. in accordance with the recommendations of the Royal Commission which recently investigated the company's operations.

Water-power Survey.—The survey of the water-power resources of Caithness is being carried out by the Hydro-Electric Board. Preparation of the scheme for hydro-electric development is complicated, it is pointed out, because of the low rainfall area and the fact that most of the land is of comparatively low elevation. A meeting has been arranged between the Board and Wick T.C. for an early date to discuss the question.

Housing Installations.—The Portland Housing Committee has considered the question as to the provision of gas and electricity supplies to the 100 permanent houses to be erected at Pound Place, and has decided that 60 be provided with electric cooking and 40 with gas cooking. The Billingham-on-Tees U.C. is considering the question of installing electricity in houses not already equipped. Tenants will be asked to pay 1s. a week until the cost is covered.

Liverpool Electricity Development.—Members of the Liverpool Electric Power and Lighting Committee recently made a tour of the electricity undertaking, and surveyed the extensions that have been effected during the war years. Ald. A. Critchley, chairman, stated at a luncheon, that in some of the rural districts the price of electricity was only half of what it was before the undertaking took them over. Mr. J. Eccles, city electrical engineer said it would be foolish to say there was no possibility of using atomic energy for ordinary commercial purposes. As an alternative to coal for the production of electricity, the tidal energy round our shores ought to be developed.

Weather and Power Systems

Joint Meeting of the I.E.E. and Meteorological Society

THE Institution of Electrical Engineers held a joint meeting with the Royal Meteorological Society on October 18, to discuss the effects of weather on power-system operation. The discussion was opened by Mr. J. S. Forrest, of the Central Electricity Board, Mr. H. W. Grimmitt, of the Electricity Commission, Mr. A. J. Drummond, of the Air Ministry Meteorological Office, and Wing Commander R. M. Poulter, of the R.A.F.V.R. meteorological branch.

Co-operation Mutually Beneficial

Speaking on the effects of weather on power-system operation, Mr. J. S. Forrest said that there was still considerable scope for the study of correlations between weather conditions and load variation, and for the development of improved methods of forecasting and combating abnormal conditions which might cause breakdowns and interruption of supply. The power-system engineer was concerned mainly with two branches of meteorology: statistics of past weather, and forecasts of future weather. Data on past weather were required for correlation with load variations and plant breakdowns, and as a basis for the design of new equipment, particularly for outdoor operation. Weather forecasts were required in order to assist in preparing loading and maintenance programmes, and in taking precautions against damage due to abnormally severe weather. Co-operation between the meteorologist and the electrical engineer should be mutually beneficial, as the engineer might supplement the meteorologist's data and might also assist in the development of the highly specialised electrical methods which were now being employed in meteorology.

Mr. H. W. Grimmitt, dealing with ice storms and overhead lines, said that though it was desirable to design an overhead power line to stand up to all weather conditions, such perfection was not economically practicable. The record of reliability and safety of overhead lines in this country was perhaps the best in the world. Total breakdowns due to broken conductors, which had occurred during bad weather conditions were very rare and had, numbered scarcely ten in the last twenty years. There were approximately 20 000 miles of h.v. lines in the United Kingdom. Against sleet storms, wind and glazed frost, no proper precautions could be taken. He went on to make a brief survey of those storms, their causes, where they were most likely to occur.

and their probable frequency. To derive any information of value, he added, a map showing contours and of such a scale that all reported damage could be accurately plotted, must be prepared. The information available indicated that the damage sustained by overhead lines was such that the Electricity Commissioners' minimum loading for conductors need not be increased, but that considerations be given to strengthening the lines in certain locations if deemed necessary. The relaxation of the loading conditions in those counties that had not experienced ice storms might be considered.

Taking weather statistics as his subject, Mr. A. J. Drummond said it was to official sources that the engineer in search of climatic statistical material would in normal circumstances resort. A satisfactory solution to a problem might, however, demand detailed statistics, a special treatment, or even a new series of observations. A line of investigation which might be worth while would be to determine the probability of a cold surge of given magnitude occurring at various times throughout the year. He was not aware of any statistics relating to the frequency of glazed frost in the British Isles. The question of probability could perhaps best be solved by analysis of data acquired in regional forecasting.

One Use of Radio-Sondes

Wing Commander R. M. Poulter read a paper on radio-sondes and thunderstorm forecasting. The most convenient method of obtaining a measure of atmospheric stability or otherwise, he said, was by sending up radio-sondes consisting of pressure, temperature and humidity elements connected to a small radio transmitter, which transmitted continual signals from which could be deduced the temperature and humidity distribution in the vertical from the ground to the stratosphere. This was done four times a day at half-a-dozen stations. A balloon about 6 ft. in diameter filled with hydrogen rose at about 1 000 ft. min.; in its neck was attached a parachute, to the parachute an aerial and, finally, the small transmitter contained in a box about 9 in. high and less in diameter. When the balloon burst at perhaps 50 000 ft. the parachute opened and the apparatus descended to the ground. The pressure, temperature and humidity elements varied the inductance of coils connected in turn by a rotating switch every minute to the grid of the first valve

of a three-valve transmitter of the Hartley type. The transmitter sent out varying audio-frequency notes which the operator at the ground station listened to and matched up by the help of a cathode-ray oscillograph. In this way he recorded the frequencies of the three notes for pressure, temperature and humidity respectively, at intervals of about two minutes. For the forecaster interested in thunderstorms these readings were plotted immediately from the teleprinter message on to a $T\phi$ -gram, a system of co-ordinates which was pre-eminently suitable for displaying the state of the atmosphere.

Mr. R. A. S. Thwaites (Manchester Corporation) said there was a common experience for which he had never yet heard a satisfactory explanation, that an overhead line would stand up satisfactorily to rain or snow, but it frequently flashed over under conditions of wet sleet. During a storm in 1937 the wind reached a velocity of 100 miles an hour at Holyhead, there were $4\frac{1}{2}$ in. of snow and ice on the overhead lines, and it had been calculated that a factor of safety of 16 would have been necessary to stand up to those conditions. Of course, it was not possible to provide for such a state of affairs. It was unlikely to occur again in a lifetime. In the case of the 1940 severe storms, which ranged from North Wales to Southampton, $4\frac{1}{2}$ in. of hard ice built up, but such conditions of glazed frost had not occurred for 50 years.

Mr. D. J. Glasspoole (Meteorological Office) dealt with the type of meteorological records which were likely to be of service to power system operators and outlined the progress that had been made in recent years in the climatological branch of the Meteorological Office in summarising the records and rendering them useful to electrical engineers. He mentioned maps of average rainfall on a scale of 2-in. to the mile over parts of Scotland for the North of Scotland Hydro-electric Board, information of the frequency of occurrence of heavy falls of rain, of intense falls in short periods, and runs of consecutive days without rain. Emphasising the importance of this information for hydro-electric power stations he asked that full use should be made of the Meteorological Office in that connection. Other records included the mapping of the mean wind force, the maximum gusts and the frequency of wind of various directions and forces. Some of this data had been summarised, in conjunction with the B.E.A.M.A., in a form so that electrical engineers could devise the most economic power unit for various localities where wind was used as a source of power. The Meteorological Office was also preparing a

climatological map of the British Isles which aimed to include maps of the means of the main meteorological elements, the extremes and also the frequency of occurrences of as many phenomena as possible.

Mr. E. A. Powell (London Power Co., Ltd.) said that when his company started a control centre in 1928 the aim was to have some method of forecasting weather for judging variations of load in the London area because the Air Ministry's daily weather forecasts, although valuable for forecasting two or three days ahead, did not give the forecast required. They, therefore, developed their own technique which enabled them to forecast the load required practically for each day. If hour to hour information could be obtained it was of the greatest value in meeting extreme conditions. It was found that although temperature had a big effect on the load, it was not very serious from the control point of view. Forecasting light, however, was also important in controlling the load, and it had been found best to deal with lighting on the basis of ft.-candles.

Mr. E. G. Dymond (Kew Observatory) demonstrated the radio-sonde described by Wing Commander Poulter.

Mr. Gordon Manley (President, Royal Meteorological Society) showed curves illustrating the difference in weather effects at higher levels and particularly towards the North of England. At the higher levels, he said, the tendency was towards dry snow, whereas at the intermediate levels there was nothing but rain, especially on the coast. At a distance of 20 miles inland, however, there was considerable snow at the intermediate levels and the possibility of rime icing on the conductors, especially with a strong wind. He also showed a map illustrating the number of days on which snow might be expected in various parts of the country.

Mr. R. G. Carrothers (Messrs. Kennedy and Donkin) said the papers made it clear that accurate short-term weather forecasts were very necessary. At the present moment there did not seem to be any means for making reliable intermediate predictions. He, therefore, asked if there was any prospect of such predictions being made possible. Not much had been said of the effect of variations in rainfall on the design of hydro-electric plants. Calculations of the necessary storage were involved in this, and with the present scarcity of information it seemed that hydro-electric plants could only produce dependable supplies of power by continuing with expensive civil engineering works and the storage of large quantities of water. In this connection he commented on the

high order of reliability maintained by the electricity supply industry in this country and pointed to the fact that in other industries a much lower order of reliability was accepted. For instance, in transport it was taken as a matter of course that in bad weather the timetable need not be rigidly adhered to, but electricity supply was nearly 100 per cent. reliable. However, that reliability was very costly and the question was whether a lower order of reliability could not be accepted in some cases.

Mr. J. F. Shipley, one of the secretaries of the Royal Meteorological Society, and a member of the I.E.E., remarked that nothing had been heard of the effect of weather on the electricity supply industry overseas. He had investigated this problem up to altitudes of 16 000 ft., but in such countries reliability was not so important as in a closely populated country like Great Britain. There were many factors operating overseas in which the weather played an important part and one was the rating of internal combustion engines. Honest British firms in trying to sell such engines in Africa or India, took those conditions into account, whereas competitors from other countries did not. Taking the conditions into account, the rating necessary resulted in an increased cost and in paying attention to this British firms suffered by reason of the methods of their competitors. In connection with hydro-electric plants situated in extreme altitudes those concerned wished to know when the snow and ice were going to melt. In certain parts of the world, the effect of this melting was such that the banks of the streams on which the hydro-electric plants were situated were completely destroyed. If, therefore, some prediction was possible of the time when the snow and ice was likely to melt, teams could be sent out ready to meet the emergency. Referring to wind power as a means of generating electricity, he said that in Bermuda the average velocity of the wind never went below 11 miles an hour and seldom exceeded 14 miles an hour, and with such constant conditions he wondered why nobody had put up a wind-power station there. The maximum wind velocity was between 40 and 50 miles an hour.

Mr. E. E. Hutchings (E.R.A.) said that one aspect of the operation of overhead lines under varying weather conditions which had received little attention was the conductor temperature. Although it required experimental confirmation, there was evidence to show that for a certain increase in wind pressure an increased rating of 30 or 40 per cent. was necessary for a given conductor. The transition

from natural convection to forced convection at low-wind speed had not yet been fully investigated, but it had been computed that the combined effect of this radiation, together with a minimum wind speed of one mile per hour, would be to raise the temperature of an ideal overhead line by something of the order of 10° C. The problem, however, was made more difficult because of local convection currents and eddy currents and the effect of reflection surfaces, and careful attention would have to be paid to this matter. The weather also affected the operating temperatures of underground cables and the relation between the moisture content of the soil and its thermal resistivity required further consideration.

Mr. W. Hill (West Gloucestershire Power Co.), speaking with regard to the formation of ice on conductors, said his experience was that this only occurred when there was no wind and when the temperature was only at about freezing point. Power system engineers would benefit considerably if they could have reasonably accurate short period forecasts of cold snaps, because with a few hours warning, the necessary steps could be taken to meet the conditions.

Mr. C. T. Melling showed some curves illustrating the variation of load with temperature, and said it seemed that the variation of output with temperature depended on the individual reaction to temperature, and from that point of view the fuel economy campaign did not bring about much improvement, if that was the full effect of the campaign. In the winter of 1944-45, there was a sharp increase in load with reduction in temperature.

Mr. W. N. C. Clinch (Northmet Co.) said that meteorologists had an advantage over the engineer in that whatever their forecasts, they could say they were not responsible, whereas the supply engineer must accept responsibility for maintaining supply under all conditions. From the various charts that had been shown it was obvious there was a distinct difference between one area and another and, therefore, it seemed there might be more collaboration between the meteorological services of the country and the control centres for electricity supply. His necessity was to know what the weather conditions would be in the next few hours in the area for which he was responsible and there was a big field for co-operation with the meteorological service.

Mr. G. W. N. Cobbold suggested that the effect of weather on radio in various forms would be the subject of a similar meeting.

Electricity in France

Recovery from War Damage—Winter Prospects

FOLLOWING a 50 per cent. increase in permitted gas consumption, the Minister of Industrial Production foresees an increase in the permitted electricity consumption, though not as much as 50 per cent. This will naturally be dependent upon the coal situation, which is quite good at the moment, the miners having risen to an efficiency when they are producing from 100 000 tons to 130 000 tons a day. Coupled with the coal position is the fact that hydro-electric water levels are very low.

Load Shedding

While awaiting the hoped-for increase in current supplies, the consumers are being forcibly rationed. The exceptionally dry weather is restricting hydro-electric power for use by the industries in the Paris area, and loads are being shed every day for as long as half an hour at a time. Industrial consumers are informed individually of the days and hours when they will be free to use power.

Declaration of war found France in a position where a vast programme of work on hydro-electric plant was nearly finished and able to supply power for the years ahead. A constant rise in production and consumption had been obvious for some years before, being 20 milliards kWh in 1939, against 14 milliards kWh in 1929. Thermal station production was fairly constant and from 1939 onwards concentration was on hydro-electric production and the erection of new barrages.

Up to 1944, and compared with the figures for 1939, electricity production declined, falling from a total figure of 18 milliards kWh in 1940 to 13 milliards in 1944, similarly, hydraulic production fell to 8 milliards in 1944, compared with 12 milliards in 1940. The period of occupation was bound to affect the position, even if existing machinery had proved sufficient for industrial needs, for drastic coal shortages, transport troubles and dry weather meant that the thermal stations were starved of fuel, while water was scarce for hydro-electric generation. In 1940 hydro-electric power was 63 per cent. of the total; in 1944 this fell to 59 per cent.

Production by thermal stations is invaluable during this time, obviating the necessity to cut off current over long periods. With the liberation there was an understandable worsening in the situation. Owing to bombardments, military operations and sabotage to factories, transport, transformer stations, etc., whole districts were completely lacking in electricity

supply for many weeks. In spite of this, decline, production compared with 1939 was less than 15 per cent of that for the whole war period.

The situation has undoubtedly improved since the beginning of this year. Since last May consumption in the Paris area has been higher than for 1938, although industrial activity is reduced, and heating has been unnecessary. This is held to be an indication of increasing use of electrical household appliances.

The future rests mainly on whether the coal crisis will be resolved quickly enough to enable stocks to be built up. Owing to drought and the premature melting of snow from the Alps and Pyrenees, the Massif Central reserves are low.

There are, however, large plants only awaiting the return of normal conditions before they resume production, and the indications are that there will be a tremendous increase in electricity consumption if pre-war figures and the increasing use of domestic, agricultural and industrial equipment are anything to go by. It is anticipated that the output for 1955 will be 40 milliards kWh.

During the war, when other fuels were either rationed or unobtainable, electricity was used to an amazing extent for cooking, and a study report on different apparatus for baking, boiling and stewing, for roasting, grilling and frying has been drawn up. Among the items to which this draws attention is a machine for dish washing with special sections for glasses, and an automatic compartment for washing and rinsing.

Multicore Solder.—The tremendous effort of the British radio, electrical and telephone industries during the war was much facilitated by the production of 77 383 miles of Ersin multicore solder wire containing 3 cores of non-corrosive flux. Of the 20 429 million joints, approximately, that were made with Ersin Multicore solder during war-time the bulk of supplies was used by practically every radio, electrical, telephone and lamp manufacturer in the production of war equipment. In conjunction with Bryant and May Ltd., the match manufacturers, a self-soldering sleeve was evolved for jointing army field telephone cables, which took one minute per joint. The production of Ersin Multicore solder, free of lead, for use in the manufacture of electrically detonated explosives was another achievement of Multicore Solders, Ltd. The slightest trace of lead would have caused premature explosion.

65 439 and consumed during the year an average of 988 units as compared with 872 for 1943/44.

The total number of domestic appliances, motors and wiring installations on hire and hire purchase were: cookers, 8 451; grillers, 2 253; kettles, 20 871; irons, 9 523; pans, 7 262; water-heaters (storage), 1 327; immersion heaters, 2 385; wash-boilers, 3 893; refrigerators, 5; vacuum cleaners, 23; radiators, 17; sundries, 30; motor starters, 685; assisted wiring installations, 7 961; and wiring circuits, 17 558. For the second successive year the department's trading has resulted in a deficit, but it should be remembered that in spite of the increases in coal and other material and labour, the general increase borne by the consumer during the war was only 10 per cent., except for those consumers who were subject to adjustment of charge related to the cost of coal.

Kingston-upon-Hull.—The paper read by Mr. D. Bellamy, general manager, before the Mid-East England Area Conference of the E.D.A., on September 26, on the subject of Post-War Problems of Domestic Electric Development, has created considerable interest since we published an abstract of his remarks in THE ELECTRICIAN of September 28, and the following extract from the minutes of a meeting held on September 25, of the General Purposes and Works Sub-Committee of the Hull Electricity Committee, indicates how Mr. Bellamy is putting his theory into practice.

The General Manager reported that he was now able to obtain limited quantities of cookers and wash-boilers. They were of the pre-war model, but the cookers were of an improved utility by the inclusion of oven thermostatic control and additional quicker boiling and simmering plate facility. It was also possible to instal these improvements on a large number of the existing cookers on consumers' premises. It was desirable that these facilities, although limited in supply, should be available to consumers within that temporary limitation. He, therefore, recommended a resumption of the hiring and hire-purchase schemes under the following conditions:—*Cookers.*—(a) That existing cookers (where modification is possible) be modified at the consumers' option at the following additional rentals:—(i) Thermostatic oven control only, 1s. 6d. per quarter; (ii) New hot plate equipment, 1s. 6d. per quarter; (iii) Thermostatic control and hot plate equipment, 3s. per quarter. (b) New cooker, fitted with thermostatic control and new hot plate equipment, additional rental (above existing rentals) of 3s. per quarter, with the addition of a further payment of 5s. per quarter for five years to meet the additional cost of the equipment arising on Purchase Tax. This special quarterly payment to be the subject of withdrawal or adjustment on any adjustment of Purchase Tax. New Wiring installation to be provided by the consumer. (c) All existing cooker and wiring rentals to remain unaltered. *Wash-Boilers.*—(a) New wash-boilers (pre-war design and type) at a rental of 4s. per quarter for a period of ten years, exclusive of wiring, with the addition of a further payment of 2s. per quarter for

five years to meet the additional cost of the equipment arising on Purchase Tax. This special quarterly payment to be the subject of withdrawal or adjustment on any adjustment of Purchase Tax. New wiring, where not installed by the consumer, to be 1s. 6d. per quarter for ten years. (b) All existing boiler and wiring rentals to remain unaltered. *Cookers, Wash-Boilers and other Domestic Apparatus.*—A resumption of the department's pre-war short-term (three years) hire-purchase scheme; this also to be applicable to any of the foregoing at the option of the consumer. The General Manager further recommended that application be made to the Commissioners for permission to borrow £50 000 to finance the cooker hiring scheme; £25 000 for the resumption of the water heating schemes, including the wash-boiler proposals; permission to borrow the unexercised portion of the sanction of £50 000 of January 16, 1939, for the resumption of the pre-war short-term hire purchase schemes. All the recommendations were approved and adopted.

Norwich.—In the report of the Electricity Committee for the year ended March 31, 1945, the number of units sold excluding those used on the undertaking, are given as 116 millions as compared with 96 millions during the previous year. The decrease in consumption was due chiefly to the serious reduction in the requirements for power, and also to a lack of recovery following the bombing of Norwich in 1942 of the domestic quarterly supplies on the two-part tariff, of the business premises two-part tariff supplies, of other sales on the flat rate and of public lighting supplies. On the other hand the consumption in the Fringe and County areas increased by nearly 100 per cent. since the beginning of the war, that is, from 19.6 million units sold to 35.5 million units sold. The number of units sent out from Thorpe power station to the Central Electricity Board was 180 710 000. The number of units taken back into the undertaking was 134 220 600. The total length of cable and overhead lines in commission on March 31, 1945, was 1 587 miles, and the number of sub-stations is 906. The income on revenue account for 1944/45 was £757 059 compared with £649 184 for the previous year, and working expenses increased by £65 904. Loan charges were £2 518 less, provision for income tax increased by £18 191, and the net profit by £26 298. It is pointed out, however, that the latter increase is due to temporary factors connected with supplies to aerodromes and other Service establishments. In the two raids in April, 1942, one city sub-station was destroyed and six seriously damaged. Six e.h.t. feeder cables were severed as well as 30 l.t. distributors and 20 000 consumers whose premises remained were without supply, although 19 000 supplies were restored within the next three days. Approximately 2 500 premises of electricity consumers were totally destroyed and have not been replaced.

Industrial Information

Shellac.—The Ministry of Supply announce that the embargo on the re-export of certain grades of shellac has now been withdrawn.

Fusegear for Quick Delivery.—The English Electric Co., Ltd., have issued an illustrated list (publication FG/103A) of fusegear for quick delivery, to meet urgent requirements for authorised priority, available from stock or at short date.

Telegraphic Address Changed.—The British Aluminium Co., Ltd., whose temporary head office is Salisbury House, London Wall, London, E.C.2, announce that their telegraphic address has been changed to Britalumin Ave. London. The address for cables is Britalumin London.

Export of Machine Tools.—The Machine Tool Control now announce that, as from November 1, Government surplus used and unused machine tools which have been on offer to British industry through the disposal scheme for four months are available for export. The restriction on the export of American machine tools acquired under Lend-Lease arrangements remains in force.

X-Ray Crystallography.—The third summer school in X-ray crystallography was held in Cambridge recently. It was organised by members of the Department of Mineralogy and Petrology and of the Cavendish Laboratory, and the administration was under the control of the Board of Extra-mural Studies, and was attended by 31 scientists from universities, Government departments, and industrial laboratories.

Grants to Leeds University.—Among the grants acknowledged by the Council of Leeds University are an annual grant of £600 for seven years from Turner and Newall, Ltd., for a research fellowship to promote research in engineering, chemistry, physics, textile industries or any allied science approved by the donors; and £750 from Babcock and Wilcox, Ltd., for equipment to be used in the coal gas and fuel industries department in the training of fuel technologists.

Motor Trawler's Electrical Equipment.—The Walker Steam Trawl Fishing Co., Ltd., have placed with Hall, Russell and Co., Ltd., Aberdeen, an order for a motor trawler of the most modern design and equipment including electric refrigerating plant, an electrically operated trawl winch suitable for 500 fathoms warp on each of two barrels, electric lighting, wireless telephone, direction finding apparatus, echo sounding apparatus and an electric log.

Detection of Structural Flaws.—In connection with the magnetic detection of

cracks or flaws in iron or steel parts, the Equipment and Engineering Co., Ltd., have developed a new medium known as Magnalite. This detecting ink contains particles which render defects fluorescent when viewed under ultra-violet rays. It is not intended that it will substitute the



The fine lines seen in this illustration are cracks in an iron component and are indicated by Magnalite fluorescent ink

standard Magnaflux detecting ink of which the company were the inventors, but it forms a valuable addition where fine cracks are to be discovered in parts where the usual markings are not easily discerned. The process is described in an illustrated leaflet issued by the company.

The Atomic Bomb.—Under the title "An Outstanding Triumph of Human Genius," a brochure (A.G. 748) has been issued by the British Thomson-Houston Co., Ltd., recording their association with the development of the atomic bomb, upon which two members of the B.T.H. research laboratory, Dr. C. J. Milner and Mr. K. J. R. Wilkinson, were actively engaged in America. The matter in the brochure is based on the official "Statements Relating to the Atomic Bomb."

Inventions Made in Germany.—The Government have decided that inventions made in Germany since September 3, 1938, shall not be allowed to form the basis of valid applications for the grant of patents, or for registration of design in the United Kingdom, and accordingly such applications will not be accepted by the Comptroller of the Patent Office. Any rights lawfully acquired by non-enemies before September 3, 1939, in inventions for which protection was applied for in Germany in the twelve months preceding that date will be safeguarded.

The Poetry of Light.—Lecuring on "The Poetry of Light," at the College Theatre, Coventry, on October 16, Mr. R. G. Gillespie Williams demonstrated for

the first time in public the Delicolour system stage lighting control unit, which is equipped with a colour selection dial upon which the colour desired is preselected. An instantaneous or a slow change of colour over any desired period of time may be made, and, it is claimed, a producer is able to select any desired shade of colour to meet every possible condition of lighting required. Mr. F. W. Godden, the Coventry electrical engineer, presided.

War-time Activities.—In connection with the Ashton-under-Lyne and Limehurst Thanksgiving Week Exhibition at the Town Hall, Ashton, from October 6—13, the National Gas and Oil Engine Co., Ltd., displayed specimens of their war work and photographs showing parts in the process of manufacture and their applications. They supplied oil engines for generating sets for radar, gun sites, aerodromes, wireless transmission, battery charging, warships, aircraft carriers, tank landing craft, cargo vessels, floating docks, and for the "degaussing" of various types of craft.

E.I.B.A. Year Book.—The Electrical Industries Benevolent Association has just issued its year book for 1945, containing the annual report of the Council for 1944, together with the accounts and a useful cross-referenced list of 33 local committees and secretaries from Aberdeen to Brighton and from Hull to Dublin. The amount paid out in grants, pensions and allowances last year amounted to £10 803, an increase of £203 on the figures for 1943. Copies of the year book can be obtained from the Secretary at 32, Old Burlington Street, W.1.

The Metropolitan-Vickers Gazette.—In the current issue is described the M.V. air blast circuit-breaker, and other contributions include a brief description of two 20 800 kW 3 000 r.p.m. turbo-alternators supplied to the Lancaster Corporation; a note on a Metrovick locomotive, rated at 2 380 h.p., 3 000 V, supplied for Brazil; a description of the Metrolux method of fluorescent crack-detection; a review of Electroflux magnetic crack-detection equipments; and notes giving examples of individual drives in different sections of the textile industry.

A Million Radio Sets.—Licences have been granted to some seventy manufacturers for the production of about a million receiving sets during the next twelve months. Of this number 400 000 are intended for export. Undertakings have been given by the industry that 50 per cent. by value of the production for the home market will be devoted to sets to be retailed at £15 or less, exclusive of purchase tax of 33½ per cent. on the wholesale selling price. The supply position in respect of the majority of the principal components required for civilian production has shown considerable improvement

and adequate quantities should be available for the present programme, for the maintenance of existing sets and for export.

Representation in Canada.—A firm of manufacturers' representatives established in Toronto wishes to secure the representation of United Kingdom manufacturers of engineering lines such as electric motors, machine tools, pumps, and so on, on a commission or purchasing basis for the whole of Canada. Interested firms should communicate with the Department of Overseas Trade, Hawkins House, Dolphin Square, London, S.W.1, quoting Ref. No. Z44852 (e).

Radielectric Pre-heating.—A booklet entitled "A Year's Experience of Radielectric Pre-heating," by J. E. Beard, of the Streetly Manufacturing Co., Ltd., has been published by British Industrial Plastics, Ltd. It gives a summary of the conclusions arrived at by the firm.

Calendars for 1946.—We are reminded of the approach of the end of the year by the receipt of 1946 calendars from Gabriel Wade and English Ltd., and Brown Boveri Ltd. The first-named firm have again followed their custom of deciding upon a delightfully coloured picture with a small block calendar below, though the subject of the picture this year is no longer a girl but a view of Portmeirion. The second calendar, produced in photogravure, is again seasonal views of Switzerland.

Contract for Iraq Rail Extension.—A contract between the Government of Iraq for the construction of a sixty-eight mile extension of the Iraqi State railway system from Kirkuk to Erbil, and Messrs. Balfour, Beatty and Co., Ltd., of London, has been arranged. It is understood that the contract, which will take about two years to complete, involves about two million cu. yds. of earth works, as well as 450 000 cu. ft. of reinforced concrete in bridges and culverts.

Grouped Motor Control Gear.—It is often an advantage to have all the motor-control equipments of an installation in one place, in the form of a multi-unit control board. With the cubicle form of construction it is always necessary to separate one control equipment from another; but it is not often desirable to be able to attend, with safety, to any individual sub-unit without having to shut down the complete installation. Such equipments are particularly suitable for certain power station auxiliaries; material handling plant for power stations, steelworks, and quarries; pumping equipments for sewage, or waterworks, etc. The British Thomson-Houston Co. Ltd., has, over a period of many years, steadily developed and improved this class of control equipment (designated Type GMC) which is described and illustrated in a new publication, DL.5620-1.

Company News

SKEFKO BALL BEARING CO., LTD.—Intm. div. 3d. per 5s. unit, tax free, payable Nov. 10. (4d. per unit.)

LIGHTALLOYS, LTD.—Fin. div. for yr. to June 30, 12½% (same), mkg. 25% (same). Net pft. £23 133 (£22 270) after taxatn.

MONTEVIDEO TELEPHONE.—Rev. 1944 £125 917 (£111 930). Exes., deprecn., other charges £74 541 (£65 861). Pfts. £51 076 (£46 068). Div. 8% (6%) tax free, fwd. £140 523 (£115 503).

LONDON ELECTRICAL AND GENERAL TRUST.—Rev. for yr. ended June 30 £55 599 (£53 831). Exes. £3 078 (£2 907), dirs.' fees £1 800 (same), taxn. £2 118 (£1 410), deb. int. £16 000 (same), net pft. £32 603 (£31 714), fwd. £16 355 (£17 099).

GREAT NORTHERN TELEGRAPH (Denmark).—Accts. for 1944 show gross receipts £1 645 660, less expnd. £1 418 433, lvg. £227 227. Available for disposal £1 045 777. Bd. recommend paymt. of div. of 20% for 1944, payable in sterling, fwd. £645 363 (£818 550).

STRAND ELECTRIC HOLDINGS.—Accts. for yr. to July 11 (which incl. accts. of Strand Electric and Eng. Co. for yr. to Apr. 30) show inc. £16 231 (£15 654). To dirs.' fees £250 (same), gen. exes. £229 (£218), leav. pft. £15 752 (£15 186). To tax on div. from Strand Electric and Eng. £7 881 (£7 590), div. 10% plus bonus 2½% (both same) £7 187, fwd. £2 518 (£1 835).

LINLEY ENGINEERING Co. LTD.—Tradg. pft. to Mar. 31, £5 989 (£9 852), plus income from invstmt. and deposits £54 (£32). To deprecn. £456 (£431), dirs.' fees £581 (£831), leav. net pft. £5 006 (£8 622). Div. 10% and bonus 2½% (div. same, bonus 5), to res. nil £1 500, taxn. res. £2 601 (£4 600), fwd. £999, increasing unappropriated blee, from £3 658 to £4 657.

RENOLD AND COVENTRY CHAIN LTD.—Tradg. pft. for yr. to July 1, £202 930. Add E.P.T. recoverable £16 000 (nil), mkg. £218 930 (£207 098). To inc.-tax £102 600 (£102 000), gen. res. £30 000 (nil), capital res. £25 000 (nil), contings. nil (£50 000), pref. div. £8 388 (same), fin. div. on ord. 7% (same), plus bonus 2½% (nil), mkg. 12½% (10%). £56 566 (£45 253), fwd. £23 675 (£27 299).

W. R. SYKES INTERLOCKING SIGNAL CO.—Tradg. pft. to April 30, £33 808 (£26 645), plus £231 (nil), pft. on invests. sale. To dirs.' fees £723 (£673), taxatn., after creditg. £800 over-provsn., £28 700 (£20 300), gen. res. nil (£3 500), spec. res. £2 300 (nil), div. 6% plus bonus 6% on cum. "A" pref. shs. (two yrs. paymt. at 6% per annum to Apr. 30, 1944) £868 (same), fwd. £9 747 (£8 299).

J. AND F. STONE LIGHTING AND RADIO Co., LTD.—Tdg. pft. for yr. to June 30 £113 802 (£79 951), add div. iron sub. co. gross £30 000 (nil), trans. fees £48 (£34), mkg. £143 850 (£79 985). Deduct deprec. £10 408 (£10 272), dirs.' fees £750 (nil), leav. £132 692 (£68 963). To pref. red. fund £7 524 (£7 113). W.D.I. £93 (£353), taxn. inclgd. £51,231 for future tax £103 000 (£44 000), pref. div. £4 586 (£4 752), ord. div. 15% (6%) £30 000 (£12 000), fwd. £13 797 (£11 308 before creditg. divs.).

LIGHT PRODUCTION Co. LTD.—Gross trdg. pft. to Apr. 30, £85 154 (£111 600), plus int. £632 (£636). Deduct exes. and deprecn. of cars £45 338 (£44 385), there remains £40 447 (£67 901). To taxn. inclgd. E.P.T., £22 500 (£45 000), plant deprecn. £3 000 (£7 000), defd. reprs. £4 000 (nil), leav. net blnce. £10 947 (£15 901). Pref. div. absorbs £375 (same), intm. ord. div. 10% £2 250 (same), fin. ord. div. 15% and bonus 5% (both same), mkg. 30% (same), to gen. res. £3 000 (£9 000), fwd. £822 (£776), mkg. unappropriated blee. £5 396 (£4 574). Dirs. have received an offer from Sheepbridge Coal and Iron Co., whereby this co. is to acquire a controllg. int. in Light Production.

Metal Prices

	Monday, Price.	Oct. 22 Inc. Dec.
Copper—		
Best Selected (nom.) per ton	£80 10 0	— —
Electro Wirebars ...	£82 0 0	— —
H.C. Wires, basis ... per lb.	9 ³ / ₁₆ d.	— —
Sheet	11 ³ / ₁₆ d.	— —
Phosphor Bronze—		
Wire(Telephone)basis ..	1s. 0 ³ / ₁₆ d.	—
Brass (80/40)—		
Rod, basis	—	—
Sheet "	—	—
Wire "	11d.	—
Iron and Steel—		
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. ...	£28 0 0	— —
Lead Pig—		
English	£31 10 0	— —
Foreign or Colonial ..	£30 0 0	— —
Tin—		
Ingot (minimum of 99.9% purity) ...	£303 10 0	— —
Wire, basis... .. per lb.	3s. 10d.	— —
Aluminium Ingots ... per ton	£85 0 0	— —
Speller... ..	£31 5 0	— —
Mercury (spot) Ware-house per bott.	£31 5 0	— —

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

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.

LONDON COMMERCIAL ELECTRICAL STORES LTD.—Sept. 20, £15 000 mort., to Engravers Guild Ltd.; charged on 20/21/22, Cursitor Street, E.C. *Nil. Sept. 25, 1944.

PROVINCIAL ELECTRICS AND REFRIGERATORS, LTD., GOSPORT.—Sept. 23, series of £10 000 debts.; gen. charge.

Satisfactions

INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO. LTD.—London, S.W.—Sat'n. Sept. 28, of debts. reg. Apr. 8, 1926.

CARMEN, B. V. (Male), Carbrooke, Watton, Thetford, radio dealer. £18 5s. 11d. Aug. 14.

CROPPER, Norman, 141, Alfred Street, South, Nottingham, electrical engineer. £32 17s. 8d. Aug. 14.

KAYE ALLOY CASTINGS, LTD., Birmingham.—Sat'ns. Oct. 4, £5 000, reg. Jan. 29,

and £5 000, reg. Nov. 23, 1936, and £3 620, reg. Dec. 9, 1938.

Application for Discharge

JEFFREE, Henry Charles, 195, Sydenham Road, Croydon, and carrying on business at 72 and 76, High Street, Thornton Heath, radio dealer. Date of hearing, Nov. 21, 1945, 10.30 a.m., the County Court, Searbrook Road, Croydon, Surrey.

Company Winding-up

ANGLO-AMERICAN ELECTRICAL APPLIANCES LTD.—At a meeting of the members of the above company, Cliffords Inn, Fleet Street, London, on October 19, 1945, a resolution was passed that the company be wound up voluntarily and that Mr. Maurice GROSE, of Cliffords Inn, Fleet Street, London, E.C.4, be appointed Liquidator.

Meeting of Creditors

THE DOME ELECTRIC CO., LTD. (In Voluntary Liquidation). A general meeting of the members and creditors of the above named company will be held at the office of Harry L. Price and Co., 47, Mosley Street, Manchester, on October 31, at 11.15 a.m. and 11.30 a.m. respectively, to receive the account of the Liquidator.

Coming Events

Friday, October 26 (To-day).

I.E.E., MEASUREMENTS SECTION.—London, W.C.2. Chairman's inaugural address, S. H. Richards. 5.30 p.m.—**SCOTTISH CENTRE.**—Aberdeen. Chairman's address by R. I. Kinnear. 7.45 p.m.—**S. MID. CENTRE, RADIO GROUP.**—Birmingham. Kelvin lecture "Scientific Principles of Radiolocation," Sir E. V. Appleton. 6 p.m.

INSTITUTE OF WELDING.—Edinburgh. "Recent Advances in Welding in the Ship-building Industry," D. M. Kerr. 7.30 p.m.

Saturday, October 27.

I.E.E., N.W. STUDENTS' SECTION.—Avenham Institute, Preston. "Electronic Control of Resistance Welding Machines," F. J. Wilkinson. 2.30 p.m.

A.M.E. AND M.E., SOUTH WALES BRANCH.—Cardiff. Joint meeting with South Wales Branches of the Illuminating Engineering Society and the National Association of Colliery Managers. "Lighting in Hazardous Places," S. W. Richards. 5 p.m.

INSTITUTION OF ELECTRONICS.—Royal Society of Arts, London, W.C.2. "Electron Tubes for Pulse Generation," F. J. G. van den Bosch. 5.30 p.m.

I.E.E., N. MID. STUDENTS' SECTION.—Visit to Kirkstall Forge Ltd. Members to meet at entrance to The Forge. 2.15 p.m.—**N.E. STUDENTS' SECTION.**—Visit to Hylton Road Power Station, Sunderland. 2.45 p.m.

Monday, October 29.

I.E.E.—London, W.C.2. Informal meeting. Discussion, "Should Engineering Concerns be

Managed by Engineers?" (Opened by the President.) 5.30 p.m.—**S. MID. STUDENTS' SECTION.**—Birmingham. "Some Mechanical Aids to Engineering Calculations," G. A. Montgomerie. 6.45 p.m.

Wednesday, October 31.

INSTITUTE OF WELDING.—Grand Hotel, Birmingham. "The Fabrication of Aircraft Fuel Tanks in Aluminium Alloy Containing 3 per cent. Magnesium," W. K. B. Marshall. 7 p.m.

I.E.E., RADIO SECTION.—London, W.C.2. Joint meeting with the Plastics Group of the Society of Chemical Industry. "Silicones—New Engineering Materials," Dr. Shalor L. Bass. 6.30 p.m.

Thursday, November 1.

I.E.E.—London, W.C.2. "Practical Aspects of Telephone Interference Arising from Power Systems," P. B. Frost and E. F. H. Gould. 5.30 p.m.

Friday, November 2.

NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS.—Literary and Philosophical Society's Lecture Theatre, Newcastle-upon-Tyne. Andrew Laing Lecture, "Problems of the Metallic State," Sir L. Bragg, F.R.S. 6 p.m.

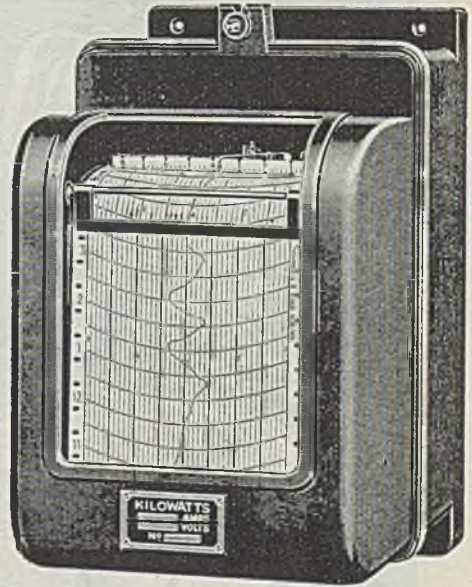
Saturday, November 3.

JUNIOR INSTITUTION OF ENGINEERS, N.W. SECTION.—Manchester. "Economics of Industrial Electric Heating," L. G. King. 2.30 p.m.

NALDERS

IDEAL RECORDING INSTRUMENTS

The illustration shows an N.C.S. Switchboard Indicating and Recording Instrument. It is fitted with calibrated scale and indicating pointer for sight reading, and gives a clear view of the chart throughout. The complete range includes Ammeters, Voltmeters, Wattmeters, Frequency Meters, Power Factor Meters, etc.



Continuous flow of Ink from Ink Reservoir.

Chart driving mechanisms are of improved type ensuring accurate timing. They are usually arranged to give a chart speed of 1 inch per hour, but can be adapted to any required speed up to 12 inches per hour. Clocks giving a higher chart speed or combination of speeds can be fitted if specified. The syphon pen supplied, fed from the ink reservoir, maintains a continuous flow of ink.

All N.C.S. Recording Instruments, Switchboard or Portable pattern, conform to the requirements of the British Standards Institution Specification.

Let us quote to your requirements.

NALDERS PRODUCTS

include Ammeters, Voltmeters, Wattmeters, Power Factor Meters, Synchronisers, Frequency Meters, Protective Relays, Circuit Breakers and Automatic Switches. All these and other Nalders Specialities are in the front rank, as guaranteed by the widely known N.C.S. Trade Mark.

NALDER BROS. & THOMPSON LTD.

DALSTON LANE WORKS, LONDON, E.8.

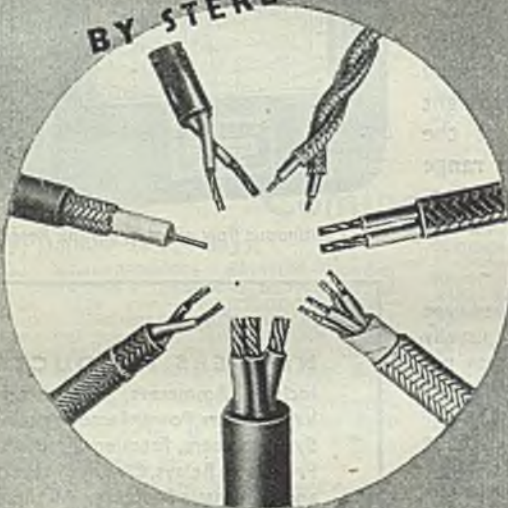
Phone: CLISSOLD 2365 (3 lines).

Grams: OCCLUDE, HACK, LONDON

WHATEVER THE NEED, IN WAR OR PEACE

CABLES

BY STERLING, CAN BE RELIED UPON



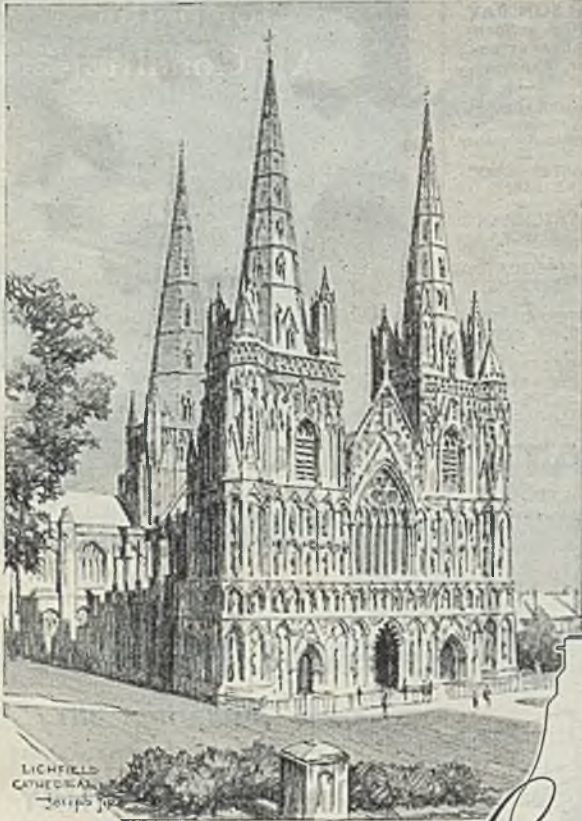
For more than five years all the energies of STERLING have been devoted to the manufacture and supply of reliable flexible cables for the fulfilment of the urgent needs of the Services and War Industries. Soon, we hope, we shall be able to give you the benefit of our research, experience and production in filling every peacetime domestic need. In the meantime however, orders are still subject to the approval of the Cable Planning Officer.

All STERLING Cables are entirely British Made to B.S.S. and G.D.E. Specifications.

STERLING
CABLES OF QUALITY

Sterling Cable Co., Ltd., Queensway, Ponders End, Middx., Tel. : HOWard 2611. Manufacturers of all types of Rubber, Synthetic Rubber and Thermo-Plastic Insulated Cables and Flexibles—controlling Lancashire Cables Ltd., Warrington, Specialising in Paper Insulated High and Low Tension Cables.

Landmarks of Britain



Birmingham

LICHFIELD CATHEDRAL

St. Chad was the first Bishop of Lichfield. The Lady Chapel contains some fine Flemish glass of the sixteenth century

BOOK
9th NOV
•
E.I.B.A
VICTORY
BALL

CRYSELCO

Lamps

MADE IN ENGLAND

FIFTY YEARS OF
QUALITY & SERVICE

Branches

BIRMINGHAM
BRIGHTON
BRISTOL

BURY ST EDMUNDS
CARDIFF
GLASGOW

LEEDS
LEICESTER
LIVERPOOL

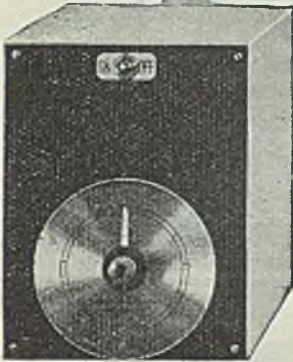
LONDON
MANCHESTER
NEWCASTLE



CRYSELCO LIMITED, KEMPSTON WORKS, BEDFORD

'SYNTIME' PROCESS TIMERS

For controlling the Time Period of SUN RAY TREATMENT, thus ensuring uniform treatment and eliminating over or under exposure.



Suitable for only A.C. mains controlled frequency.

MASTER CLOCK SYSTEMS

WATCHMAN'S CLOCKS

STAFFLOCATING SYSTEMS

INTERNAL TELEPHONE SYSTEMS

ELECTRICAL MECHANISMS to SPECIAL REQUIREMENTS

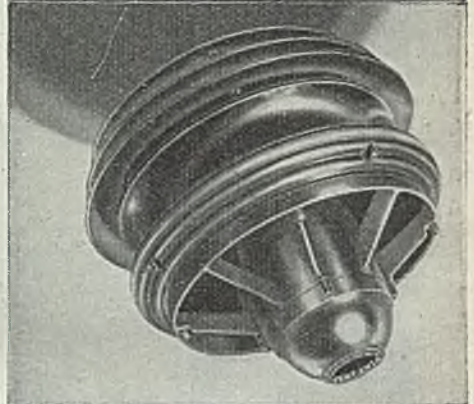
SYNCHROMATIC

TIME RECORDING CO., LTD.,

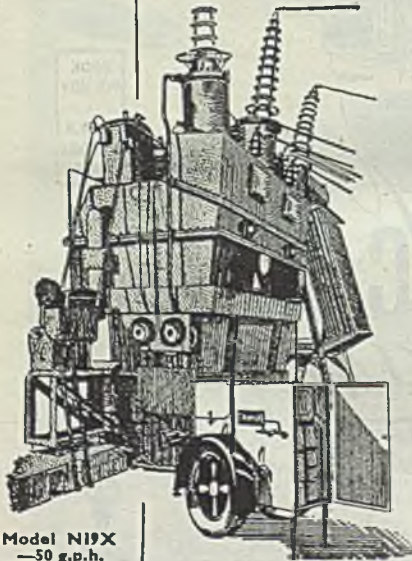
65, ERSKINE STREET, LIVERPOOL, 6.

Telephone: ANFIELD 1834-5.

VENT-AXIA for better Air Conditions



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



Model N19X
—50 g.p.h.
Others available from 5 to 450 gallons per hour.

STREAM-LINE FILTERS

keep insulating oils

CONSTANTLY

AT PEAK EFFICIENCY

The occasional circulation of the oil in a transformer through a Stream-Line filter will ensure full insulating qualities at all times.

Batches of carbonised switch oil can be readily delivered in condition equal to new.

The filter is simple—compact—portable—and of unrivalled efficiency.

Ask a User!

WRITE FOR DETAILS TO-DAY

Stream-Line Filters Ltd.

HELE-SHAW WORKS, INGATE PLACE, LONDON, S.W.8

*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

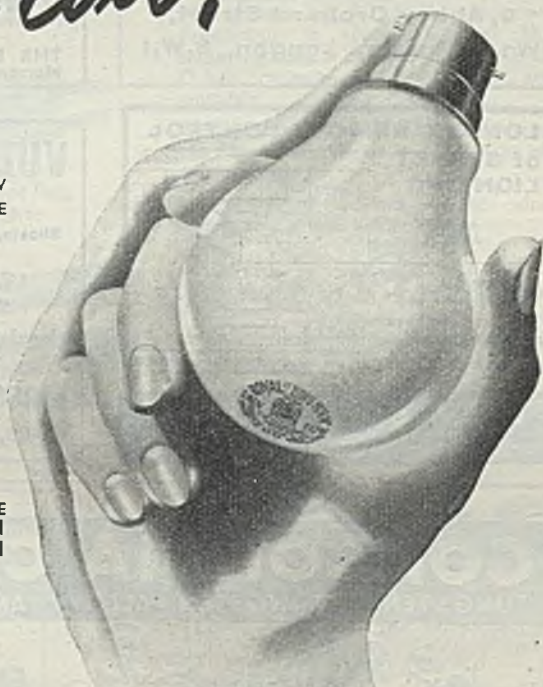
COILED-COIL

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



INSTRUMENT WIRES INSULATING MATERIALS

**WEST INSULATING COMPANY
LTD.,**
2, Abbey Orchard Street,
Westminster, London, S.W.1

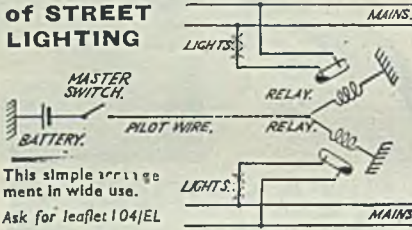


For accurate
Temperature,
measurement
and control.

Rototherm

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

LONDEX REMOTE CONTROL of STREET LIGHTING



This simple arrangement
in wide use.
Ask for leaflet 104/EL

LONDEX LTD

MANUFACTURERS OF RELAYS
AMERLEY WORKS 207 AMERLEY ROAD LONDON S E 20

VULCANIZED FIBRE.

EBONITE, BAKELITE

Sheets, Rods, Tubes and Machined Shapes.

LEATHEROID Sheets, Rolls, etc.
"CLIFTEX" Insulating Tapes.

Insulating Staples, Jointing, Presspahn.

MOSSER & MITCHELL LTD.

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

CONCORDIA CONTACTS

TUNGSTEN, TUNGSTEN-ALLOY AND IRIDIO-PLATINUM.



ENQUIRIES INVITED
ADDRESSED TO:-

ELCORDIA LTD., 2, CAXTON ST. LONDON, S.W.1.

W. G. PYE & CO. LTD.

TEST EQUIPMENT
AMPLIFIERS AND INSTRUMENTS
FOR RESEARCH

"GRANTA" WORKS, 80 NEWMARKET ROAD,

Telephone: Cambridge 4032

CAMBRIDGE

Telegrams: Pye, Cambridge.



MODEL No. H 1008.
(BRITISH PATENT No. 544011)

Suitable for light or medium work, and soldering temperature is attained in thirty seconds.



T.4. Light Duty Jaws.



T.8. Medium Duty Jaws.

ELECTRODE SOLDERING TOOLS

JAW TOOLS are available for soldering cables into lugs, ferrules on to tubing, etc., up to 3" in diameter. Production is speeded up as the soldering time is considerably reduced. Other models of hand tools are available.

These tools operate from power units and are safe in use. Operate off A.C. supply.

Specify cored Solders, Solder wire, Argent Solder and Solder Paste.

Stanelco Products

Proprietors:

STANDARD TELEPHONES AND CABLES LIMITED,
FERNDOWN NORTHWOOD HILLS,
NORTHWOOD, MIDDLESEX.

Telephone: PINNER 4885.

POST-WAR PLANS FOR EMERGENCY LIGHTING



When provision for Emergency Lighting is embodied in architect's plans, economy and better results are achieved. When post-war plans are in hand you should consult Chloride, who have had more experience of this kind of work than any other company. Moreover, they are the patentees of **KEEPA-LITE**—the equipment which instantly and automatically 'switches on,' should the mains fail.

Chloride
BATTERIES

THE CHLORIDE ELECTRICAL STORAGE COMPANY LTD.,
Grosvenor Gardens House, London, S.W.1

W.R. 58A

DUNDAS

Insulating

MATERIALS

Varnished Cloths
IN SILKS AND CAMBRICS

Tapes

IN SEWN AND SEAMLESS
BIAS FORM

Guaranteed to B.S.I. Specification

EDWARD

MACBEAN

& CO.
LTD.




WELLINGTON MILLS
PORT DUNDAS, GLASGOW, LE.4

Telephone: Dundas 5864 (3 lines)

MOTORS

from
STOCK



CITY ELECTRICAL CO
LONDON

EMERALD STREET, LONDON, W. C. 1. TELEPHONE HOLBORN 9722.

**PRESS
TOOLS FOR
MICA & METALS**

LiBerty 8118

H. J. COBB
AND SON,

35a, SOUTH PARK RD.
WIMBLEDON, S.W.19

THE ALL-BRITISH

"MAVITTA"

DRAFTING MACHINES
and TABLES



**DRAFTING
MACHINES
FOR ALL
BOARDS**

**PERFECTLY
BALANCED
TABLES**

Write NOW
for literature and
prices

The Mavitta Drafting Machines Ltd.
Anchor Works, Park Road,
ASTON, BIRMINGHAM 6

Telephone: EAST 0482
Telegraphic Address - "Mavitta, Birmingham"

C. Clifford & Son Ltd.
BIRMINGHAM



**PHOSPHOR
BRONZE**

"SEA-CLIFF"
Trade Mark.

TUBES, SHEETS, RODS & WIRE

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

**MANOR ELECTRIC OVEN
& FIRE CO.**

175, Windsor House, Victoria Street,
London, S.W.1 Tel.: Abbey 1782

ELECTRICAL ENGINEERS

Manufacturers of
HOSPITAL FOOD TROLLEYS,
IMPREGNATING OVENS, Etc.

Also Apparatus to Customers' own specifications

PRECISION PRESSWORK for ALL Trades




We quote to Sample, Blue-print
Rough Sketch or Specification.
Our reputation for high grade
Presswork, Wirework, Springs,
etc., in all metals is second-to-none.



TELEPHONE: ACCRINGTON 2115-6.

YOU SHOULD READ OUR BROCHURE ABOUT



MICROFUSES
THE TRADE MARK

The
FUSE ELEMENT
DESIGNED TO PROTECT
LOW CURRENT INSTRUMENTS
AND APPARATUS BY A
CIRCUIT BREAKING
ACTION.

MICROFUSES LTD.
KANGLEY BRIDGE ROAD
LOWER SYDENHAM - S.E.26
TEL: 510-5129-5120

Send for full details now!

WHY YOU SHOULD USE ONLY
ERSIN MULTICORE



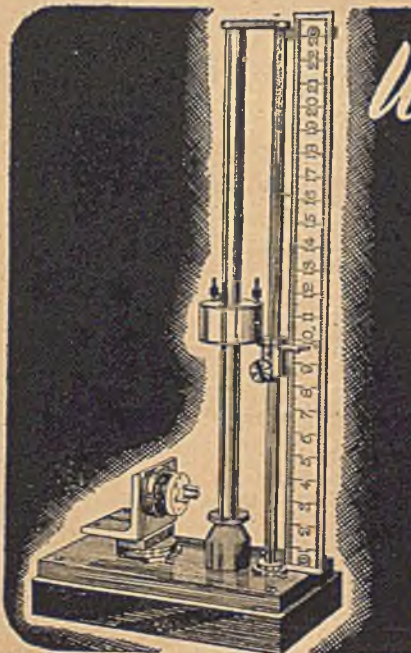
For Better Joints in Less Time
ERSIN MULTICORE
The Solder with 3 Cores of Non-corrosive Flux.

- Avoids Dry Joints.
- Speedily makes Sound Joints on Dirty or Oxidised Surfaces.
- Always Correct Proportions of Flux and Solder.
- No additional Flux required.
- Approved by Air Ministry and G.P.O.

FREE
"Technical Notes on Soldering" and samples sent free on request to firms engaged on Government Contracts.



MULTICORE SOLDERS, LTD.
Commonwealth House,
London, W.C.1.
Tel: Chanc'y 5171/2



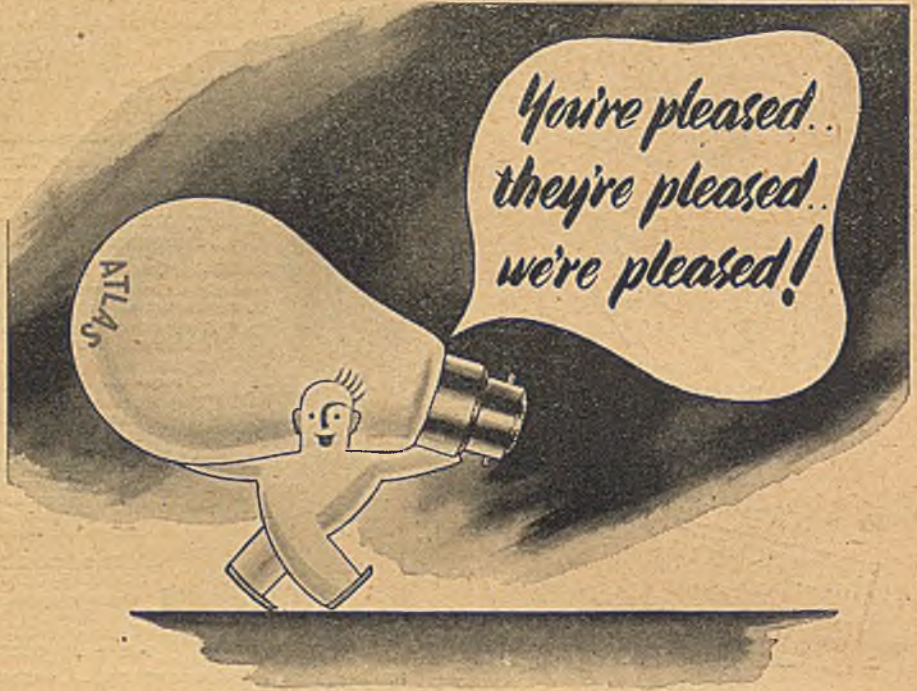
Wylex Testing

MOULDING TEST—Wylex mould their own mouldings and prove for themselves the strength of every one. Here is shown the Impact Test Machine, designed and made at Wylex Works. Wylex mouldings must satisfy the exacting demands of this machine.

"Wylex must be good"

GEORGE H. SCHOLES & CO. LTD.
WYLEX WORKS, WYTHENSHAW,
MANCHESTER.

Tel: Wythenshawe, 2251/2.
Grams: "Kilowatt," Manchester.



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: EUSton 1183

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

N.-E. Depot: 45 Sandhill, Newcastle-on-Tyne, 1. Phone: Newcastle 24068

101