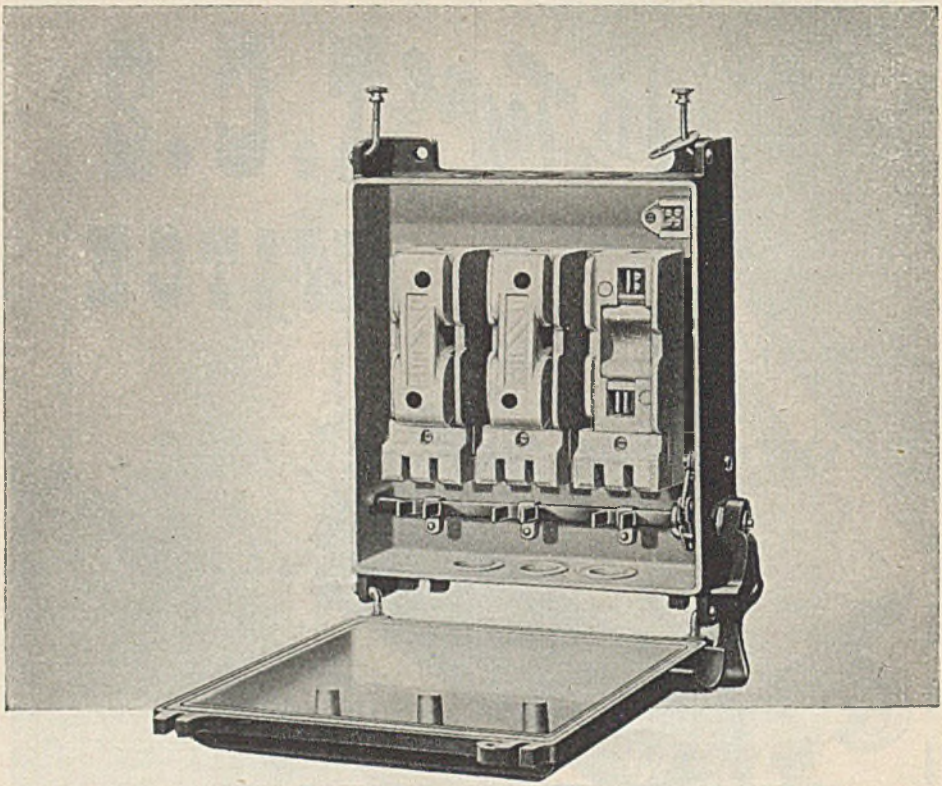
THE

ELECTRICIAN

THE TECHNICAL NEWSPAPER OF THE ELECTRICAL INDUSTRY

14 MARCH, 1947
SIXPENCE



M.E.M. HAVE MODERNISED THE 'MEMREX-SENIOR' RANGE

Patent Removable Switch Bar. Wiring is facilitated and erection costs reduced by the quick withdrawal of the switch bar. A notable advance in switch-gear design.

For Universal Use. Drilled clearance holes for top, bottom; or top and bottom conduit entry. Units are rated from 15 to 100 amps and are supplied with either Kantark "Senior" re-wirable fuses or with suitable carriers for "Kantark" H.R.C. fuses.

Conversion to Triple Pole and Neutral. "Memrex-Senior" triple pole switch-fuses are drilled and tapped for the addition of a neutral terminal.

High Quality and Reasonable Price. Nearly 40 years of intensive specialisation make possible the high quality and low price of the "Memrex-Senior" range.

Write today for List 280 *with full details.*

MEM

Switch, fuse and [illegible] gear, electric fires and localised lighting equipment

Midland Electric Manufacturing Co. Ltd., Birmingham, 11. Branches in London & Manchester

Write for Pamphlet descriptive of the "Avo" Instruments illustrated above.

THE world-wide use of "AVO" Electrical Testing Instruments is striking testimony to their outstanding versatility, precision and reliability. In every sphere of electrical test work they are maintaining the "AVO" reputation for dependable accuracy; which is often used as a standard by which other instruments are judged.

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.
WINDER HOUSE · DOUGLAS STREET · LONDON · S.W.1 TELEPHONE VICTORIA 3434 7

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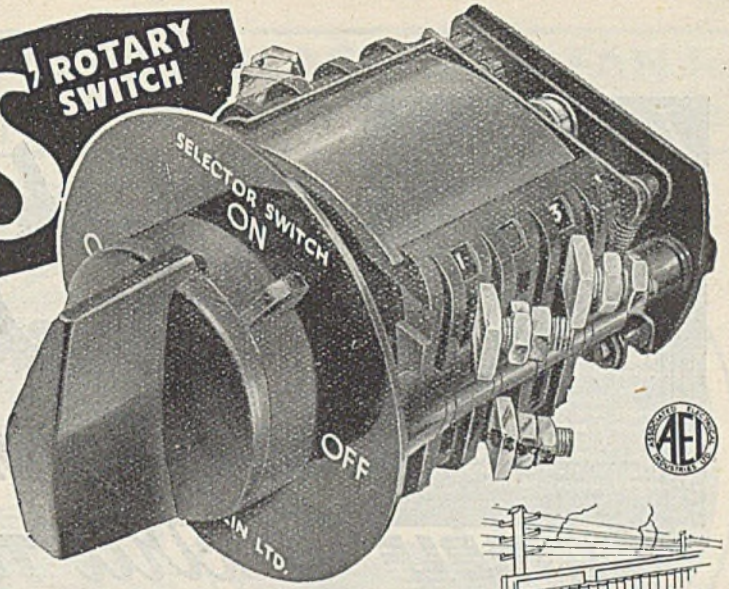
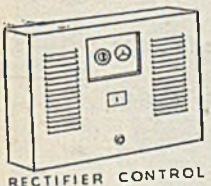
'RS' ROTARY SWITCH



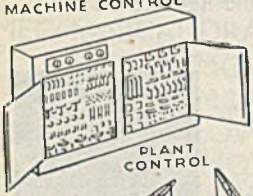
Multi-way
Multi-pole
Sizes up to 60 amps

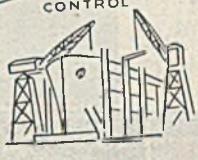
The type 'RS' Rotary Pattern Switch offers a solution to your control problems. Some of its many applications are illustrated here.

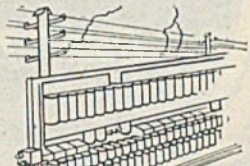
Write for leaflet 93 A 1 which fully describes the many important features of the Switch.

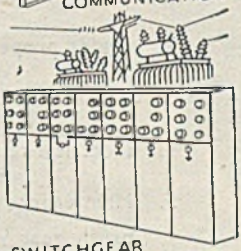

RECTIFIER CONTROL

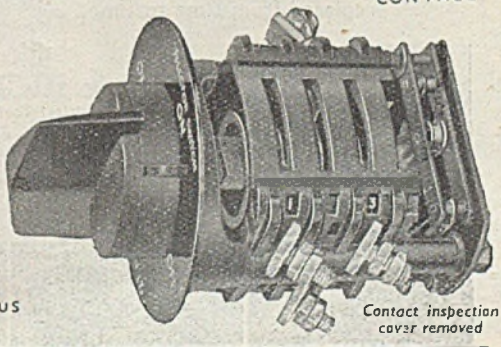

MACHINE CONTROL


PLANT CONTROL


SCIENTIFIC APPARATUS CONTROL


TELE-COMMUNICATION


SWITCHGEAR CONTROL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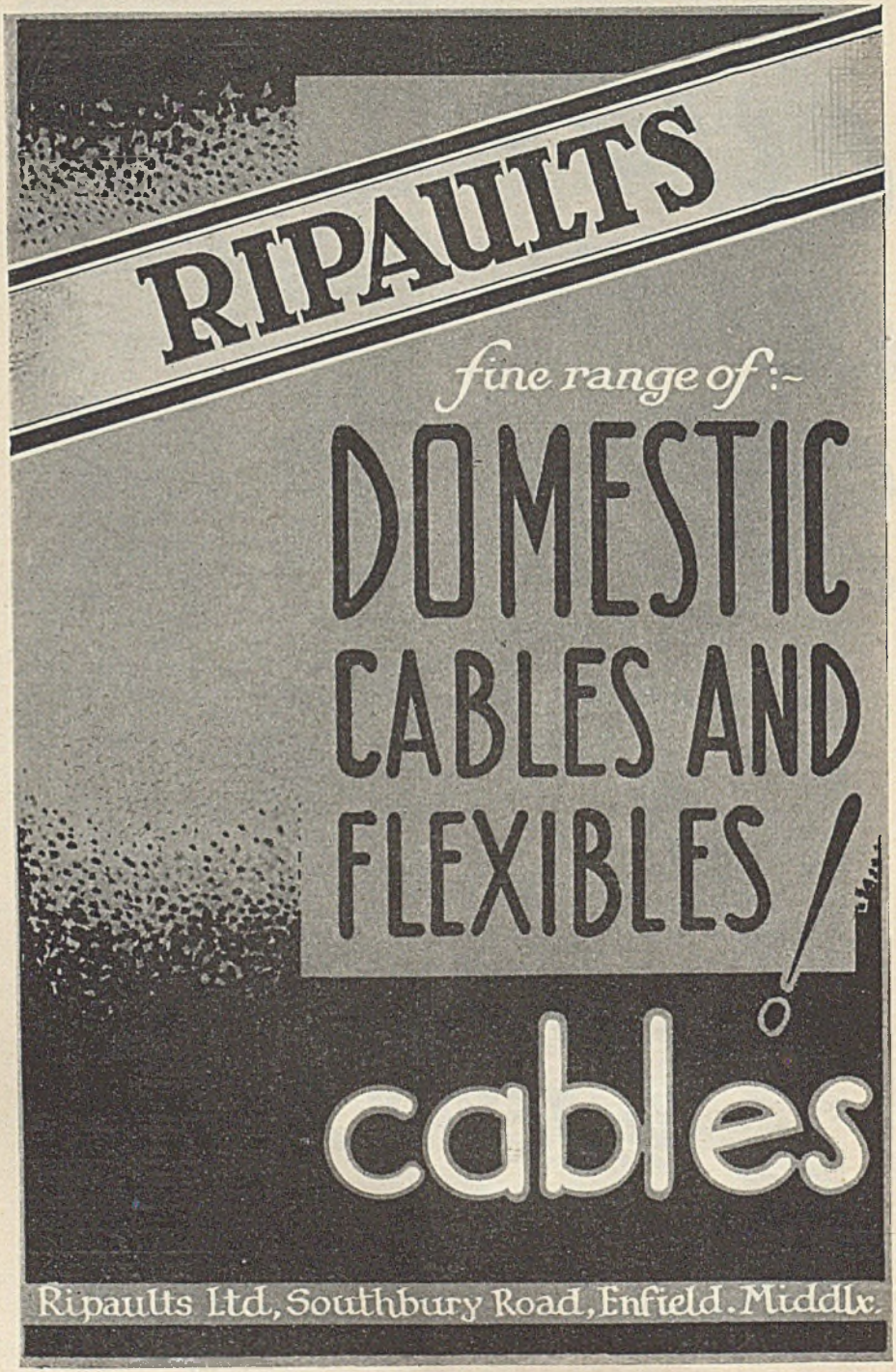
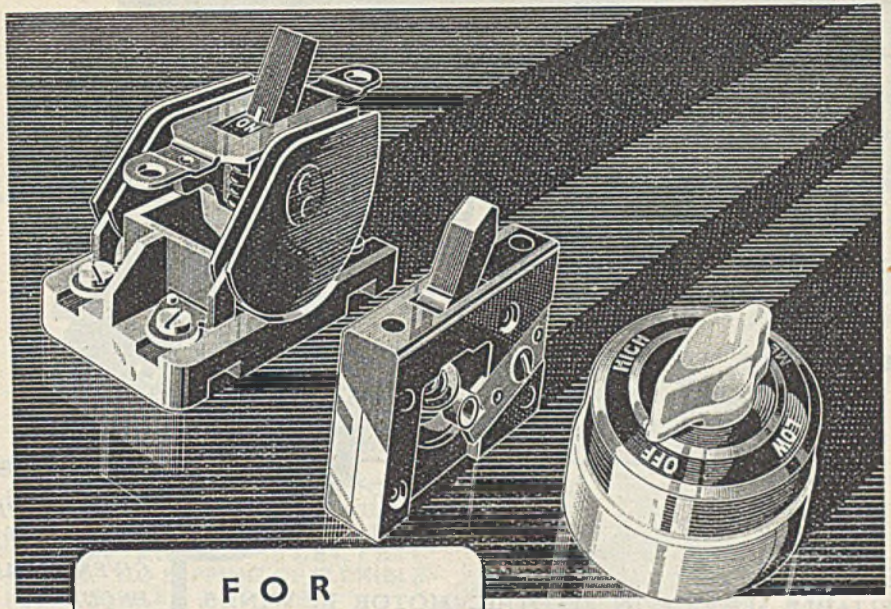

RIPAULTS
fine range of :-
DOMESTIC
CABLES AND
FLEXIBLES
cables
Ripaults Ltd, Southbury Road, Enfield. Middlx.



FOR DOMESTIC APPLIANCE CONTROL

Arrow offers the largest range of Precision Built Switches for every specific need in the industrial and domestic field.

Tumbler switches from 1 to 60 amp. rating, and rotary switches in all circuit combinations from 5 to 35 amps. 250 volts.

Arrow Switches are quick make and break. They have been carefully designed and manufactured to give long trouble-free service.

ARROW

ARROW ELECTRIC SWITCHES LIMITED, HANGER LANE, LONDON, W.5

MISCELLANEOUS ADVERTISEMENTS

TENDERS

CITY AND COUNTY BOROUGH OF BELFAST.

ELECTRICITY DEPARTMENT.

TENDERS are invited for the Supply, Delivery and Erection of:—

33 kV Armourclad Switchgear.

Specification (No. G.79) and Form of Tender may be obtained from the City Electrical Engineer and General Manager, East Bridge Street, Belfast, on deposit of two guineas. (Cheque to be made payable to the Belfast Corporation Electricity Department.) This deposit will be refunded provided a bona fide tender has been sent in and not withdrawn. Extra copies may be obtained at one guinea each, which sum will not be returnable.

Sealed tenders, endorsed with the name and address of the firm tendering, and marked "Electricity Department, Tender for 33 kV Armourclad Switchgear," must be lodged with the undersigned not later than 4 p.m. on Thursday, 3rd April, 1947.

The lowest or any tender will not necessarily be accepted.

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

JOHN DUNLOP,
Town Clerk.

City Hall, BELFAST.
5th March, 1947.

METROPOLITAN BOROUGH OF POPLAR.

SALE OF ROTARY CONVERTER.

THE Council invites an offer for the purchase and removal from site by the 30th June, 1947, of the following:—

1—1 000 kW General Electric Co., Rotary Converter; Year 1919; speed 500 r.p.m. A.C. side:—Transformer, 6 000 volt. 3-phase, 50 cycle. D.C. side:—470/520 volts. Exclusive of all interconnecting cables, and control panels.

This machine is ready for immediate dismantling and removal.

Form of tender together with further particulars, which include arrangements to view, may be obtained from the Borough Electrical Engineer and General Manager, 208, East India Dock Road, Poplar, E.14 (Telephone: EAST 2883).

Offers should be enclosed in sealed plain envelopes endorsed "Offer for Rotary Converter," and lodged with the undersigned not later than 6.30 p.m. on Thursday, 17th April, 1947.

The Council do not bind itself to accept the highest or any offer.

S. A. HAMILTON,
Town Clerk.

Poplar Town Hall,
BOW ROAD, E.3.
27th February, 1947.

STATE ELECTRICITY COMMISSION OF VICTORIA,

22-32, William Street,
Melbourne, Australia.

TENDERS are invited for Steel Cored Aluminium Conductor and Steel Earth Conductor for 220 kV Transmission Line in accordance with specification No. 46-47/114.

Full particulars available from Agent-General for Victoria, Victoria House, Melbourne Place, Strand, London, W.C.2.

Tenders, accompanied by preliminary deposit of £50, and endorsed "Specification No. 46-47/114," are returnable at the Commission's Office, 22, William Street, Melbourne, by 11 a.m. on Wednesday, 2nd April, 1947.

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

W. J. PRICE,
Secretary.

TENDERS

CITY OF BRADFORD.

THE Bradford Corporation invite tenders for the supply, delivery and erection of—

TWO 350 kW GLASS BULB TYPE MERCURY ARC RECTIFIERS, etc., FOR BARKEREND ROAD SUB-STATION.—Contract "C.52."

Copies of the Conditions of Contract, Specification, etc., may be obtained from the Electrical Engineer and Manager, 45-53, Sunbridge Road, Bradford.

Tenders, on the forms provided, must be delivered to the undersigned not later than 10 a.m. on Tuesday, 22nd April, 1947, and no tender will be received unless enclosed in a plain, sealed envelope bearing the words "Tender for Mercury Arc Rectifiers, etc.—Contract 'C.52,'" but not bearing any name or mark indicating the sender.

The Contract will be let subject to the Bribery and Fair Wages Clauses of the Corporation, which may be seen at the office of the undersigned. The lowest or any tender will not necessarily be accepted.

W. H. LEATHEM,
Town Clerk.

Town Hall, BRADFORD.
March, 1947.

SITUATIONS VACANT

CITY OF BRADFORD ELECTRICITY DEPARTMENT.

ASSISTANT CLERK OF WORKS (POWER STATION).

APPLICATIONS are invited for the position of Assistant Clerk of Works (Power Station) from persons who have had a sound technical and practical engineering training.

The person appointed will be required to assist the Clerk of Works in supervising the installation of power station plant.

The salary and conditions of employment will be in accordance with the N.J.B. Agreement, the salary payable being that attaching to Class H, Grade 10 (£329/337/347 per annum).

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

Applications, stating age and giving details of education, technical training and experience, together with copies of two recent testimonials, and endorsed "Assistant Clerk of Works (Power Station)," should be sent to the Electrical Engineer and Manager, 45-53, Sunbridge Road, Bradford, so as to reach him not later than 9th April, 1947.

W. H. LEATHEM,
Town Clerk.

Town Hall, BRADFORD.
March, 1947.

CITY OF LINCOLN.

ELECTRICITY DEPARTMENT.

JUNIOR Engineer required with some Constructional and Drawing Office experience for temporary appointment in connection with Generating Station Extensions, with possible permanency in the Department on completion of the above works.

Salary and conditions in accordance with N.J.B. Schedule, Grade (10), Class "G," commencing at £312 per annum.

Applications in writing, stating age, qualifications and experience accompanied by copies of testimonials or names of persons to whom reference can be made, to be delivered to the undersigned not later than the 22nd March, 1947.

F. NEWEY, M.I.E.E.,
Engineer and Manager.

Corporation Electricity Dept.,
Brayford Side North, LINCOLN.
3rd March, 1947.

SITUATIONS VACANT

CITY AND COUNTY BOROUGH OF BELFAST.

ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the following positions:—

(a) **Assistant Power Station Superintendent.**

Applicants must have a sound engineering training, have a University degree in Electrical Engineering and/or be Corporate Members of the Institution of Electrical Engineers, and have experience of power station practice. They must not be more than 40 years of age on the 1st April, 1947.

The salary for the position is in accordance with Grade 5, Class J, of the National Joint Board Schedule of Salaries for Technical Engineers on the staff of Authorised Undertakers. The scale is £651 for the first two years, £666 for the third and fourth years, and £682 after the fourth year.

(b) **Meter Engineer.**

Applicants should have served an apprenticeship with a Meter manufacturer or in the Meter Department of a Supply Authority and possess the Higher National Certificate in Electrical Engineering or be Corporate Members of the Institution of Electrical Engineers. It is desirable that applicants have experience in the operation of a Class "A" testing station. They must not be more than 40 years of age on the 1st April, 1947.

The salary for the position is in accordance with Grade 8b, Class J, of the N.J.B. Schedule. The scale is £456 for the first two years, £466 for the third and fourth years, and £477 for the fourth year.

(c) **Power Station Chemist.**

It is desirable that applicants have a University degree in Chemistry and have experience of feed water treatment and boiler water conditioning for 650 lbs./sq. in. 850 degs. F. plants, testing coals and oils and combustion control. They must not be more than 40 years of age on the 1st April, 1947.

The commencing wages for the position are £8 14s. 10d. per week, being in accordance with Grade 8b, Class J, of the N.J.B. Schedule. The scale is £456 for the first two years, £466 for the third and fourth years and £477 after the fourth year. Upon completion of twelve months' satisfactory service the position will be established on the Salary List.

Preference will be given to ex-Service candidates possessing the required qualifications.

In computing applicants' ages for the purpose of the age qualification clause, any periods of war service in H.M. Forces will be deducted from applicants' actual ages, provided that this will not apply to applicants whose actual ages would be over 45 years on the date of taking up duty.

Applications must be made on official forms, which can be obtained from the City Electrical Engineer and General Manager, Electricity Department, East Bridge Street, Belfast, and, with copies of not more than three recent testimonials, should reach the Town Clerk, City Hall, Belfast, not later than 4 p.m. on Friday, 28th March, 1947.

Canvassing, oral or written, if proved to the satisfaction of the appointing authority, will disqualify.

JOHN DUNLOP,
Town Clerk.

City Hall, BELFAST.
5th March, 1947.

ELECTRICAL ENGINEER, about 30, required for Cement factory. To be responsible for installation and maintenance of electrical plant throughout factory. No generating plant. Applicant must have wide experience of maintaining low tension A.C. plant. Permanent position, pension, etc. Commencing salary £500 p.a. Applications in writing only, giving full particulars of experience, to Lafarge Aluminous Cement Co. Ltd., Fondu Works, West Thurrock, Grays, Essex.

SITUATIONS VACANT

MANCHESTER CORPORATION.

ELECTRICITY DEPARTMENT.

Principal Power Sales Assistant.

APPLICATIONS are invited for the position of Principal Power Sales Assistant, at a salary in accordance with Class M, Grade 8, of the N.J.B. Schedule (which is equivalent to £635 per annum, rising by two biennial increments to £664 per annum).

The duties are of a technical and administrative nature, and involve negotiations and correspondence with industrial power consumers.

Applicants should be Corporate Members of the institution of Electrical Engineers, and should preferably have had similar experience with an electricity supply undertaking or with a manufacturing concern.

The appointment is subject to the City Council Superannuation Scheme, and the successful candidate will be required to pass a medical examination.

Applications, giving age and full particulars of technical training and experience, together with copies of recent testimonials, should be endorsed "Principal Power Sales Assistant," and addressed to me, and not to any member of the Council, so as to be received not later than 10 a.m. on Monday, 31st March, 1947.

Canvassing, directly or indirectly, will disqualify.

PHILIP B. DINGLE,
Town Clerk.

Town Hall,
MANCHESTER, 2.
March, 1947.

METROPOLITAN BOROUGH OF FULHAM.

ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the following positions on the established staff:—

Clerks (Male or Female).

Candidates must hold, as a minimum, the Schools Certificate. Experience in the work of an Electricity Undertaking will be an advantage. The appointments are in the Clerical and General Divisions of the National Joint Council Scheme of Conditions of Service.

Clerical Division.

Applicants must be between 21 and 30 years of age and have had training and experience in accountancy work.

Salary: Males commencing at £335 rising to a maximum of £380 plus cost of living bonus at present £59 16s. per annum. Females commencing at £268 rising to a maximum of £304 plus cost of living bonus at present £48 2s. per annum.

General Division.

Males: 16 to 26 years of age. Salary £65 to £300 per annum, plus London Weighting £10 to £30 and cost of living bonus at present £24 14s. to £59 16s., according to age. Females: 16 to 30 years of age. Salary £52 to £240 per annum, plus London Weighting £8 to £24 and cost of living bonus at present £20 16s. to £48 2s., according to age.

The appointments are subject to medical examination and to the Local Governments Superannuation Act, 1937.

Forms of application and conditions of appointment may be obtained on sending me a stamped addressed envelope (endorsed with title of position applied for). Completed applications must be posted to reach me not later than 12 noon on 8th April, 1947.

C. F. THATCHER,
Town Clerk.

Town Hall,
FULHAM, S.W.6.

EXPERIENCED DRAUGHTSMEN required for the mechanical design of large D.C. and A.C. machines by Mather and Platt, Ltd., Park Works, Newton Heath, Manchester, 10. Write c/o Employment Department.

SITUATIONS VACANT

BEDFORD CORPORATION ELECTRICITY UNDERTAKING.

APPOINTMENT OF CONSUMERS AND INSTALLATION ENGINEER.

APPLICATIONS are invited for the above appointment from persons, with sound technical training, who have had considerable experience in electrical installation work, the repairs and maintenance of electrical appliances, sales and showroom Departments.

The successful candidate will be expected to supervise these Departments and to be able to prepare complete installation schemes and estimates and able to advise consumers and conduct correspondence.

Applicants should be Corporate Members of the Institution of Electrical Engineers.

Salary and Conditions of Employment will be in accordance with the National Joint Board Schedule, at present Class "G," Grade 5, commencing salary £573 per annum.

The appointment will be subject to the provisions of the Local Government and other Officers Superannuation Act, 1922, and the successful candidate will be required to pass a medical examination.

A flat will be available to the successful candidate at a reasonable rent.

Applications, containing full details of age, qualifications and experience, accompanied by copies of three testimonials, to be forwarded to the undersigned not later than the 24th March, 1947.

Canvassing, either directly or indirectly, will disqualify the candidates.

P. G. CAMPLING,
Chief Engineer and General Manager.

Electricity Offices,
Prebend Street, BEDFORD.
March 1st, 1947.

SOUTH LANCASHIRE TRANSPORT COMPANY.

ELECTRICITY GENERATION AND DISTRIBUTION DEPARTMENT.

CABLES and Sub-stations working Charge Hand required with experience of E.H.T. Cables and L.T. Cable work, also with Mercury Arc Sub-station equipment, together with lighting and power in Depots.

Conditions of employment are according to the National Joint Industrial Council, present rate 31.75 pence per hour. Applications giving age, experience, training and references to the Managing Director, E. H. Edwardes, Esq., Transport Offices, Leigh Road, Atherton, Lancs.

FIRST-CLASS Electricians required. Used to all systems. Permanent posts to right men. Apply—R. J. Kemp and Co., Coalville.

SITUATIONS WANTED

ADMINISTRATION.—Advertiser offers services in administrative capacity in charge of electrical appliance service department or in similar technical appointment. Accustomed to responsibility and control of technical staff, stores, and correspondence. A.M.Brit.I.R.E., 6 years Electrical Officer in Royal Navy, mostly in charge of department. Age 30, single, and has accommodation in London. Salary reasonably commensurate with qualifications and experience. Now demobilised and free. Please write, indicating nature of appointment: BM/PASO, London, W.C.1.

YOUNG man, 32, 16 years' technical experience all types telecommunications equipment and lines, seeks situation with prospects. Similar line or electrical engineering.—Box L.E.I., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

SALES BY AUCTION

G. R.

BY ORDER OF THE MINISTER OF SUPPLY.

Without Reserve.

THE MINISTRY OF SUPPLY DEPOT, NO. 123. NORTON FITZWARREN, NEAR TAUNTON,

(Within 2 miles of the centre of Taunton.)

SALE BY AUCTION OF ABOUT
8 000 FELT-LINED AND OTHER TARPAULINS,
650 SLEEPING BAGS,
A LARGE QUANTITY OF PARACHUTE EQUIPMENT,
900 AIRCRAFT TYRES AND QUANTITY OF INNER TUBES,
200 GENERATING UNITS,
Petrol driven from 14.25 to 240 volts and from ½ to 5 Kilowatts A.C. and D.C.
LARGE ASSORTMENT OF CARPENTERS' ENGINEERS' AND ELECTRICIANS' TOOLS AND EQUIPMENT,
400 ONE, TWO AND THREE TON CHAIN HOISTS, 1 800 CHIEF AIR CREW ASSEMBLY STANDS,
QUANTITY OF CANVAS AND FELTINGS,
FOLDING PARACHUTE TABLES,
LAMINATED TABLE TOPS, AIRTIGHT BOXES, CANVAS TOOL BAGS,
PERSPEX GLASS, ROPE, CASES AND TRUNKS, JACKS,
PORTABLE STARTERS AND HEATERS,
EXTENDING AND OTHER LADDERS,
COMPASSES,
FLOOD-LIGHTS, ANTI-ICING AND INSULATING COMPOUNDS, ETC.,
130 MOTOR VEHICLES AND TRAILERS.

AUCTIONEERS:

W. R. J. GREENSLADE & CO., F. L. HUNT & SONS, A. W. PARKER & CO.

(Fellows of the Auctioneers' and Estate Agents' Institute),
Acting in conjunction.

SALE DAYS: TUESDAY, WEDNESDAY, THURSDAY AND FRIDAY, MARCH 25th, 26th, 27th and 28th, 1947, at 11 o'clock punctually each day.

VIEW DAYS: FRIDAY, SATURDAY AND MONDAY, MARCH 21st, 22nd and 24th from 10 a.m. to 3 p.m., and on SALE DAYS from 9 a.m. to 10.30 a.m.

CATALOGUES: Price 6d., may be obtained from the Auctioneers:—
W. R. J. Greenslade and Co., 3, Hammet Street, Taunton (Tel.: 2601),
F. L. Hunt and Sons, 9, Hammet Street, Taunton (Tel.: 2743), and
A. W. Parker and Co., 53, East Street, Taunton (Tel 2101).

Applicants for Catalogues—Please mark envelopes M.O.S.

ADMISSION WILL BE BY CATALOGUE ONLY.

AGENCIES

MANUFACTURERS of and dealers in Electrical accessories, Equipment and Cables desirous of exporting their products to a reliable engineering firm in Northern India are asked to communicate with Colonel R. W. Cardew, Thesowes, Ashton, near Helston, Cornwall.

WELL-KNOWN and influential importing house having very good connections and a vast field of clientele desires sole representation of all electrical goods. Please contact Vyas Brothers, Post Box 2036, 33, Nanabhai Lane, Churchgate Street, BOMBAY.

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.

FOR SALE

FOR SALE.—Large quantity of new Starter Cable 61/.036 at £12 per 100 yds.—Apply G. A. Day Ltd., London Road, Portsmouth.

SACKS and Bags in excellent condition for all commodities, as low as 4½d. each. Write: John Braydon Ltd., 230, Tottenham Court Road, W.1. Tel. No.: Museum 6972.

100 /150-a., 500/250-v., unused Artic Fuses, £1 10s., and S.P., D.P., T.P. Knife Switches for swbd. mounting, £1 per S.P.—Gath's, Hipperholme, Halifax.

TO all manufacturers of radio and electrical goods.—L. Goodman (Radio) Ltd., 9, Percy Street, Tottenham Court Road, W.1, have the following surplus goods for disposal: 400 Syndanyo Panels, size 27 in. by 23 in., bevelled edges ¾ in. thick. Large quantity of Hellerman Rubber Sleeves in all sizes. Midget Radio Cabinets. 2 Tons 22½ S.W.G. D.C.C. Wire. Large quantity 16/012 3 Core Flex. 4 000 SBC Holders, Fluorescent Fittings 5 ft. and 4 ft. complete. Fluorescent Chokes. Power Factors. 15 and 30 amp. 2 way Fuse Boxes. 60 000 :01 Mica Condensers. Phone: MUSeum 0216.

OVERHEAD Bus-bar Trunking System. Patent Rights for Sale. System well tried out, many thousands feet in use to-day. Entirely satisfactory, mechanically sound, extremely efficient. Unique design for Home or Export. Limitation of space for manufacture reason for disposal.—Box L.E.F., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

60 GROSS yds. Delaflex Varnished Cotton Insulating Sleeving, assorted sizes. 100 000 yds. Yellow Rubber Connecting Wire, size 1/22 and 1/20 S.W.G., wrapped in 500 yd. coils. 180 50 yd. Rolls, 7 in. wide, Black Insulating Varnished Silk Cloth, .004 thickness. Reasonable offers wanted.—Box L.E.G., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

ELECTRIC HOIST BLOCKS, capacity 5-cwt. to 7 tons. Reasonable delivery.—A Morgan and Co., 50, Wilkin Street, London, N.W.5. 'Phone: GUL. 1147.

ONE 4 h.p. Petrol driven Lighting Set for sale, developing 1½ kW at 60 V. The engine may be used separately for belt drive. Price £65.—W. A. Dawson, Ltd., Whitefield Road, Sundon Park, Luton.

1-H.P. Ransomes D.C. Electric Motor with 2 starter. Revs. 950, voltage 230, price £10.—Arnold and Son, Leatherhead.

ELECTRIC FIRE ELEMENTS: 1 000 watt pencil type elements available from time to time. With dural screwed on end caps and terminals. 4s. 6d. each NETT. Sample including post and packing, 5s. No reduction for quantities, but no post or packing charges on lots of 100 and over. Overall length about 10⅜ in. Oblong curved front firebars also in stock. 7 in. by ⅜ in. face (i.e., fire opening dimension), 5s. 6d. each. 8 in. by 3 in. ditto, 5s. 9d. each. SPIRALS (coiled nickel chrome elements) only. Send details of your requirements and we will quote you. Sample 1 000 watt spirals, 16s. per doz., post free. Please state voltage on all element orders. ELECTRIC FLOOR STANDARDS: Full size metal type, sprayed finish, three colours available, blue, cream, green, complete with holder and circular flex, scrolled metal legs, £2 each, to clear, including carriage and Purchase Tax. LARGE QUANTITY 2 B.A. brass C.S. screws, ¾ in., nuts and washers for disposal. Screws 2s. 6d. per gross. Full hexagon nuts, 2s. 2d. per gross. Washers 4d. per gross. All post free. TOGGLE SWITCHES: 5/10 amp. flush type with long dural dolly and two hexagon dural fixing nuts. Useful as fire switches, etc. Sample, 2s. 6d., post free. 27s. per doz. Special prices for large quantities.—Pruden and Pope, 38, Church Road, Upper Norwood, S.E.19. Tel.: LIVingstone 1426.

FOR SALE

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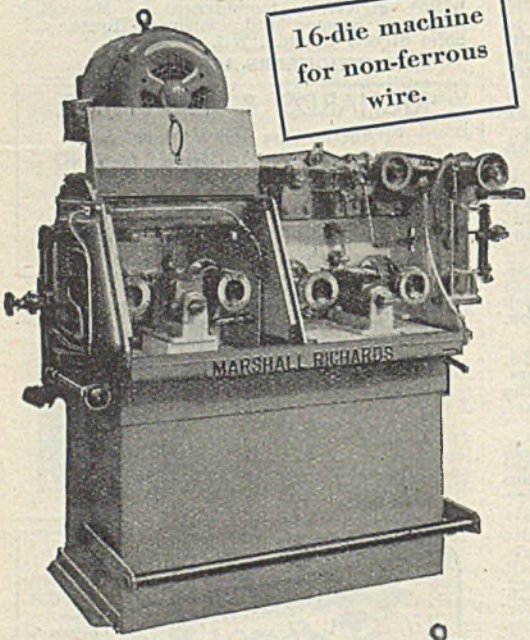

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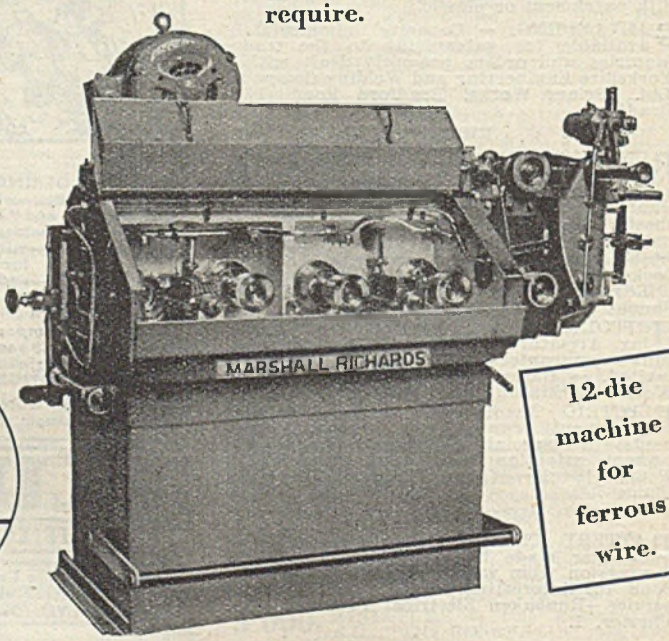

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Next Winter's Fuel

THOUGH the electricity supply and manufacturing industries have to some extent settled down after the interruption caused by the coal crisis, circumstances are in many instances far from normal, nor are they likely to be for some time. Against a background of uncertainty in the continuity of both power and materials is an understandable anxiety of what might happen next winter, for the target mentioned in the White Paper of 200 000 000 tons of coal for the year, is regarded by many in the supply industry as inadequate.

As explained in the last issue of THE ELECTRICIAN, the Government is budgeting for a weekly coal consumption figure for electricity generation of 580 000 tons —a figure which, with even the present restrictions applied indefinitely to domestic consumption of electricity, would make the building up of stocks extremely difficult, if not impossible, and the prospects facing the supply industry next winter are therefore causing apprehension.

This anxiety was increased on Monday, when in the three-day debate in the House on the economic affairs of the nation, SIR STAFFORD CRIPPS pointed out that the Government had taken an estimate of 89 000 000 tons of coal as available during the six summer months, of which 11 800 000 tons would be consumed for electricity generation. This figure gives an average weekly tonnage of 453 846, or less by 126 154 tons when compared with the 580 000 tons previ-

ously mentioned, and will make the building of stocks even more difficult. Coal deliveries to power stations in the winter months have always been erratic, due to weather conditions and other causes, and it has therefore been the practice of the industry in the past to hold in reserve, stocks of about six weeks' duration. The Ministry of Fuel, on the other hand, appears to hold the view that stocks of a volume to last four weeks should be adequate, and so far as we can ascertain regards the building up of such a stock as being practical politics with a weekly summer consumption of coal of 453 846 tons. Be that as it may, we submit that until the Ministry makes it possible for the supply industry to revert to its former practice of carrying six weeks' coal stocks, there is facing the country a danger of another power crisis in the winter of 1947-48, every bit as crippling as that through which we have just come.

A Dubious Saving

SUPERFICIALLY, the emergency decision, on February 12, to reduce the statutory limits of voltage appears to have been a reasonable way of obtaining a forced and impartial drop in consumption. One wonders, however, whether the real saving achieved is up to expectations and, if so, whether the gain in coal justifies the inconveniences caused. In the first place, it should be remembered that for months past the voltage available at the far end of overloaded feeders has remained at the lower limit, to take an optimistic view, of the statutory value, and with the recent reduction pressures of well below 200 V have, it seems, been by no means uncommon on nominal 230 V mains. Arising from this, users of small motors have experienced difficulties both in starting and running, test instruments with limited powers of voltage regulation have become unreliable and countless industrial processes, to judge from reports, are at reduced efficiency. So far as the domestic user is concerned, it is doubtful whether the voltage reduction saves any appreciable power, since boiling and cooking take longer, while, presumably, heat losses through convection, etc., are spread over a correspondingly greater period. The radio receiver not provided with mains transformer tappings is for the most part distorted even when programmes are available, while the useful output of incandescent lamps is probably reduced far more than 5 per cent. by this drop in voltage. The latter condition seems a direct hint to the public to buy higher wattage lamps, and those who have sat shivering before the barely glowing bar of an electric fire will agree that the temptation to switch on another element can be very strong indeed. This particular move in the prevailing march to greater austerity should, we submit, be carefully reconsidered before an awakened public starts a run on auto-transformers.

January Overseas Trade

THE Board of Trade returns for January indicate that in spite of most favourable overseas market conditions, our progress towards economic stability is not gaining that momentum essential for success. The value of exports during the month was £91.2 million, which was £0.9 million less than in November although greater than in any other month except last July, and January had 27 working days compared with 26 in November. Allowing for the rise in prices since 1938, the value of exports in January is estimated provisionally as only 12 per cent. greater than in 1938, compared with 15 per cent. in November and 20 per cent. in July. The value of imports in January was £121.4 million. Retained imports of raw materials were £3.5 million below the average for the previous quarter. The value of electrical exports showed an increase of £325 458 on the December total, which was affected by the holidays, but was £451 694 less than the figure for November. We are, therefore, still far from within measurable distance of reaching the target of 75 per cent. above the exports for 1938, originally set by the Government, and as competition becomes intensified in foreign markets the task will become proportionately more difficult. It is only by increasing productivity to an unprecedented degree and decreasing the cost of production so that the prices of our manufactures can compare favourably with those of competitors that we will be able to regain national stability. The coal crisis, the main cause of which was lack of foresight and practical planning, brought

about an almost disastrous setback from which it will take industry months to recover, and has made the general presentation of demands for more pay and shorter working hours less possible of satisfaction.

Research and its Reward

SUPPORT of the E.R.A. in the future will without doubt pay as good a dividend as any before, and as an indication of its value, one has only to call to mind the remarkable success which has followed its investigations into switchgear arc control devices, and dielectrics. With regard to the former, the gas blast and oil blast methods, introduced by the E.R.A., largely form from an international point of view, the forefront of circuit breaker development, while, as to dielectrics, the association has pointed the way to many of the main advances in new materials, despite the handicap of shortage of money for expenditure upon this type of investigation. The necessity of increasing our output per man hour, raising the units generated per lb. of coal consumed, point more directly than ever to the importance of such bodies as the E.R.A., for it is only by research and more research that we are likely to attain that state of efficiency, that lowering of production costs, that flow of consumer goods which will permit this country to regain its prosperity. Notwithstanding these facts no mention of the association is made in the Electricity Bill.

Future of the E.D.A.

THE possible effects of nationalisation on the E.R.A. apply to some extent to the future of the E.D.A., for though the objectives of these two associations are different, they are both concerned with ultimate benefits to the public. The E.D.A., like the research association, is dependent upon the supply industry for an appreciable amount of financial aid, and its future in a nationalised industry was referred to at the North-West England and West Wales Area luncheon in Manchester last week. That the association should continue to enlighten the public in the use and application of electricity is not in doubt; that the Consultative Councils named in the Bill might usurp to some extent the functions now carried out by the E.D.A. was noted in THE ELECTRICIAN of January 27, and the industry was quick to respond. As in the case of the E.R.A. the position of the E.D.A. needs clarifying by the Minister of Fuel, for though at the moment its normal rôle of promoting electrical development cannot be given its full scope, the association can, as it did in the war years, do much to bring about economy in electricity consumption, both by instruction in the proper use of domestic appliances and by publicising the need for economy. Appeals to the public by the Ministry of Fuel to switch off during the restricted hours, have, quite wrongly, in some cases been ignored on political grounds, as is indicated by the many letters published in the national Press. Similar appeals made in the future by an independent, and non-political body like the E.D.A. would, we suggest, be more readily accepted by those who do not yet fully appreciate the seriousness of the position, and the Ministry should, therefore, take every advantage of the machinery which the association built up in more prosperous times for carrying its message to the public, and which was used to such good effect during the war.

Planners and Productivity

A BRAKE on progress and one of the chief causes of delay in the erection of power stations and the commissioning of much-needed generating plant, has been the spate of planning with conflict of planning interests. In this connection a timely word of warning was uttered by Sir CLAUDE GIBB at the annual luncheon last week of the Northern Counties Area of the British Electrical Development Association. "Some people," he said, "are now wondering whether the country is approaching the stage when everyone will be engaged in planning and no one in producing. As a nation we are losing sight of the fact that the men who win the raw materials and fabricate the products contribute most to the wealth of the nation. Production is the result of team work, but in a competitive world a production unit will soon go out of business if the proportion of non-producers to actual producers becomes too high. A little more planning and a little less doing and the country will be over the brink. There is no alternative to hard work. The planning of theorists, political or otherwise, is no substitute."

E.D.A. Area Activities

Annual Meetings in Northern Counties and North-West

SPEAKING on March 4 at the luncheon of the Northern Counties Area of the E.D.A., Sir Claude D. Gibb, chairman and managing director of C. A. Parsons and Co., Ltd., said that the electricity supply industry had no need to be ashamed of the fact that to-day there was a shortage of generating plant, and that the shortage was likely to continue for several years. It was a matter of pride for the industry that it stopped normal development and released productive capacity which had had a major effect in winning the war. Those concerned with the manufacture of generating plant knew only too well the time taken to secure all the many authorisations needed before a new power station, or the type of building needed, could be decided. Many of these delays were due to " super planning." Some people were now wondering whether the country was approaching the stage when everyone would be engaged in planning and no one producing. As a nation we were losing sight of the fact that the men who won the raw materials and fabricated the products contributed most to the wealth of the nation. Production was the result of team work, but in a competitive world, a production unit would soon go out of business if the proportion of non-producers to actual producers became too high. A little more planning and a little less doing and the country would be over the brink. There was no alternative to hard work. The planning of theorists, political or otherwise, was no substitute.

At the first meeting of the newly constituted Area Committee, the chairman and vice-chairman appointed for the ensuing year, were respectively, Mr. H. H. Mullens, assistant general manager, North-Eastern E.S. Co., Ltd., and Mr. R. L. Hewling, chief electrical engineer, Skelton and Brotton U.D.C.

FUTURE OF E.D.A.

The part the Electrical Development Association will play in the nationalised electricity supply industry gave rise to conjecture in some of the speeches at the annual luncheon of the North-West and North Wales Area E.D.A. at Manchester, on March 6.

Ald. Sir William Walker commented on the paradox of the E.D.A. now having to do everything possible to restrict the use of electricity. Apparently, in the Electricity Bill no provision was made for the continuance of such organisations as the E.D.A., and financing them. Most people in the industry who had come to the conclusion that nationalisation was inevitable, felt it would be a wrong step for the Government not to avail itself of the knowledge and experience which had been accumulated over many years.

DEMAND FOR ELECTRICITY

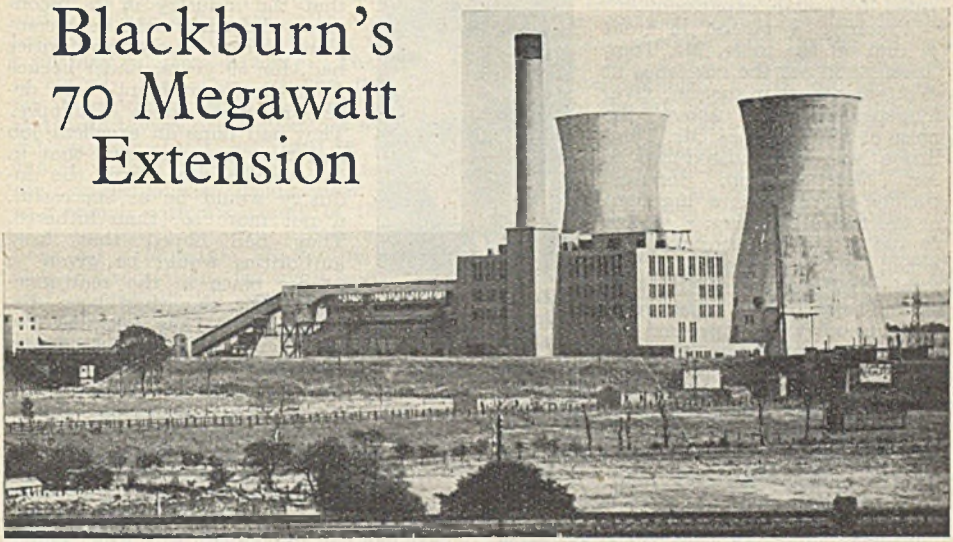
Mr. H. J. Randall, chairman of the E.D.A. Council, said the fuel crisis had made many people realise for the first time the extent to which industry was dependent upon an abundant supply of electricity, but it was probably more needed in the cottages and small homes than anywhere else. If there were now sufficient generating plant and sufficient fuel to run that plant, they would now be witnessing the greatest boom in electricity this country had ever known.

" We are being asked whether in view of the restrictions on the use of electricity and impending legislation, there is any need for the continued existence of the E.D.A. I cannot help feeling that the authorities at the end of this year or at the beginning of next year, whenever is the vesting date, will be well advised to continue this organisation, though necessarily there will have to be changes in its constitution."

Mr. G. A. Robertson, chairman of the Area Committee, reported on the work of the Area Textile Sub-Committee. Six thousand copies of the booklet " Electricity in the Service of Cotton," had been printed and work was now in hand on other booklets dealing with electrification in the spinning industry, the dyeing and finishing section, the lighting of textile mills, etc. A lecture service had also been provided in conjunction with manufacturers of electric motors and other equipment. The sub-committee had made a survey of 1 400 cotton mills and from this it would appear that the conversion from steam drive to electrical drive would save the country something like 750 000 tons of coal per annum.

Mr. E. J. Cook, engineer and manager of Chapel-en-le-Frith undertaking, was elected chairman and Mr. P. Bregazzi (St. Helens) vice-chairman, of the Area Committee at the annual meeting. The report stated that the major feature of the work in Lancashire was the formation of the Textile Sub-Committee under the chairmanship of Mr. R. H. Harral (Blackburn).

Blackburn's 70 Megawatt Extension



View of the Whitebirk Station of Blackburn Corporation, where last week a 70 MW extension was officially commissioned by MR. GEORGE TOMLINSON, *Minister of Education*

THE Whitebirk power station of Blackburn Corporation, though first conceived in 1912, took shape from the increased demand for electricity which followed the 1914-18 war and initial work upon constructing the first half of the station commenced in 1919. This was put into commission in 1921 and in the following year, the second half was put into commercial use, giving the station an aggregate capacity of 25 000 kW. In 1939, Whitebirk, became a "selected" station, and in the following year at the direction of the Central Board work began on an extension to the Blackburn undertaking of 30 000 kW for commercial operation in 1943, raising the capacity of the station to 55 000 kW. This was followed by a further direction for a second extension comprising 40 000 kW, for commercial use in 1945, and raising the aggregate capacity of the station to its present-day figure of 95 000 kW.

Work on these extensions was commenced in August, 1940, and they form the first two stages of a major plan for the station, in that there are two further stages of extensions yet to be put in hand which will result in the total generating capacity being raised to 150 000 kW.

The completed extensions were constructed to plans and specifications prepared by Mr. Richard H. Harral, the undertaking's electrical engineer and manager, who was appointed by the Council to act as consulting engineer, and by whose courtesy we are able to include in this issue a brief description of the technical details.

The extensions were officially opened on March 7, by Mr. George Tomlinson, formerly Minister of Works, and now Minister of Education, at a luncheon presided over by Ald. E. Porter, chairman of the Electricity Committee.

Mr. Tomlinson, at the luncheon, said that, of late, the dependence of the home and of industry on adequate supplies of electricity had been thrown into sharp relief. It was a paradox of the times that whilst envisaging extensions in the production and use of electricity, it was sometimes necessary to curtail supplies. This was where extensions, such as those at Blackburn, could make a double contribution, an immediate contribution of plant and a long-term one in coal saving. The Central Board's programme for the next four years aimed at increasing the national generating capacity by 5 000 000 kW, and already a direction had been given for a further extension of the Blackburn station by the installation of another 40 000 kW turbo-alternator.

In the past, Blackburn had been justly proud of its progress. An increase in seven years of 20 per cent. in the number of consumers, and over 80 per cent. in the units sold was no mean record. But

generating plant must be provided to match expansion.

Touching a button in front of him on the table, Mr. Tomlinson then set the machines at Whitebirk East in motion. Over loudspeakers and above the noise of the machines, Mr. Tomlinson was then introduced to Mr. Geo. Wilson, foreman turbine driver. As a highlight of the formal opening, a replica of the station interior was unveiled on a screen in the Public Hall, and from Whitebirk station—nearly two miles away—Mr. Geo. Wilson expressed the thanks of the operating staff to the Minister for his attendance.

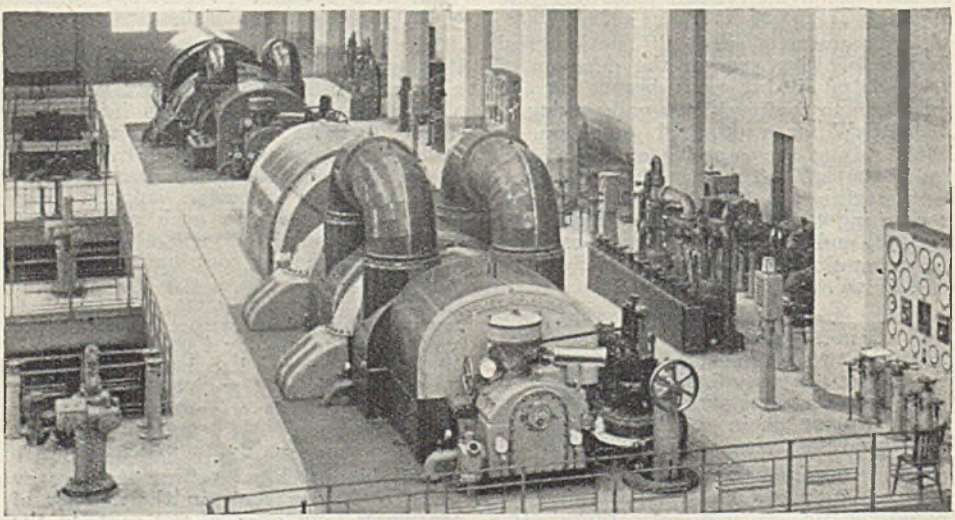
MR. R. H. HARRAL, *electrical engineer and manager*

Councillor G. B. Eddie, as leader of the Town Council and a member of the Electricity Committee, referring to the nationalisation of the industry, said that the Blackburn undertaking had not always been so flourishing. At one time it had required "special nourishment," costing £200 000, which had come out of the rates. He offered congratulations to the pioneers of the scheme and to Mr. R. H. Harral and his staff, who had done so much to establish the undertaking in its present position.

The toast of "Our Guests," proposed by Councillor E. Woolley, J.P., was responded to by Mr. J. S. Pickles, president of the Incorporated Municipal Electrical Association.

Mr. Pickles said, in regard to nationalisation, that there were two points of which he hoped Mr. Tomlinson would take note and discuss with his colleagues of the Cabinet. They were all anxious that the industry in its reconstructed form should be a complete success. Local authorities had, for 50 years, under licence from the Government, been developing their areas of supply. They had done an excellent job and they were anxious that in its reconstructed form the industry would be as successful, if not more so, than hitherto. They had hoped that local authorities would be given a proper place in the rearrangement, but they had been disappointed. They felt that the electricity undertaking should have strong roots in every region, and they therefore suggested that before the Bill became an Act something should be done to give local authorities a better place than they had at present in vision.

His second point was that electricity had always been progressive and prosperous because of the stimulus of competition. They had had to compete with other industries—with coal and gas, for instance—and they enjoyed the competition. There had also been competition in the industry itself between different undertakings—between company and municipal. In the reconstructed industry it was essential that the spirit which had manifested itself down the years should be maintained. This could only be done if the Government provided a flexible type of organisation, permitting the Area Boards which were to be set up to act as ordinary business enterprises.



The turbine room with the 30 MW set in the foreground

The new 70 000 kW of plant is made up of two turbo-alternators, one of 40 000 kW and the other 30 000 kW, with six 150 000 lbs./hr. boilers and two cooling towers of 1 800 000 gal./hr. capacity. The station is entirely dependent on the two latter for its condenser circulating water supply and both towers are Davenport hyperbolic concrete structures, each 250 ft. high and 165 ft. in dia. at the sill. A feature of each tower is that inside, near the top, is a trough with a capacity of 10 000 gal. of water which provides a constant water head for a Mulsifyre fire-fighting installation in the station, for main transformers and a new 33 kV switch-house to be described. The trough is kept supplied by condensation at the top of the tower, but provision is made for pumping water should it be necessary.

COAL HANDLING PLANT

Normally coal is transported to the station by rail and canal, but there are also facilities for road-borne supplies. On the railway siding is a wagon-tippler roughly in line with the boiler-house firing aisle, rail-borne coal being taken from the siding to the bunkers by a duplicate straight belt-conveyor on an enclosed gantry in three sections, with towers at the junction points. Canal-borne coal is handled by a crane near the second conveyor-system tower. Distribution and reclaiming are effected by a drag scraper system.

All the boilers are Simon-Carves tri-drum water-tube type with International Combustion, class " L " chain-grate stokers. Melesco superheaters, Senior Heenan twin-tube economisers, and Howden regenerative air heaters. The circulatory system in each case embraces bare-tube water-cooled walls, and the combustion chamber has a volume of 10 900 cu. ft. The steaming conditions are 630 lbs. per sq. in. and 875° F., each boiler being equipped with twenty Clyde soot-blowing points, automatically sequence-operated after push-button operation of the first point. Ash is dealt with by a l.p. water-sluice system, the ash and water being discharged into a sump outside the boiler-house. A telpher with perforated grab feeds the ash into an elevated bunker for discharge into disposal lorries. The water is again circulated through the system.

All the boilers are fully automatically controlled from a separate control room equipped with complete Kent instrumentation for all records and indications necessary for general efficiency. The automatic control employs a single master controller connected with a master steam receiver, and is mounted on a central control panel. The master controller governs directly the speed of the f.d. and i.d. fans on each boiler by adjusting the position of the scoop tubes in the hydraulic couplings. A furnace pressure controller in each boiler measures any change of suction in the combustion chamber and further adjusts the f.d. fan speed, preserving balance-draught conditions. A fuel air controller measures the air flow and rate of fuel feed to each of the boilers. A control desk with manual/automatic changeover switches allows the boilers to be manually-controlled from the firing floor, remotely but manually from the control room, or fully automatically. There is also an " on " or " off " automatic control master switch on the desk which is equipped with miniature steam flow indicators and ammeters.

The heat cycle for the combined boiler and turbine plant is on the closed-feed principle, the returning condensate being treated in four feed-water heaters; two fed with steam bled from the h.p. cylinder and two with steam bled from the l.p. cylinder. Make-up water from the town supply is dealt with by a Weir vertical evaporator, fed with steam bled from the same point as that which serves No. 3 (h.p.) feed-water heater.

Altogether, there are in the new station four Mather and Platt feed pumps, three motor-driven and one steam turbine driven, all common to both turbines and all the boilers. Each pump has a capacity of 40 000 gal. per hour against 850 lb./sq. in. Delivery from the first h.p. heater is direct to the economisers through Copes feed-water regulators and the surge water goes to four 15 000 gal. surge tanks.

THE TURBO-ALTERNATORS

Both turbo-alternators are English Electric 3 000 r.p.m. machines. The turbines each have two cylinders, h.p. impulse and l.p. double-flow reaction, and in the 40 000 kW set there are 19 fixed and 19 moving stages in the h.p. cylinder and 11 fixed and 11 moving stages in each flow of the l.p. cylinder. Each turbine has a centrifugal governor which operates the main throttle valve, the nozzle valve and the overload valve through oil relay gear. The turbine stop valve steam conditions are 600 lbs. per sq. in. and 850° F. Generation is at 33 kV direct, and the alternator capacities of 40 000 kW and 30 000 kW are at 0.8 p.f. lag. The alternators are directly-coupled and separately-excited and are ventilated on the closed-circuit system with water-cooled air coolers. There are two separately driven fans per set, outside the foundation block, and the total amount of air required at m.c.r. for the alternator, exciter and slip-rings is about 82 000 cu. ft. per min. for the larger set.

Each set discharges to a pair of English Electric condensers with a total cooling

surface of 30 000 and 40 000 sq. ft. The condensate is dealt with by two 467 and 700 gal. per min. Drysdale two-stage vertical spindle extraction pumps, and the air is extracted by two 110 and 150 lb. per hour Hick Hargreaves two-stage steam-jet air ejectors.

The extensions include a new 33 kV switch-house built separately from the station, and measuring overall about 164 ft. long, 46 ft. wide and 26 ft. high. The principal of segregation is continued inside the building, which contains in separate compartments, the control and metering room, busbar zone protection, battery, neutral earthing and fire service rooms, in addition to the main switch room. The latter is further sub-divided by the provision of division walls and sliding fireproof doors.

The main switchgear, of Reyrolle manufacture, is of the metal-clad compound-filled, duplicate-busbar, horizontal draw-out type, with provision for busbar selection by means of removable plugs. The circuit-breakers are solenoid-operated and interlocking and safety features are provided to prevent inadvertent and unauthorised operation. The switchgear is fitted with turbulators and has a breaking capacity of 1 000 MVA. There are at present twelve switch units installed, six of 1 200 A, and six of 800 A carrying capacity, which, with the exception of one unit, namely, a 1 200 A busbar section switch, are situated in two switch rooms, five in one and six in the other.

The switchgear is normally controlled from the main control board in a turbine room annexe in the power station, but there is an emergency control board in the new switch-house. Control and indicating devices associated with the operation of the alternators, transformers, feeders, and other circuit-breakers are interposed in a system diagram, on the control boards.

Supply is distributed to 36 548 consumers and there are at present 148 substations connected in the system. The total area of supply is over 40 sq. miles, served by a total of 525 miles of 33 000 V, 6 600 V and medium voltage cable. In addition, there are over fourteen miles of overhead lines operating at 6 600 V, together with many miles of medium voltage overhead lines serving the rural district and isolated farm premises.

The main contractors of electrical interest engaged in the extensions included: (turbo-alternator sets and condensers) English Electric Co., Ltd.; (steam generating units) Simon-Carves, Ltd.; (automatic boiler control) George Kent, Ltd.; (steam and feed pipework) Babcock and Wilcox, Ltd.; (switchgear) Reyrolle and Co., Ltd.; (transformers) English Electric Co., Ltd. (coal handling plant) Simon-Carves, Ltd., New Conveyor Co., Ltd.; (drag scraper equipment) International Combustion, Ltd.; (ash handling plant) Simon-Carves, Ltd.; (power and control cables) W. T. Henley's Telegraph Works Co., Ltd., Edison Swan Cables, Ltd., Pyrotenex, Ltd.; (concrete cooling towers and circulating water pipe-work) Davenport Engineering Co., Ltd.; ("Mulsifyre" fire protection) Mather and Platt, Ltd.; (electrical installation and cable work) Blackburn electricity department undertaking.

Fuel Consulting Service

A PLAN whereby a highly-qualified team of mining engineers and fuel technicians will tackle the dual problems of producing more coal and using that which is being produced to the best advantage was outlined, on Monday, when Mr. Robert Foot, managing director of the Powell Duffryn group and lately chairman of the Mining Association of Great Britain, announced the formation of a new company, to be known as Powell Duffryn Technical Services, Ltd.

Because of the importance attached to the coal problem in all countries, Mr. Foot stated that the Powell Duffryn group had decided to set up the new organisation to give practical help to industry in all matters of fuel production and utilisation, both here and overseas. Although its mines had now been transferred to the National Coal Board, the group—which had been the largest colliery undertaking in the world—had retained its existing organisation for promoting fuel efficiency and also a strong nucleus on the mining side. Their experience and knowledge would now be placed at the disposal of industry in general, through an organisation covering as independent consulting engineers the whole range of fuel problems. Its work would be complementary to that of the Ministry of Fuel, and close attention would be paid to such developments as district heating.

It was explained that, although associated with a colliery undertaking, the new organisation would not hesitate to give impartial advice to any firm seeking its service, whether this meant recommending solid fuel, gas, oil, or electricity as a source of power. The sole criterion would be the maximum efficiency. Furthermore, their consulting engineers would be prepared to plan and supervise the building of new concerns.

In the course of his statement, Mr. Foot revealed that research carried out by Powell Duffryn, Ltd., into the carbon products of coal had produced results, details of which would be announced later, of considerable importance to the electrical industry.

The Industrial Close-Down

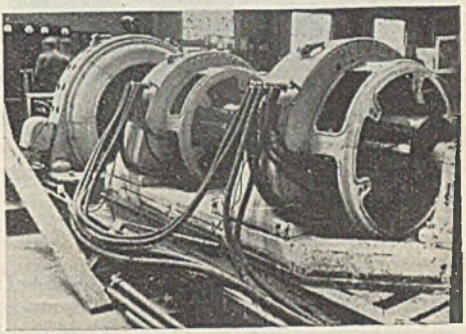
Measures Taken by Manufactures to Maintain Production

BY ingenuity, foresight and a certain amount of good fortune, many manufacturers were able to arrange emergency power supplies to maintain a good proportion of their output during the recent fuel crisis, and below we continue from our last issue the story of how firms were affected and of measures taken to overcome their difficulties.

CROMPTON-PARKINSON, LTD.—At the Chelmsford works of the company about 70 to 80 per cent. of normal productive capacity was achieved by utilising the oil-engine generating plant in conjunction with a revised arrangement of their works' supply system. In the power house there are three Sulzer four-cylinder, vertical air-injection types, rated 550 B.H.P. at 225 r.p.m., which have given excellent service for 26 years; and one Crossley-Premier four-cylinder horizontal pressure-charged type, rated 550 B.H.P. at 273 r.p.m., installed 11 years ago. The engines drive Crompton 375 kW, d.c. generators giving a 230 V three-wire output through static balancers to a distribution network, which is also fed by rotary convertors, either by themselves, or in parallel with the generators. The a.c. required in the works is derived normally from an incoming 11 V feeder from the County of London Electric Supply Co., Ltd.

With no incoming a.c. supply available, the problem was to obtain one by utilising the d.c. generators. A scheme was prepared to cover contingencies during the war and was therefore adopted. This involved the use of two d.c. motor-alternator sets in the main machine test plant. One of these, a 400 kVA unit, had been regarded as more or less obsolete on account of age and was in need of complete overhaul. It was impossible to run the set on full load continuously until a considerable amount of work had been done on the foundations. The works engineer and his staff started work immediately the B.B.C. announcement was made on February 7. By adopting somewhat unconventional but effective methods of grouting-in they were able to test the set on Sunday afternoon ready to take load on Monday morning.

Apart from meeting the immediate problem of maintaining electrical power supply, the management were faced some time ago with the urgent problem of how to keep going the factory heating and process steam boilers when coal stocks were rapidly diminishing and could not be replenished fast enough, if at all. That problem has been solved by using waste-oil-treated coke breeze in place of coal. To avoid the labour of mixing the coke breeze and oil by manual handling, a special arrangement was devised, and fitted to the boiler hopper feeding system, to



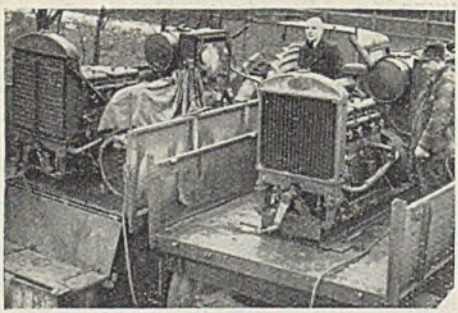
Aged d.c. motor alternator recommissioned to provide an a.c. supply at the Chelmsford works of Crompton Parkinson, Ltd., during the fuel crisis

spray the incoming breeze with oil atomised by fuel-oil injectors. This necessitated the installation of special air compressing plant. An additional refinement was obtained by developing a technique of over-feeding the fuel hoppers, and thereby causing an agitation, and a superior admixture of the oil-sprayed breeze during its upward passage to the hoppers; so that there was a constant overflow of prepared breeze down the overflow pipe to the pit adjacent to the incoming fuel feed. The prepared breeze stored in the pit was available for automatic feeding into the elevator to meet deficiencies in the breeze being fed straight into the elevator, due to its being damp or wet. It was found that the highest rate of combustion must be maintained, by using maximum draught, and keeping the furnace at its full capacity continuously.

The result of applying this waste-oil-treated coke breeze technique was that the works' boilers were kept going at full pressure throughout the whole of the difficult period when no coal was available.

THE PLESSEY CO., LTD.—By installing portable electric generating plant the company were able to continue with the design and development of their products. Two Diesel-electric mobile sets were obtained from the Canning Town Fair Ground, their 110 V d.c. generators being electrically coupled to provide a 230 V supply for lighting the design and development

laboratories. A.c. power for instruments and test gear was derived from an alternator driven by a Lincoln V-8 petrol engine.



Two Diesel-electric generators from Canning Town Fair Ground supplying power to the design and development laboratories of the Plessey Co., Ltd.

A Diesel-electric generating set, obtained from the company's Swindon works, supplied, through batteries, lighting in the administrative offices, and a small petrol electric generating set provided additional supplies for other essential work. With the restoration of power, work commenced in the machine shops on March 3. Production is developing day by day.

Siemens Bros. and Co., Ltd.—At the Woolwich works, where power is taken from the public supply, about 5 000 workpeople were given a week's notice with effect as from Tuesday, February 18. All processes requiring steam were stopped because of shortage of coal and only one boiler house was kept going to prevent the place freezing up. All production shops dependent on power were shut-down also, and the only people working were those doing a few essential jobs and maintenance work. The staff carried on their duties under difficult conditions. Arrangements were made to open up again as soon as power was restored, but it is anticipated that it will take many weeks to get back to normal production because supplies of materials have been interrupted.

Further Crisis Reports

FOLLOWING our account, last week, of the experiences of some of the larger supply undertakings during the crisis period, we have received further reports from chief engineers, of which the two following are a typical selection.

An area unaffected by industrial restrictions, and thus reflecting the extent to which domestic co-operation was effective, was Plymouth, where, Mr. H. Midgley told us, only 11 h.t. circuits could be opened without interference with essential supplies. The load that could be shed from these circuits amounted to approximately 18 per cent. of the normal morning peak. During the two weeks when the statutory order was effective, consumption dropped to 2 517 000 units and 2 556 000 units, respectively. The average undertaking demand at 10.30 a.m. during the fortnight ended February 26 was 14 500 kW, as compared with an average unrestricted level of 25 600 kW. When, after Sunday, March 2, the isolation of domestic feeders was discontinued, the 10.30 a.m. average demand rose to 18 513 kW.

No difficulty was experienced by his undertaking, Mr. Midgley said, in "picking up" load at the end of each restricted period, but trouble occurred at certain of the sub-stations, where the protective gear frequently operated on transformers fitted with balanced current protection, making it necessary for each sub-station to be inspected after the particular h.t. feeders had been switched in.

From the Bradford undertaking, Mr. T. H. Carr has sent an interesting set of load curves, comparing the restricted week-day and week-end demands with those of unrestricted weeks. In the first two weeks of the cuts, he estimated, approximately 1 700 tons of coal were saved, and the reduction in units sent out was of the order of 1 160 000 units per week. Since Bradford lay outside the area where industrial cuts were in force, great difficulty was experienced in switching off supplies to domestic consumers, and only a small percentage were so treated, except on Sundays, when it was found possible to isolate a greater proportion of feeders. No special measures were needed to meet the variations in load.

The Ministry of Fuel and Power exhibit at the Scottish Fuel Efficiency Exhibition, to be held at the Kelvin Hall, Glasgow, from March 19 to April 5, will consist of three displays illustrating, respectively, structural insulation, domestic heat services, and district heating. A conference on fuel efficiency in connection with the exhibition will discuss "The National Outlook" and "District Heating and Fuel Efficiency," on March 25; "Heating and Housing in Scotland—New Developments" and "Fuel Service for Scottish Homes," on March 26; and "Fuel in Scottish Industries," on March 27. On the Wednesday afternoon Mr. C. H. A. Collyns will speak on "Electrical Installations and Appliances" and on Thursday morning Mr. W. J. Cooper will deal with "The Place of Electricity in Fuel Economy."

The Electricity Bill

Opposition Challenge to Powers of Central Authority

DURING the continuation of the discussion, in Standing Committee, of the Electricity Bill, Oppostion members sought to reduce the powers given to the Central Authority under Clause 2—in which the Authority may manufacture, sell and hire plant and fittings and is to carry out " all such other activities as it may appear to the Authority to be requisite in connection with the performance of their duties or with a view to making the best use of any assets vested in them by the Act."

Mr. Gaitskell, Parliamentary Secretary to the Ministry of Fuel and Power, admitted that the Clause was widely drawn, but he thought it essential that the powers be equal to those contained in the memorandum and articles of association of the electricity supply undertakings.

To this, Sir Arnold Gridley said that shareholders were prepared to take risks, but this was another matter, as the taxpayers' money was involved. Despite numerous appeals, however, Mr. Gaitskell insisted that the powers of the Authority should not be limited in the way suggested.

Soon after this, an Opposition amendment which deleted from Clause 2 the subsection permitting " all such other activities " was carried against the Government by 24-11 through a misunderstanding, each side of the Committee, with one exception, voting opposite to the way they intended. This section will now have to be reinserted by the Government, presumably at the Report stage.

There was considerable discussion over the Authority's right to manufacture plant and fittings. Both Mr. Shinwell and the Parliamentary Secretary affirmed that the Government had no intention of going into this industry—it was not in their programme, said the Minister, although it might appear at some time. They must retain this right purely as a precautionary measure, he claimed, against price rings or restrictive practices.

The Minister accepted an amendment moved by Mr. R. S. Hudson, however, which will now prevent the Central Authority from manufacturing plant or fittings for export.

When the Committee resumed, on Tuesday, the Opposition withdrew an amendment seeking to ensure that prices charged for manufactured electrical fittings sold by the Central Authority should not be less than the recognised retail prices.

Mr. Shinwell said he saw no reason why there should not be healthy competition. On the other hand, if the Area Boards sought unduly to subsidise electrical fittings in any unhealthy fashion and enter into unfair competition with private traders he would regard that with disfavour. It was the intention, he said, that electrical fitting contractors, whether large or small, could be employed by the Area Boards as their agents.

Questions of electrical interest asked during the week included the following:—

Coal Requirements, C.E.B.—The Minister of Fuel was asked by Maj. Lloyd if he would give a list of the original, amended and supplementary estimates of coal requirements sent to his Department by the C.E.B. Two estimates, Mr. Shinwell replied, were submitted by the Board, the first, during July, 1946, for the period October 26, 1946, to April 25, 1947, and the second, on November 22, 1946, for the period November 30, 1946, to April 25, 1947. For the period January 3 to February 7, the original estimate was 640 000 tons per week on average, the revised estimate was 676 000 tons and the actual consumption was 685 000 tons. For the two weeks preceding the crisis (when the weather began to increase consumption and dislocate supplies), the Minister added, the corresponding figures were 627 000, 662 000 and 729 000 tons.

Coal: Thermal Efficiency.—During Question Time, the Minister of Fuel was asked by Mr. Marples what method was employed by the Central Electricity Board to check the efficiency of the power stations throughout Great Britain. Mr. Shinwell answered that continuous records were kept of the fuel consumed and the units generated at each station controlled by the Board, and from these the thermal efficiencies were calculated.

" Is it not a fact," Mr. Marples continued, " that the calorific value of the coal determines in a large measure the efficiency of the power stations? What steps are taken to check the calorific value of the coal delivered to the power stations? "

The Government were doing their best, the Minister replied, to supply the right quality of coal and to have regard to the design of the boiler plant, although it was not always possible to do so. Following this, Mr. Marples again asked what steps were taken by the Ministry to determine the calorific value. Mr. Shinwell answered that, on the one hand, they were in the closest association with the National Coal Board for the supply of coal, and on the other with the Central Electricity Board.

ELECTRICAL OVERSEAS TRADE

JANUARY EXPORTS EXCEED THOSE FOR DECEMBER BY £325 458

THE value of electrical exports in January showed an increase from £5 249 481 in December to £5 574 939, but did not reach the total for November, which was £6 026 633. The aggregate for January, 1946, was £3 229 919, whilst the monthly average in 1938 was £1 829 198. The balance of the value of exports over that of imports for the first month of this year was £5 436 918, the value of electrical imports being £138 021. This was £6 008 more than the total of £132 013 for the corresponding month of last year, but £65 795 less than that for December (£203 816). The monthly average for 1938 was £328 117.

Domestic radio receiving sets despatched to overseas buyers numbered 41 011, value £429 144, compared with 34 670, value £366 747, in December, 6 415, value £53 600, in January last year, and a monthly average of 7 053, value £36 755, in 1938. British India was the largest purchaser, taking 10 009 sets, Iran coming next with 5 937 sets. Electric lamps shipped showed a decrease from 3 189 475, value £95 086, in December, to 3 010 552, value £108 764 (including discharge lamps), in January. The comparative figures for January, 1946, and 1938, were 2 875 030, value £114 289, and 1 638 099, value £49 440, respectively. House service meters sent abroad increased from 21 314, value £57 616, in December, to 24 444, value £62 910, in January, contrasted with 18 877, value £37 732, in January last year, and 18 778, value £15 791, in 1938. Shipments of vacuum cleaners and parts decreased from 186 tons, value £151 215, in December, to 139 tons, value £116 964, in January, as against 22 tons, value £19 415, in January last year, and 55 tons, value £26 662, in 1938. Acceptances of welding machinery and electrodes increased from 281 tons, value £116 665, in December, to 737 tons, value £135 795, in January, compared with 1 061 tons, value £133 924, in January last year.

There were appreciable increases in the demands for electric cables, wires, etc., generators, motors and other electrical machinery. Despatches of rubber-insulated cables, wires, strips and strands increased in value from £274 546 in December to £384 821 in January, and similar products with insulation other than rubber from £301 156 to £359 513. In January last year the amounts were £173 064 and £313 973, respectively, and in 1938 £117 533 and £153 256. Purchases of generators rose from 1 192 tons in December to 1 863 tons in January, motors from 1 177 tons to 1 324 tons, and other electrical machinery, switchgear, transformers, etc., from 2 036 tons to 2 274 tons. The comparative quantities for January, 1946, and the monthly average of 1938 were: Generators, 666 tons and 858 tons; motors,

IMPORTS	Monthly average 1938	Month ended January 31 1946	1947
	£	£	£
Electric cables, wires, strips, and strands, insulated	31 246	920	2 774
Domestic radio receiving sets, complete, and chassis substantially assembled (including radiograms in 1947)	10 148	7 766	6 494
Telegraph and telephone equipment, line apparatus for long distance communication, speech input equipment and signalling apparatus (including testing equipment)	9 243	1 300	4 446
Radio communication and navigational aid (including radar) equipment, complete	47 870	38 731	1 606
Other descriptions			6 507
Valves, electronic, complete (including cathode ray tubes in 1947)	10 893	5 806	13 449
Furnace carbons, electric, complete	4 054	143	31 317
Other electric carbons	2 301	24 713	2 043
Bulbs and discharge lamps, complete, ready for use	10 265	93	1 116
Other electric lighting appliances, accessories and fittings, and parts thereof, not elsewhere specified	38 662	962	9 475
Batteries, primary (complete, and parts other than carbons)	3 549	10	584
Electrical instruments (other than telegraphic and telephonic)	32 057	8 843	13 544
X-ray apparatus and vacuum tubes	9 734	5 640	16 422
Other articles	52 980	17 907	7 897
Motors, complete—			
Under 1 H.P.	12 451	5 166	82
From 1 to 250 H.P.	13 047	205	1 604
Other motors, including parts	535	6 114	6 723
All other sorts	14 455	3 485	3 184
Portable mechanical appliances, electrically operated, not elsewhere specified	24 627	2 542	2 209
Welding machinery (including welding electrodes), other than tube making	—	1 667	6 545
Total	328 117	132 013	138 021

625 tons and 927 tons, other machinery, switchgear, transformers, etc., 1 285 tons and 1 035 tons.

The Dominions, Colonies and other British countries took the bulk of the electrical goods and apparatus sent out of this country in the first month of the year, British India making purchases value £558 398, the Union of South Africa £528 758, Australia £162 702, New Zealand £135 095, Eire £107 689, British Malaya £92 414, Palestine £87 015, Channel Islands £32 597, British West Africa £37 170, Southern Rhodesia £38 283, British East Africa £24 209, Burma £32 747, Ceylon £29 551, Hongkong £36 725, Canada £32 643, British West India Islands £24 764, other British countries £79 976.

Other overseas buyers included Norway with £154 353, Iran £129 024, the U.S.S.R. £123 573, Sweden £100 759, Denmark £103 666, Netherlands £101 936, Belgium £79 499, Switzerland £38 890, Poland £38 737, Portugal £54 111, Yugoslavia £60 452, Turkey £34 619, Egypt £74 089, Argentine £102 581.

British India bought generators to the value of £85 349, motors worth £41 442 and other electrical machinery for £86 043; while purchases by other countries included the following:—U.S.S.R.: generators £84 294, other electrical machinery £217 850; Union of South Africa: motors £46 568, other electrical machinery £95 304.

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

	Monthly average 1938	Month ended January 31 1946	1947
	£	£	£
EXPORTS			
Submarine telegraph and telephone wires and cables	17 289	89 491	19 208
Other telegraph and telephone wires and cables	71 803	221 731	161 663
Other electric cables, wires, strips and strands, rubber insulated	117 533	173 064	384 821
With insulation other than rubber	153 256	313 973	359 513
Transmitters for public broadcasting and television, and radio communication and navigational aid (including radar) equipment, complete	28 296	60 500	122 731
Domestic radio receiving sets, complete, and chassis substantially assembled (including radiograms in 1947)	36 755	53 600	429 144
Telegraph and telephone equipment, line apparatus for long distance communication, speech input equipment and signalling apparatus (including testing equipment)	242,716	373 487	488 776
Other descriptions	57 848	111 000	174 750
Valves, electronic, complete (including cathode ray tubes in 1947)—			
Transmitting and industrial valves	41 272	22 703	24 912
Other		53 924	87 061
Electric bulbs and discharge lamps, complete	49 440	114 289	108 764
Other descriptions of electric lighting appliances, accessories and fittings, and parts thereof, not elsewhere specified	48 565	129 366	233 323
Batteries, and/or cells, primary, complete	13 572	41 604	35 123
Accumulators, complete	48 647	94 576	180 381
Parts and accessories	—	46 930	81 346
Electrical cooking and heating apparatus (including industrial) other than radio frequency heating apparatus—			
Heating apparatus and heating elements therefor	14 064	43 936	158 322
Other sorts	16 600	10 251	75 341
Electrical instruments (other than telegraphic and telephonic)—			
Commercial (including ammeters, voltmeters, &c., and parts thereof)	15 878	27 956	95 304
House service meters complete	15 791	37 732	62 910
All other descriptions	9 612	35 654	27 030
Electro-medical apparatus (other than X-ray apparatus, X-ray tubes, X-ray and other valves and vacuum tubes)	3 038	13 909	15 640
X-ray apparatus and vacuum tubes and parts thereof	4 881	27 046	91 541
Insulating materials, not elsewhere specified—			
Cloth and tape	7 038	25 554	32 616
All other	12 305	51 693	68 727
Other articles	108 083	176 026	161 621
Generators, complete—			
Not exceeding 200 Kw.	38 071	30 536	105 091
Exceeding 200 Kw.	119 079	134 828	402 212
Parts	—	5 199	36 819
Motors and parts thereof	145 045	141 242	341 742
Converting machinery	101 304	222	25 160
Transformers for lighting, heating and power, including coils		135 276	279 865
Rectifiers for power-house use	3 463	3 893	9 170
Starting and controlling gear for electric motors	50 866	58 673	68 200
Switch gear and switchboards (other than telegraph and telephone)	184 533	182 619	331 545
Electrical machinery, not elsewhere specified	15 497	21 464	15 921
Vacuum cleaners and parts	26 662	19 415	116 964
Other portable mechanical appliances, electrically operated, not elsewhere specified, including parts thereof	10 394	13 633	26 187
Welding electrodes	—	66 873	48 571
Welding machinery, other than tube making machinery and welding electrodes	—	66 051	87 224
Total	1 829 198	3 229 919	5 574 939

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 as brief possible.

MR. H. C. SILVER, senior technical secretary of the E.R.A., is retiring from that position on March 31, after over 25 years' service with the association. Educated at Brighton College and University College, London, Mr. Silver proceeded in

MR. H. C. SILVER

MR. E. E. HUTCHINGS

1901 to Faraday House Electrical Engineering College as assistant in the testing and standardising department, later being appointed superintendent of that department. In 1918 he joined the technical staff of the B.S.I., and in 1920 was appointed as committee secretary in the newly-formed Electrical Research Association. He is a member of the I.E.E. Mr. Silver will continue with the association, on special work, until September 30. Mr. E. E. Hutchings has been appointed a senior technical secretary, and will take over from Mr. Silver the responsibility for the sections dealing with cables, overhead lines and safety problems. Mr. Hutchings received his technical education at the Northampton Engineering College, London, taking the degree of B.Sc. (Eng.) in 1925. He joined the staff of the E.R.A. in the same year and worked for a period in the switch and control gear section, transferring in 1930 to the researches on cable rating and allied problems. Mr. Hutchings represents the association on a number of I.E.E. Committees.

MR. R. T. PARDOE has been appointed sales manager of the British Electric Transformer Co., Ltd.

MR. J. E. C. BAILEY of Baird and Tatlock (London), Ltd., has been elected president of the Scientific Instrument Manufacturers' Association of Great Britain, Ltd., and Mr. T. J. Offer (Charles Baker) and Mr. Frank Wakeham (the Cambridge Instruments Co., Ltd.) have been made vice-presidents.

MR. K. W. FINCH, senior technical assistant in the Norwich electricity department, has been appointed to the position of deputy borough electrical engineer at Cheltenham.

MR. F. CROSS, assistant electrical engineer with the Liverpool electric supply department, has been appointed to the position of workshop superintendent.

MR. C. R. WILCOX, turbine superintendent and maintenance engineer at Southwick power station, has resigned to take a post with Associated Electrical Industries, Ltd., in India.

MR. F. BENNETT, mains assistant under the Cardiff Corporation, has resigned on accepting an appointment as assistant electrical engineer for planning and development with Guest, Keen and Baldwins, Ltd.

MR. T. McCONNELL, deputy borough electrical engineer and mains superintendent with Scarborough Corporation has been designated deputy engineer and a separate appointment is to be made for the position of mains superintendent.

MR. B. C. EVANS, chairman and managing director, has resigned from the board of Veritys, Ltd., on the completion of 55 years' service. He is being retained in an advisory capacity. Mr. C. J. Pitt, managing director, has been elected chairman.

MR. C. W. HUGHES, area officer (consumers), under the London and Home Counties J.E.A., has been promoted to the position of assistant chief engineer to the Authority as from January 1. He has been placed in charge of the engineering section at the head office.

MR. JAMES PATERSON, managing director of the Clyde Valley Electrical Power Company, has been elected president of the Incorporated Association of Electric Power Companies; Brig.-General Wade H. Hayes and Lt.-Colonel E. H. R. Woodward were made vice-presidents.

MR. D. J. STRUTT has retired after more than 37 years with the British Thomson-Houston Co., Ltd. During most of the time he has acted as commercial engineering representative for the company

in the Midlands, where he made innumerable friends. A student of King's College, London, Mr. Strutt gained a wealth of practical engineering experience with various manufacturing companies in this country, including the British Westinghouse Company, and in America. He also spent some time with the St. James and Pall Mall Electric Light Company.

MR. A. DAVIES, at present consumers' and installation engineer with the Bedford electricity undertaking, has been appointed service and development engineer in the Cheltenham electricity department. Mr. Davies received his training in the installation department and showroom of the Chester undertaking, and then became showroom manager with the Barnsley Corporation. After serving in that capacity for three years he was appointed sales engineer at Heston and Isleworth, which undertaking he left in 1936 to take up his engagement at Bedford. He is an associate member of the I.E.E.

MR. J. A. BAILEY has been appointed by the Cheltenham electricity department as an ex-Service trainee for a period of two years. Mr. Bailey served an apprenticeship at the British Thomson-Houston Co.'s Willesden works and spent a further six months there as junior draughtsman. In 1942 he joined the Royal Air Force and reached the rank of flight-lieutenant in 1944.

MR. J. P. TANNER, consumers' engineer and meter superintendent with the St. Pancras electricity department, who succeeds Mr. Hedley Large as borough electrical engineer at Stoke Newington, began his career as an apprentice to electrical and mechanical engineering with Mumford and Sons at Plymouth. His first appointment was that of sub-station attendant with the Plymouth electricity department in 1930, and in 1935 he was promoted to junior mains engineer. A year later he went to the Finchley electricity undertaking as senior mains assistant, and in 1938 took up a similar position at Stafford, going to St. Pancras as assistant mains engineer in August, 1929. He then progressed to the positions of assistant meter superintendent, deputy consumers' engineer, and consumers' engineer and meter superintendent. He is an associate member of the I.E.E.

MISS K. E. PLATT, of Wallasey electricity department, is this year's winner of the Elizabeth Sloan Chesser cup, awarded annually to the demonstrator gaining the highest marks in the E.A.W. diploma test. The Councillor Miss Walter rose bowl, awarded each year by the E.A.W. to the school which gains the highest average marks in the home workers' certificate examination for schools, has been won, for the third year in succession, by the Westonbirt School, Tetbury, Glos., who will hold it for 1947. The Whalley Range High School, Manchester, was a close runner-up.

MR. G. DARNLEY-SMITH, managing director of Bush Radio, Ltd.; Mr. C. K. F. Hague, managing director of Babcock and Wilcox, Ltd.; Sir Robert Micklem, chairman of Cooke, Troughton and Simms, Ltd.; Sir Harry Railing, chairman and joint managing director of the General Electric Co., Ltd.; Col. H. Riggall, a director of Ruston and Hornsby, Ltd., and Sir Alexander Ramsay, a director of the Engineering and Allied Employers' National Federation, have been appointed members of the Engineering Advisory Council, which is to provide for the Minister of Supply a means of consultation with employers and workers in the industry on matters of general concern in the engineering field.

Obituary

MR. ARTHUR MONTAGUE MULLINER, former electrical engineer to Middleton Corporation, aged 66 years. He retired two years ago.

MR. HENRY MARK PEASE, a former managing director of Standard Telephones and Cables, Ltd., in U.S.A., on March 7.

MR. LESLIE GORDON, first clerk and solicitor to the London and Home Counties J.E.A., at Dorking, on March 8, aged 67 years. Mr. Leslie Gordon spent nearly fifty years in the public service. He became Town Clerk of Hammersmith in 1912, at the early age of thirty-two, and Town Clerk of St. Marylebone in 1924. Mr. Gordon was called to the Bar in 1913, but had been practising as a solicitor since 1924. He undertook the honorary secretaryship of the Conference of Local Authorities owning Electricity Undertakings in Greater London, and in that capacity he took a major share in the promotion of the Electricity (Supply) Acts, 1919 and 1922, which provided for the appointment of Joint Electricity Authorities and Boards; and, upon the establishment of the Joint Authority for London and the Home Counties, he was invited to become its first clerk and solicitor, which office he held with conspicuous ability for 21 years until his retirement last September. Mr. Gordon was from its formation honorary secretary of the Conference of Joint Electricity Authorities and Joint Boards, and he was elected chairman of the Joint Committee of Electricity Supply Organisations for the year 1945-46. The funeral service will be held at St. Mary's Church, High Street, Dorking, to-day, at 3.15 p.m., the interment following at Dorking Cemetery.

Hospital Installations

Explosion Dangers in Operating Theatres

THE stringent precautions demanded when using electrical equipment in the inflammable atmospheres of hospital operating theatres formed a major part of the lecture delivered by Mr. J. J. Tomlinson, before the Association of Supervising Electrical Engineers, on February 19.

Mr. Tomlinson, who is chief engineer to Kings College Hospital, took as his subject "The Electrical Equipment of a Modern Hospital," and gave an interesting description of the installation for which he is responsible. Some hospitals, he said, generated their own electricity, and he strongly recommended this practice on the grounds of economy. Full use could be made of waste heat from prime movers for low-grade heating and with the complete utilisation of the exhaust steam, the thermal efficiency of generation could be increased from about 25 per cent. to something like 60 per cent.

The generating equipment in his own hospital, Mr. Tomlinson explained, consisted of two 100 kW and one 50 kW Diesel-electric generators and one 75 kW steam-electric plant. The exhaust steam from the steam-electric generator was used at low-pressure for space heating throughout the hospital and for water-heating in the domestic calorifiers.

COPPER STRIP CONDUCTORS

Regarding the distribution system at Kings College Hospital, which was at 110 V d.c., Mr. Tomlinson thought that a feature of interest was a system of ducts which radiated over the site below the ground floor, the supply mains being carried through these ducts as bare copper strip on porcelain insulators. These copper conductors terminated in ward block switchboards on the ground floors, and from there, distribution was carried out by v.i.r. cables, with separate pairs of circuits, for power and lighting, going into each ward.

Turning to the operating theatres, the speaker said that the lighting was here a most important feature. The main light over the table was usually a special type of 100 W lamp with which a shadowless light of about 3 000 c.p. was thrown in an 18 in. ring on the table.

The ever-present possibility of fire or probably an explosion in the theatre was one, he said, that could not be ignored. During the time that anæsthetics were being administered, inflammable gases were escaping to the atmosphere and forming highly explosive mixtures. The two causes of ignition were sparks at the contacts of electrical control gear and sparks created by frictional electricity. All switches installed in the theatre should be of the sparkless type, consisting of a sealed contact tube containing mercury, operated by a semi-rotary movement. Plug and socket outlets should be of the three-pin interlocking type which prevented the withdrawal of the plug while the circuit was closed, and the switch controlling the outlet should also be of the sparkless type. Voltage regulators should be preset, and if required in the theatre, should be totally enclosed and flameproof, as also should all electric motors and speed regulators.

DANGERS OF STATIC ELECTRICITY

The second, more insidious form of ignition—that resulting from frictional electricity—depended to a large extent on the atmospheric conditions existing in the theatre. Trolleys and other articles of equipment would not hold their charge so long in a humid atmosphere, and he recommended the installation of wet and dry bulb thermometers, so that any tendency of the air to become dangerously dry could be averted by adjustment of the air-conditioning apparatus.

Practically all the equipment in a theatre was mounted on rubber-tyred castors, and was thus admirably insulated. It could be earthed with brass or copper trailing chains, firmly screwed to the trolleys at two points. If the surgical staff demanded a silent floor in the theatre, such as rubber-covering, this should be of the conducting type. With advantage, trolley tyres could be of the same material.

All operating theatres, Mr. Tomlinson went on, should be equipped with emergency lighting, so that in the event of supply breakdown, a secondary system would automatically and instantaneously be switched on. The most frequently used method was the trickle-charged storage battery.

After explaining that he had omitted, in his lecture, any reference to electric therapy, as it was such a vast subject, Mr. Tomlinson concluded with some figures relating to the generating plant at his own hospital. The price per unit generated last year, he said, was 0.791d., and the total units generated 741 368, of which 418 660 units came from the Diesel-powered generators. The Diesel-electric load factor was 63.03 per cent. and the steam load factor 75.3 per cent.

H.V. Wood-Pole Lines

Operational Characteristics Where Metal-work is Not Earthed

THE advantage of the unearthed wood-pole line for country districts was emphasised during the discussion by the I.E.E. Transmission Section on February 12 of a paper, by Mr. G. T. Garwood, on "The Operational Characteristics of Modern H.V. Wood-Pole Lines."

The paper was devoted to the study of the operation of h.v. wood-pole lines in which the insulator metalwork is not connected to earth. It dealt distinctively with the two types of line of this kind, namely, lines in which the metalwork is bonded, as by the use of steel cross-arms; and lines employing wood cross-arms in which the bonding as well as the earth connection is omitted. The author dealt with the insulating properties of complete line structures, as derived from their porcelain and wooden components; and then, from a consideration of the adverse agencies to which they are subjected, proceeded to conclusions regarding their operating characteristics. Some original experiments were described, and tentative conclusions submitted, with special reference to the effect of unearthed construction on the performance of insulators under conditions of fog and deposit. The nature and effect of lightning surges was also dealt with, and particularly the matter of surge asymmetry as a cause of interphase flash-over, and as a factor in the choice of the type of cross-arm. The paper emphasised that, for the attainment of the optimum operating results, there should be a closer correlation between line design and local conditions than had usually obtained in the past.

MR. H. W. GRIMMITT (Electricity Commission) recalled that the first printed regulations for overhead lines appeared in 1896; prior to that date, regulations had been written for each line erected. At that time there was no mention of earthing metalwork, and most of the lines erected up to 1914 were of unearthed construction. He believed that some of them were working satisfactorily to-day. In 1920, when the first regulations of the Electricity Commissioners were printed, they went right over to earthing the metalwork, presumably following American practice, which had at that time swung completely over to earthing everything. The Americans, however, came back very rapidly to the unearthed type of construction. The first uninsulated line in this country under the new regime of the Commissioners was put up in Derbyshire in 1932, and gave no trouble at all. In considering insulation, it was very important to have regard to the precise location of the line. Much of the trouble experienced had been due to neglect of this point. Personally, he was very much in favour of an unbonded line using a timber cross-arm. The correct type of cross-arm for a timber pole was a timber cross-arm; the idea that mild steel was superior to timber for an outdoor structure was wholly erroneous. If the excellent practice of the Post Office had been followed, and timber cross-arms used, there would not have been so much trouble with earthed and semi-earthed lines. He had never been keen on complete standardisation and complete uniformity; it took all the interest out of life. B.S. 1320 was an attempt to co-ordinate design and produce an overhead line properly designed according to the knowledge available, and should, where possible, be adhered to, but the man on the site must make the decision himself. That applied also under the regulations, and was as it should be. At the moment there was not much likelihood of the Commissioners revising their regulations, but it should be borne in mind that under Regulation 20 anybody could ask for a particular regulation for his own job.

MR. R. C. ANDERSON (Electric Transmission, Ltd.) expressed his pleasure in finding that the author, as he moved from an industrial district to the uplands, changed his transmission line design three times. Those changes were subtle and economic and paid due regard to changes in atmosphere, topography and earth resistance. That was sound transmission line engineering, which must be imaginative. For extra high voltage lines, he suggested that the cross-catenary construction came closest to the principles enunciated by the author. There were three pendant insulators carrying the phase wires, which constituted the primary insulation, while the secondary insulation was provided by a long insulator on each side. For 132 kV the impulse strength between the phase conductor and earth was 1 500 kV, and the interphase insulation had an impulse strength of 1 000 kV, those figures being about 50 per cent. higher than the grid figures, and it was suggested that the pendant insulators should have only five normal insulator discs in series. If such a line were erected in the South of England, where the isokeraunic level was about 14, he computed that it would have about one outage per hundred miles per annum. It would be interesting to know

how that compared with the figure for the grid.

MR. P. K. DAVIS (Northmet) emphasised the importance of obtaining further information regarding lightning surge problems on lines below 33 kV, in view of the large total mileage of such lines which were not interconnected and the importance of maintaining continuity of supply. It had been the experience of his company, he said, that interphase faults at the pole top due to large birds, straw or hay bridging two insulators, occurred very rarely. On the 52 miles of unbonded line with wood cross-arms installed in the last nine years no faults had occurred, other than two interphase faults due to birds and straw. With regard to the burning or charring of poles due to leakage or capacitive currents, which might occur with earthed construction when the bonding had been inefficient, their experience had perhaps been unfortunate, since on a system which comprised over 5 000 earthed poles with steel cross-arms there had been 17 pole fires due to capacitive currents in the last eighteen years, three only being initiated by lightning strokes and 14 by the vibration of the 0.05 in. steel-core aluminium conductor, which broke the insulator binder. In all cases the conductor fell on the cross-arm. The probable cause of the burning of the pole was the deterioration of the bonding wire connections, and particularly the below-ground connections to the earth plates, which were of the semi-circular type enclosing the pole and therefore a token form of earthing. They were taking steps to convert all their earthed poles to unearthed construction by removing the bonding wire for some distance above ground level. The unearthed pole line appeared to be the line of the future in country districts, and it was, therefore, to be hoped that the supply of wood poles would soon become more abundant.

MR. M. D. STONEHOUSE said that the experience of his company had been restricted, so far as the type of line under discussion was concerned, to unbonded construction and relatively light lines, and it had been uniformly satisfactory. If present difficulties with regard to lightning effects could be largely removed at a reasonable cost, and if an unbonded type of construction was adopted, most of the difficulties which now attended rural transmission at 11 kV would disappear.

MR. R. H. GOLDE (E.R.A.) said that on high voltage steel-pole lines with earth wire, lightning trouble could be overcome unless the footing resistance was unusually high; on 132 kV lines a footing resistance of about 10 ohms was sufficient to prevent back flashover in almost all cases. It was apparently thought that a similar type of construction would be suitable for 11 kV, but, in fact, the corresponding figure for an 11 kV line was about 5 ohms and, taking account of the additional inductive voltage drop in the tower or earthing lead, unless the footing resistance of an 11 kV line was below about 2 ohms, back flashover was likely to occur. Footing resistances of that order of magnitude, however, were almost impossible to obtain, and that was one of the reasons why earthed lines with overhead wire for 11 kV had shown up badly. A second reason was the higher number of strokes likely to fall on an earthed as compared with an unearthed line. It was possible to calculate the ratio of the number of direct strokes likely to be obtained on unbonded, unearthed and earthed lines. Assuming a pole height of 30 ft. and a span length of 300 ft., and calling the number of flashes to the unbonded line 1, the number of flashes to the unearthed construction would be 1.38, and the number to the earthed construction would be 1.92. The actual position was worse than that, because an earthed line attracted more high-current strokes than an unbonded line.

MAJOR T. G. MARTIN said that two years ago he was commanding a unit which was dealing with transmission lines on the Continent. They linked Belgium and Holland to supply Holland from Belgium during operations, and did so by erecting a 70 kV wood line of orthodox construction, but they were not happy about their section and angle poles, where there was pronounced warping. They had had to cut down their trees in the Belgian forests, and did not get good timber. It was clear that very great care ought to be paid to the selection of timber for any type of tall pole when employed at pronounced points of deviation.

MR. G. T. GARWOOD replied briefly and mentioned that there might be some justification for a wood cross-arm with reinforced concrete poles, thus preserving the merit of at least some degree of supplemental insulation.

The Gauge and Tool Makers' Association is arranging a convention for its members and their business friends to be held at Bournemouth. It will open on Friday evening, June 6, with a cocktail reception followed by a dinner and dance, and will close with a farewell dinner on Sunday, June 8. There will be organised social activities. It is proposed to arrange a visit to the International Fair in Paris in May. The party will leave London on Friday, May 17, and will be accommodated at the Hôtel du Palais d'Orsay, and will return to London on May 20.

Protecting Electrical Equipment

Types and Methods of Finishing Reviewed

THE necessity for the correlation of the results of accelerated tests on protective finishes with field experience was stressed in a paper on "Protective Finishing of Electrical Equipment," by Messrs. F. Widnall and R. Newbound, read at the meeting of the I.E.E. Installations Section on February 13. The paper was presented by Mr. Widnall and Mr. G. H. Hardwick owing to the absence, because of the illness, of Mr. Newbound.

This paper gave a review of current practice and methods of protective finishing for electrical equipment. It covered most conditions met in normal service, but excluded the more specialised tropical and arctic conditions, which differed considerably from normal applications. The conditions under which the protective finishes are used were divided into six classes, and the service conditions for each class were described. Different types and methods of protective finishing were reviewed and described in some detail, together with reference to a number of self-protective materials. The choice of a finish for a particular piece of equipment, stated the authors, was frequently a compromise between the various factors involved, but a broad tabulation was given with examples of the influence of particular factors in a final choice. The correct evaluation of accelerated tests on finishes was most difficult, and the necessity for correlation with field experience was stressed. Methods of testing and process control were reviewed and some of the difficulties which arose in service were illustrated. This review of the field of protective finishes showed the range of problems which must be considered by the engineer when designing and manufacturing his products, and pointed to the desirability of close co-operation with the industrial chemist.

MR. W. R. STEVENS (G.E.C.) said that the protection to be given to an article was a question of economics; the industrialist must decide what was the most economic, which was not necessarily the cheapest, protective material, and must bear in mind that there was usually no point in using the cheapest material underneath and then putting on an expensive protective finish.

BRIGADIER F. H. MACLENNAN (chief inspector of electrical and mechanical equipment, Ministry of Supply) said that some consideration must be given to the problem presented by tropical conditions, and the "sweat box" or tropical chamber test had been used by his inspectorate for some years. They normally tested specimens for 21 cycles of 24 hours each, of which eight hours would be at 60°C. with 100 per cent. humidity, the remaining sixteen hours being drying off in the same cabinet in the presence of condensed moisture. That had taught them a great deal about protective finishes. It was not possible to relate the results of a test of that kind directly with what would happen in, say, Sierra Leone, but it gave some standard for comparative if not for absolute answers.

MR. H. D. SYMONS (H. D. Symons and Co.) emphasised that while the primary object of a finish was to protect the apparatus, it had also to be suitable in appearance, and suggested that it should be chosen in relation to the design or shape of the article to be protected. There was need, he said, for the most careful control by the laboratory of the workshop processes. There seemed to be a tendency to sacrifice appearance to utility, but appearance was very important, particularly for the export market.

MR. R. C. L. EVELEIGH (Pinchin Johnson and Co., Ltd.) stressed the importance of cleanliness and of keeping the surface to be painted free from grease and dirt, and said a very large number of paint breakdowns were due to the application of the paint to an improperly prepared surface. The only satisfactory test, he said, was one carried out under actual practical conditions. Anyone who depended too much on accelerated tests in making a comparison between finishes was likely to be seriously misled.

MR. G. A. WILLIAMS (B.T-H.) remarked that it was unfortunate that if a special feature was required in a finish it could often be obtained only by the sacrifice of some other quality, so that, for example, if high temperature resistance was needed the finish would be inflexible, while if a flexible organic finish was provided there would be a definite limitation to the temperature which it would withstand without discoloration or actual failure. A technique was being developed, he said, for the application of a very thin film of superior metal to a thicker base

of cheaper metal, and when fully available it should be attractive to have a thin skin of stainless steel, Monometal, aluminium or copper on a cheap base. The outstanding problem was that of the cut edges.

MR. E. A. OLLARD (adviser on electrodeposition methods to the B.N.F.M.R.A.), said that by suitable design considerable economy in the cost of finishing could be secured. For plated surfaces, much better results would be obtained by radiusing all the corners, and so on, and avoiding sharp re-entrant angles. A great deal of research was being done on plated coatings and methods of testing, and the British Non-Ferrous Metals Research Association would be glad to give engineers and designers generally the benefit of their experience.

MR. C. A. MORTON questioned the authors' description of aluminium as self-protective and pointed out that there was a marked difference in the corrosion resistance of its various alloys, some requiring pre-treatment and painting even for the mild potentialities of a suburban atmosphere. Care must be taken when using anodised sheet aluminium. For lighting fittings it must be of the highest purity possible, 99.99 per cent., and its use for this purpose should be confined to the lighter industries or to interiors where the condensation risk was not very great and a good deal of attention could be given to maintenance. The corrosion resistance of anodised sheet aluminium could be increased with a thicker film or a longer time in the bath, but this decreased the reflectivity.

MR. F. C. FUKE (British Mechanical Productions, Ltd.) referred to the authors' suggestion that spotless white finishes should be used for kitchen equipment, and suggested that white had a somewhat repellent appearance, particularly on large surfaces such as cookers; an ivory or pale cream finish would be more restful to the eye and might be easier to maintain.

MR. N. H. DENHOLM (Lloyds Register) said that there was a very large field for small electrical fittings, and even for small galvanised screw-conduit fittings and things of that kind, but for marine work the finish was all-important; many such small items, especially if fitted near the open deck, had regularly to be replaced for no other reason than that the material of which they were made was unsuitable or inadequately protected.

MR. T. R. PYE, speaking as one primarily concerned with paint, said that radiant heat drying was becoming a popular method of stoving paint films, and was particularly suitable for the modern stoving synthetics; a combination of infra-red and ultra-violet radiation was now being suggested for the purpose. Although ultra-violet radiation was one of the major factors in the breakdown of paint film, it was also an accelerator of polymerisation, and could help to dry just as did infra-red radiation. An alternative to vitreous enamelling which might soon be available was the use of paints based on the silicone resins. That type of resin had very good resistance to solvents such as grease, and its acid resistance and alkali resistance were very good; films could be produced with very good flexibility and yet with a hardness almost equal to vitreous enamelling.

MR. L. G. DOBBIE (Australian Department of Scientific and Industrial Research), who had been in charge of the war-time investigations in Australia on the tropicalisation of equipment, said it had been their experience that the deterioration which occurred under conditions of high humidity and high temperature was simply an accelerated deterioration of the same type as that experienced in ordinary conditions. The rates of many chemical reactions which led to corrosion increased two or three times whenever the temperature rose by about 10°C. Under tropical conditions the rates of deterioration were so high that different methods of protection must be employed to obtain a reasonable life.

German Industry

The following reports containing scientific and technical information from German industry are now available and can be purchased at the sales offices of the Stationery Office:—B.I.O.S. 786, Investigation of Methods of Development and Evaluation of New Plastic Products in Certain German Establishments (4s.); B.I.O.S. 867, Television Development and Application in Germany (7s.); B.I.O.S. 919, The Application of Electrosmosis to Soil Drainage on Civil Engineering Work in Germany (1s. 6d.); B.I.O.S. 980, Electro-Acoustics in Germany, Part I (4s. 6d.); B.I.O.S. 993, Notes on Production of Cast and Sintered Alnico Magnets (3s.); B.I.O.S. 1 004, X-ray Crystallography in Germany and Austria, with Special Reference to Mineralogy (3s.); B.I.O.S. 1 176, Sound Recording, Reproducing and Other Electro-Acoustic Targets (3s.); B.I.O.S. E/R 309. Hereans Vacuumschmeltz A.G. Method of Production of "Einschmeltz," an Alloy for Glass Sealing in Flash-Lamp Bulb Manufacture (2d.).

Safety in Mines

New Hypothesis of Flameproof Enclosure Gaps

INVESTIGATIONS which have lead to a greater understanding of the mechanism by which ignition propagates from the inside of a flameproof enclosure, and which may be of value in the future design of mining electrical apparatus, are recorded in the 24th annual report, for the year 1945, of the Safety in Mines Research Board. (H.M.S.O., 1s.)

The most acceptable current hypothesis, it is considered, is that the major factor governing the tolerances permitted between flanges is the turbulence of the flame gases; this is thought to drown the flame by preventing sufficiently long contact between any part of it and the inflammable mixture into which it is projected.

Observations made during tests have shown that the flame, as judged by visibly reacting gases, passes through some flameproof gaps but fails to ignite external mixtures of inflammable gases. Presumably, the report states, the flame is always hot enough, and will do so if it remains long enough in contact with the external mixture. It follows from this that a turbulent mixture must be more difficult to ignite than one that is quiescent and, it is thought, it is reasonable to suppose that if the turbulence is great enough, ignition may be impossible. The success of a gap, therefore, in preventing an external ignition is due to the velocity of efflux of gas and flame being great enough to set up enough turbulence to prevent the "lag on ignition" period being exceeded.

COMPONENTS OF FLAME SPEED

The speed of flame in a gas mixture, the report goes on, has two distinct components: (a) that due to the spread of the chemical reaction and (b) that due to the movement of the burning mixture, which, in this instance, is caused by the pressure produced by the flame inside the vessel. If this pressure could be relieved completely, the flame would proceed with its lowest speed, that due to chemical reaction alone.

A series of experiments, undertaken with the object of determining the part played by turbulence, are described. The safe gap in a sample enclosure was found to increase as the point of ignition was moved farther from the gap, thus allowing considerable internal pressure to build up before the flame emerged and, conversely, if pressure-release holes were drilled in the enclosure, it was found that the safe gap was independent of the position of ignition.

From these results, it seems necessary to abandon the idea, it is concluded, that flange-protection depends on the cooling of the flame gases by adiabatic expansion at the moment when they escape from the enclosure, or on cooling by loss of heat by conduction whilst they are in contact with the flanges.

DISAPPOINTING PLASTICS TESTS

During the year, tests were also carried out on flanges made of a synthetic resin. Earlier work had shown that these flanges had the same maximum experimental safe gap as those made of metal, but they did not, however, withstand heat so effectively, and ultimately failed as a result of charring. To overcome this trouble, synthetic resin flange surfaces with a thin layer of copper or a layer of another synthetic resin of great heat-resisting properties were tested, but neither proved to be any better than the material tried in the first place. After a few tests the copper began to flake off, leaving large areas uncovered, which charred as before. The heat-resisting synthetic resin did not char so readily, but ultimately failed.

Experiments on the conditions for intrinsic safety of low-power electric circuits were continued during the year. Materials with non-linear resistance characteristics, in shunt with the air-cored circuit inductance, increased the minimum igniting current, but proved erratic in effect. Rectifiers of the copper oxide or selenium type, however, proved to be most effective in raising the minimum igniting current through air-cored inductances. The resistance of a suitably used rectifier, it is pointed out, is high and it does not interfere with the operating current of a bell or a relay coil; but by eliminating a break-spark it acts as effectively as a resistance of very low value, such as could not be used without preventing the operation of the instrument.

Tests were continued in the field of lighting, to discover the degree of danger in using hot-cathode fluorescent lamps, which might become fractured in an explosive mixture while the filaments are heating, but are, so far, incomplete. The results indicate that the necessary safety conditions could be fulfilled.

Some trouble experienced with misfires of Cardox shells led to a detailed examination of the firing characteristics of the fuseheads in use with them, and to consequent improvements in sensitivity introduced by the manufacturers.

Industrial Information

Public Library Lighting

Following the decision of the Lambeth Borough Council to improve the lighting in their public libraries, Thorn Electrical Industries, Ltd., were awarded the contract for installing Atlas fluorescent tubes and fittings. The photograph reproduced on this page, shows the effect in the reading room at Durning Library. The lighting is to the Illuminating Engineering Society's standard. The company have also been entrusted with a contract for re-lighting the Carnegie, West Norwood, South Lambeth and Brixton central libraries and this work is proceeding forthwith on modern lines.

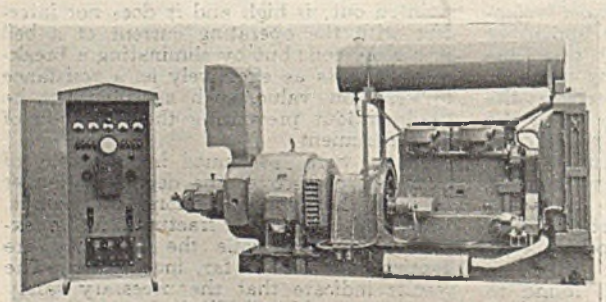
Fluorescent lighting at Durning Library, Lambeth

New E. A. W. Branch

The Dundee branch of the Electrical Association for Women, the fourteenth to be formed since the war, has two women Bailies among its officers. Bailie Mrs. A. B. Miller is the chairman, and Bailie Mrs. A. Holway, the secretary. The Lord Provost of Dundee gave an address of welcome on March 4, and other speakers were Mr. P. Thoms, the electricity convener, and Miss C. Haslett, director of the E.A.W.

Ekco Plastics Exhibition

As part of a general policy to keep all employees fully aware of the varied divisions that make up the Ekco organisation, E. K. Cole, Ltd., staged an informal plastics exhibition at their works at Cowbridge, Malmesbury, recently, primarily to show the Malmesbury personnel how the company's plastics division works. Mr. D. Radford, general manager, plastics divison, opened the exhibition in the presence of the Mayor and other local celebrities. He reviewed the company's plastics history, showing how pre-war the division was almost entirely complementary to the firm's main radio manufacture. During the war, he said, big extensions to the plant were made in order to cope with Service requirements. Since the war the extended plant has been converted to peace-time uses and is engaged on many Government contracts, with a major effort directed to producing products essential for the housing drive. The exhibition was open to the public each evening.



One of six transportable generating sets for supplying multi-operator welding equipment for use in Iraq oilfields

Welding Sets for Iraq Oilfields

Six transportable generating sets recently supplied by the Associated Equipment Co., Ltd., of Southall, Middlesex, to the Iraq Petroleum Co., Ltd., provide an a.c. supply of electricity to multi-operator welding equipment. They will be used in the Iraq oilfields for work such as the erection of welded steel oil storage tanks, and the weld jointing of pipe lines. The oil engines are of the A.E.C. 6-cylinder 9.6 litre "Comet" Mark III type, 120 mm. bore, 142 mm. stroke, with a continuous rating of 100 B.H.P., and an overload rating of 112 B.H.P., both at 1 500 r.p.m. The engine is directly coupled to a Crompton Parkinson three-phase 50-cycle alternator giving 380 V between lines,

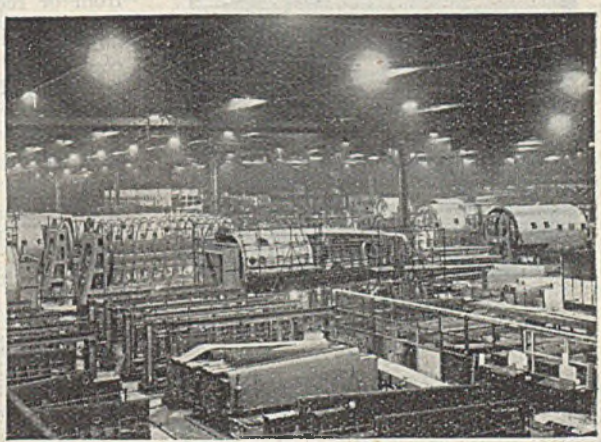
and 220 V line to neutral, with a continuous output of 63 kW, 105 kVA at 0.6 power factor. The alternator output is taken to a weather-proof sheet steel control cubicle manufactured by the Metropolitan-Vickers Electrical Co., Ltd. This incorporates a transformer with a delta primary, and an interconnected-star secondary to give a four-wire supply for three 300 A rating single-phase 100 V arc-welders. Each welder is connected separately between one line and the earthed neutral, and is provided with a 16.5 kVA condenser for power factor correction. The control cubicles are fitted with switchgear to enable the alternator output to be used for providing 380 and 220 V supplies for power and lighting. The sets are completely self-contained, being mounted upon fabricated steel bedplates together with 56 gal. capacity fuel tanks, starter batteries, and exhaust silencer.

Electricity in the Home

The educational value of the E.A.W. home workers' course is recognised by the Walsall Education Committee who are holding a special series of classes on "Electricity in the Home," in the Walsall Technical Institute on the suggestion of the local E.A.W. branch. The Committee are entirely responsible for the course, providing both the teacher for theory and the demonstrator for practical work, while the Walsall electricity department is making the necessary apparatus available.

Lighting for Air Liner Construction

When A. V. Roe and Co., Ltd. built their Chadderton aircraft factory, Metrovick illuminating engineers were invited to plan the lighting in conjunction with Benjamin Electric, Ltd., and W. H. Smith and Co., Ltd. In the main assembly bays 400 W standard mercury discharge lamps in deep dispersive reflectors, provide an average illumination of 10 lumens per sq. ft. Sub-assembly bays involving smaller components and greater detail, are fitted with 400 W Iso-thermal lamps, which are partially colour corrected, and give an average illumination of 12 lumens per sq. ft. In the large machine and bench assembly shops, where bright metal parts are handled, glare has to be avoided and the illumination must be adequate for detail work. Accordingly Benjamin Glassteel units with 250 W Metrovick discharge lamps are used supplying 15/20 lumens per sq. ft.. To provide safe lighting inside the fuselage of large aircraft a Metrovick type L.U. 230/12 v 150 VA transformer, to eliminate danger of shock, is fixed to each jig assembly unit. The jigs are wired in conduit with two-pin sockets into which is plugged the Metrovick portable aircraft handlamp; twelve hand lamps can be used on one jig.



Metrovick lighting installation at the Chadderton aircraft factory of A. V. Roe and Co., Ltd.

Notes for Contractors

Under the Control of Engagement (Amendment) Order, 1947, which came into force on February 24, members of the N.F.E.A. are now free to engage electrical operatives of all ages without the necessity of obtaining permission from the Ministry of Labour in respect of men aged 30 years or under. An agreement between the National Federated Electrical Association and the E.T.U. awards an increase in the amount payable as country allowance from 4s. per night to 4s. 6d. per night. The new rate becomes payable as from the third pay day in March, and for the pay period covered by that pay day.

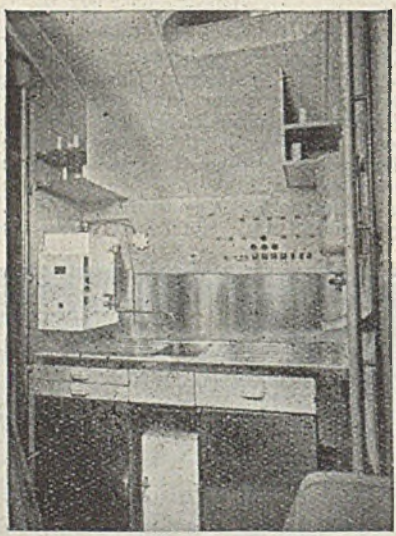
J. and P. Extension

Johnson and Phillips, Ltd., have acquired a factory at the former R.A.F. depôt, Kidbrooke. The extension consists of a range of shops comprising five large bays, and has been allocated to their switchgear department, which has been steadily outgrowing the accommodation available at Charlton. The new shops are about a mile distant from the company's main works, and are opposite to J. and P.'s sports ground and pavilion at Kidbrooke. The removal of part of the switchgear works to this site is almost completed.

having formed a useful task for workpeople displaced from their ordinary duties by the fuel crisis electricity cut. This transfer of a substantial portion of the switchgear section to Kidbrooke, complete with the switchgear drawing office staff, has allowed a much needed extension to the heavily loaded transformer works at Charlton.

Royal Viking's Telephone Equipment

A special telephone installation for the Viking aircraft which the King is using during the Royal Family's visit to South Africa has been designed and manufactured by the General Electric Co., Ltd. In addition, the G.E.C. have supplied refrigerators, vacuum cleaners, lighting fittings, urns, water heaters and luminous warning signs. The Royal Flight will use four 'planes—two passenger, one freight, and one for staff. The passenger 'planes are similarly equipped. A 4-way control panel, in the flight-captain's office, serves two telephones in each of the two saloons and provides immediate communication between any two persons in the 'plane. The control panel has four sets of lamps and keys coloured to correspond to the



Pantry of one of the Royal Vikings, showing the G.E.C. water heater on the left

colouring of lamps on the saloon telephones. Auxiliary apparatus is housed in the rear of the control panel, so making a single self-contained unit. The saloon telephones, which are Gecophone table type, are moulded in ivory material with all external metal parts heavily rhodium-plated. The control panel keys have a positive action which is proof against flying shocks. The system, in common with all the other electrical apparatus, operates from a 24 V d.c. supply.

Transfer of Control

The Board of Trade, in conjunction with the Ministry of Supply, announce that the powers of control over the manufacture and supply of radio-gramophones and wireless receivers (including television receivers) have been transferred to the Minister of Supply.

Price Advances

The Simplex Electric Co., Ltd., announce advances in the prices in current price lists affecting conduits, conduit fittings, switch and fuse gear, lighting equipment, flameproof equipment, electric fires and appliances, storage water heaters and immersion heaters, tubular heaters and industrial irons.

Chinese Radio Contract for Britain

China has placed with Marconi's Wireless Telegraph Co., Ltd., of Chelmsford, a contract valued at nearly £300 000 for the supply of 12 telegraph/telephone transmitters varying in power from 5 to 25 kW, designed for use on the international telephone circuits. In addition, 30 triple-diversity high-speed receiving equipments and 150 commercial receivers are to be supplied.

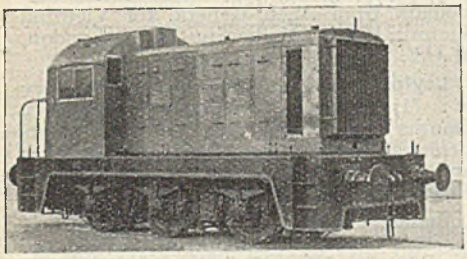
Five-Day Week Adopted

B.I. Callender's Cables, Ltd., has adopted the five-day working week and announces that all the company's works will be closed on Saturdays. As a consequence, goods will not be despatched from or received at any of the factories, but staff will be available at all head offices and branch offices throughout the country to ensure that urgent business is not delayed and that the minimum of inconvenience is caused to customers and suppliers.

New Diesel-Electric Shunter

A new Crompton Parkinson Diesel-electric shunter has several outstanding features. It is powered by a "V" type engine, an arrangement which is readily accessible for inspection and adjustment. The engine generator set is fitted with the "Crompton-Armstrong" automatic load regulator which makes it impossible to impose dangerous overloads. The d.c. generator is flexibly coupled to the engine, and the whole power unit is self-contained and flexibly mounted with three-point suspension. The number of connections to the chassis has been kept to a minimum, thus allowing easy removal of the power unit. Air for the engine intake and cooling the generator and motors is all filtered. The

motors are axle-hung with high-ratio single-reduction gears, and are forced ventilated by an engine driven blower. Roller gear has been specially developed and is



New Diesel-electric locomotive developed by Crompton Parkinson, Ltd.

suspension bearings are used. The control so arranged that by means of one switch the locomotive can be converted from a hump shunter to a transfer or branch line locomotive running at 30 to 40 m.p.h. The design of the locomotive is readily adapted for any gauge from 3 ft. 8 in. upwards. The engine has a maximum output of 400 H.P. and the locomotive, which weighs 45 tons, develops a maximum tractive effort of 30 000 lbs. The maximum speed is 40 m.p.h.

Battery Service on Royal Tour

Throughout every stage of the Royal tour of South Africa, Exide and Exide-ironclad batteries will perform the unobstrusive task of supplying electric current for many and diverse needs. The coaches of the Royal train are fitted with Exide-ironclad batteries for lighting and air-conditioning when the train is stationary, and to provide the power for operating the telephone system. Each of the four Vickers' Viking aircraft of the King's Flight is equipped with a 24 V Exide battery.

Institute of Welding N.L. Branch

At a recent meeting of the North London branch of the Institute of Welding, at the South-West Essex Technical College, Walthamstow, Dr. S. H. Harris introduced the sound film "Steam" of Babcock and Wilcox, Ltd., illustrating the principles embodied in the design and operation of a water-tube boiler for a modern power station, together with details of construction and manufacture. At the end of the film Dr. Harris answered questions by members.

B.E.A.M.A., Contract Price Formulæ

For purposes of calculating variations in: (a) rates of pay, the rate of pay for adult male labour at March 8, 1947, shall be deemed to be 110s.; (b) costs of material, the index figure for intermediate products last published by the Board of Trade on March 8, is 212.0 and is the figure for the month of February, 1947.

R.C.M.F. Exhibition

No fewer than 93 firms exhibited products classified under more than 150 categories at the fourth annual private exhibition of radio, television and communications components and test-gear held by the Radio Component Manufacturers' Federation at the new Royal Horticultural Hall, Westminster, on the first four days of this week, commencing on Monday. Television and radar parts were more in evidence than previously and prominence was given to radio test apparatus. The trend towards miniaturisation resulted in displays of some remarkably small components for new midget receiving sets, car radio and deaf aids. There were also shown new magnetic materials, metal alloys, the latest developments in insulants and examples of metallised ceramics and glass for use in hermetic sealing devices. The wide range of resistors included at least one example designed for atomic research purposes. Among the exhibitors were the following:—

Steatite and Porcelain Products, Ltd.; Ripaults, Ltd.; Dubilier Condenser Co. (1925), Ltd.; Suflex, Ltd.; Tannoy Products (Guy R. Fountain), Ltd.; Varley (Oliver Pell Control), Ltd.; Telephone Manufacturing Co., Ltd.; Telegraph Condenser Co., Ltd.; Micanite and Insulators Co., Ltd.; Duratube and Wire, Ltd.; Standard Telephones and Cables, Ltd.; Salford Electrical Instruments, Ltd.; Hellermann Electric Co., Ltd.; Sifam Electrical Instruments, Ltd.; H. J. Enthoven and Sons, Ltd.; Multicore Solders, Ltd.; Taylor Electrical Instruments, Ltd.; British Insulated Callender's Cables, Ltd.; Painton and Co., Ltd.; A.B. Metal Products, Ltd.; Westinghouse Brake and Signal Co., Ltd.; British N.S.F. Co., Ltd.; Labgear, Ltd.; Ferranti, Ltd.; Daly (Condensers), Ltd.; Telegraph Construction and Maintenance Co., Ltd.; Geo. Bray and Co., Ltd.; Belling and Lee, Ltd.; Automatic Coil Winder and Electrical Equipment Co., Ltd.; Aerialite, Ltd., Parmeko, Ltd.; A. H. Hunt and Co., Ltd.; A. F. Bulgin and Co., Ltd.; Taylor, Tunnicliffe and Co., Ltd.

Under an Order of the Ministry of Fuel and Power, THE ELECTRICIAN *was obliged by the fuel crisis to cease publication for two consecutive issues. All subscription orders are, therefore, being extended by two weeks, so that for the price of his annual subscription, each subscriber will receive the 52 issues for which he contracted.*

Invoices for renewals falling due during the month of March were prepared before the February crisis. In view of the very large number of accounts involved and the urgent need to save paper, these are being despatched without alterations and such subscribers will receive their extensions, as promised above, during 1947-8 instead of immediately.

Contracts Open

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

Sheffield, March 17.—Supply and delivery of three 1 000 kVA, 11.2/3.3 kV, three-phase transformers. Particulars from General Manager and Engineer, Commercial Street, Sheffield, 1; deposit, £2 2s.

Windsor, March 17.—Supply and erection of plant and machinery at sewage disposal works, Ham Fields, Berks, consisting of: (1) Electrically-driven sewage pumping sets; (2) switchgear, cables and wiring; (3) dual fuel engine-driven alternator sets. Specification seen at Borough Engineer's Office, 16, Alma Road, Windsor, or at office of Engineers, Messrs. Cotterrell and Son, 54, Victoria Street, S.W.1.

Swansea, March 17.—Annual maintenance of refrigerators in the Education Committee's school meals kitchens. Particulars from Director of Education, Education Department, Guildhall, Swansea.

Birkenhead, March 22.—Supply and delivery of: (a) 150 MVA metal-clad switchgear at 11 kV and 6.6 kV; (b) transformers, various sizes and types. Specifications from Borough Electrical Engineer, Craven Street, Birkenhead.

Windsor, March 24.—Wiring maximum of 228 existing Corporation houses at Dedworth. Particulars from Borough Engineer, 16, Alma Road, Windsor; deposit, £1 1s.

Wallasey, March 24.—Supply and delivery, for 12 months, of various distributing equipment. Specifications from Borough Electrical Engineer, Wallasey Road, Wallasey.

Newark, March 24.—Supply and delivery of two sheet steel kiosk sub-stations and equipment, including 300 kVA 11 000/415 V transformer. Specifications from Borough Electrical Engineer, Municipal Buildings, Baldertongate, Newark.

Bath, March 31.—Supply and delivery, for 12 months commencing June 1, of various electrical equipment; also, supply of high-voltage testing set and 16 insulation testing sets. Specifications from City Electrical Engineer, The Old Bridge, Bath, Somerset.

Victoria, Australia, April 2.—State Electricity Commission of Victoria invites tenders for steel-cored aluminium conductor and steel earth conductor for 220 kV transmission line, in accordance with specification no. 46-47/114. Particulars from Agent-General for Victoria, Victoria House, Melbourne Place, London, W.C.2.

Leyton, April 2.—Supply and delivery of: (1) Cables; (2) meters; during 12 months commencing April 1, 1947. Particulars from Borough Electrical Engineer and Manager, Electricity Offices, Cathall Road, Leytonstone, E.11.

Belfast, April 3.—Supply, delivery and erection of 33 kV armourclad switchgear. Specification from City Electrical Engineer and General Manager, East Bridge Street, Belfast; deposit, £2 2s.

Dundee, April 3.—Supply, delivery and erection of 33 kV, three-phase, metal-clad switchgear at Clepington static sub-station; also, 33/6.6 kV, three-phase 10 000 kVA outdoor type "on-load" tap-changing transformers, and liquid type 6.6 kV neutral earthing resistances at the same sub-station. Specifications from City Electrical Engineer, Dudhope Crescent Road, Dundee; deposit, £1 1s. each.

Dundee, April 10.—Supply, delivery and erection of 33 kV, three-phase metal-clad switchgear, for extensions at Carolina Port generating station; also, supply, delivery and jointing, supervising the laying of three-core and one-core, 33 kV cables for Carolina Port/Clepington feeders. Specifications from City Electrical Engineer, Dudhope Crescent Road, Dundee; deposit, £1 1s. each.

The Engineering and Metalcraft Exhibition, which is to take place at the Royal Horticultural Hall, Westminster, from May 12-23, is the first of a series to be held in London during 1947 and 1948 under the title "Britain's Best," their purpose being to focus attention on the quality aspect of British industries for home and export trade. These exhibitions will be selective rather than inclusive, and are primarily designed for trade visitors, but the public will also be admitted during certain hours. The sponsors are, the British Bulletin of Commerce (Exhibition Department), 17-18, Henrietta Street, Strand, London, W.C.2. The exhibits will include air conditioning units, aluminium products, cableways, cooking equipment, electric fires, engineering equipment, electrical goods, fans, fluorescent fittings, heating apparatus, instruments, lamps, light fittings, lighting plants, machine tools, power transmission appliances, radar products, vacuum cleaners, water heaters, washing equipment, wireless apparatus.

Electricity Supply

Preston.—Fluorescent lighting is to be employed in Fishergate, one of the main streets of the town.

Guisborough.—The Urban Council has decided not to adopt the recommendation of the Joint Industrial Council for a 14 days' annual holiday for electricity workers.

Orpington.—Application has been made, by the West Kent Electric Co., Ltd., for consent to the establishment of an underground 33 kV, three-core, p.i. lead-covered cable, from the Orpington sub-station to the Sundridge generating station of the Sevenoaks and District Electricity Co., Ltd.

Ashton-under-Lyne.—The sum of £2 000 has been allocated by the electricity undertaking to rate relief. During the year ended March 31, 1946, a net profit of £9 480 was made, as compared with a loss of £3 655 in the preceding year. Added to the accumulated balance of £6 491 brought forward, this gave a net surplus of £15 971.

Surrey.—Proposals for the reinforcement of the main supply cables in the Esher, Twickenham and Sutton area have been submitted to the Electricity Commissioners for approval. The work, which will involve the installation of 33 kV switchgear, 33 kV mains and pilot cables, 33 kV transformers and 11 kV switchgear, will cost, it is estimated, £162 755.

Scunthorpe.—Plans for the sale of radio sets by the Town Council are likely to be delayed. After making a number of enquiries, the Borough Electrical Engineer has informed the Council that none of the recognised manufacturers of radio equipment is prepared to accept the Corporation as agents for this purpose, as each manufacturer is satisfied with the existing agencies.

Islington.—At a recent meeting, the Council approved the expenditure of a further £4 000 on the purchase of additional radio sets. If sales justify still more purchases at a later date, further recommendations will be considered. Approval was also given to estimates amounting to £62 169, for the provision of standard voltage and system supplies to five blocks of flats.

London.—During the recent cold spell, a great number of the London and Home Counties J.E.A. transformers became overloaded and it is regarded as urgently necessary that the transformer capacity should be increased before next winter. Orders have, therefore, been authorised, at an estimated cost of £34 718, for twenty 500 kVA and ten 300 kVA transformers, and the relative truck-type, 250 MVA switchgear.

Liverpool.—A sum of £100 000 will be contributed this year to relief of rates, compared with £50 000 last year. Estimates for the year starting in April amount to £3 190 891 expenditure on generation, and £3 976 513 on distribution. The effect of the crisis on the finances of the electricity undertaking, in reduced sale of current and other directions, cannot yet be calculated, but is expected to be considerable.

Seaham.—Increase in charges have been agreed to by the Urban Council. The domestic rate has been increased from 3½d. to 4½d. per unit, the charge for business heating is to be raised from 1d. to 2d. while the rate for heating and cooking is to be raised by ½d. per unit to 2d. The hire purchase system is to be abolished and consumers are to be given the option of transferring to the domestic or other tariffs. The issue of free lamps to assisted wiring consumers is being suspended at once.

Darlington.—Following expert advice, the Electricity Committee has decided against a £120 000 scheme for drawing cooling water from the River Skerne. For some years complaints have been made by people living in the vicinity about precipitation from the cooling towers. To overcome the matter the Committee considered using river water, but has now been told that the pumping of warm water back into the Skerne (which flows through the centre of the town) could cause a fog which might be dangerous to traffic. Other means of overcoming the difficulty are now being considered.

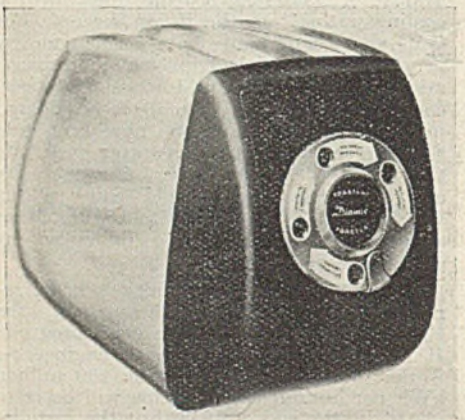
Eire.—In spite of difficulties, it is reported, electrification schemes of the E.S.B., Dublin, are making good progress. It is expected that the civil engineering works in connection with the 200 million kWh per annum Erne scheme will be completed by the end of 1948, but the installation of electrical equipment may be delayed until early in 1951. On the Liffey, however, the Leixlip scheme will give an output of 10 million units per annum. A turf-fuelled station at Clonlast is expected to have two generators in operation by 1948 and a third by 1950. The ultimate output will be 90 million units per annum.

Equipment and Appliances

Review of the Ideal Home Exhibition

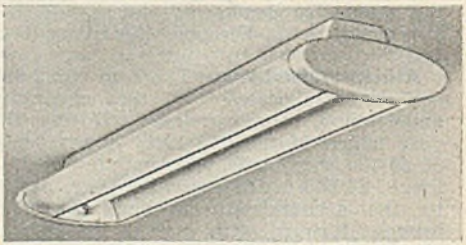
AT a time of acute shortage of building materials and restrictions on the use of electricity during part of the day, it was not to be expected that the first post-war Ideal Home Exhibition would equal its predecessors in spectacular displays and large-scale demonstrations. Nevertheless, in the field of domestic appliances, British electrical manufacturers are well represented, as is indicated by the following selection of exhibitors' names:

Aeronautical and General Instruments, Ltd.; Aidas Electric, Ltd.; Amplion (1932), Ltd.; Appleby and Co. (London); Ardente Acoustic Laboratories, Ltd.; Ashley Brandon Co., Ltd.; John Logie Baird, Ltd.; A. Bell and Co., Ltd.; Belling and Co., Ltd.; Bendix Home Appliances, Ltd.; Berry's Electric Co., Ltd.; Brightglow, Ltd.; British Diamix, Ltd.; British Electrical Development Association; British Emulsifiers, Ltd.; British Refrigeration Association; British Thermostat Co., Ltd.; British Thomson-Houston Co., Ltd.; British Vacuum Cleaner and Engineering Co., Ltd.; Bylock Electric, Ltd.; Caton's Metal Production, Ltd.; Cooper Manufacturing Co.; Richard Crittall, Ltd.; De La Rue Insulation, Ltd.; Domestilux, Ltd.; Dubrae Manufacturing Co., Ltd.; Electrical Engineering Comstruction Co., Ltd.; Electrolux, Ltd.; Elfson, Ltd.; Emmarel Distributors, Ltd.; Eralite Manufacturing Co., Ltd.; Escaré, Ltd.; Falcon Forge (Thomas Haywood and Sons); Fleet Electrics, Ltd.; Fortiphone, Ltd.; C. J. Fox and Sons, Ltd.; Hamco Metal Pressings, Ltd.; Harmer and Co., Ltd.; Hawkins and Co., Ltd.; "His Master's Voice"; H.M.V. Household Appliances; Hoover, Ltd.; Hotpoint Electric Appliance Co., Ltd.; Howland Engineering Co., Ltd.; Hurley Machine Co. (England), Ltd.; Hurtons (Heating and Sanitary) Appliances, Ltd.; Lesser and Sons (1923), Ltd.; Linaglow, Ltd.; Mackett and Moore, Ltd.; Mercantile Produce Co., Ltd.; Midland Industries; Modern Industries (London), Ltd.; Morphy-Richards, Ltd.; "Ossicaide"; Parnall (Yate), Ltd.; Radiant Cavity Signs, Ltd.; Radio Instruments, Ltd.; RAP Distribution, Ltd.; Riva Fireplace Co., Ltd.; Rollnick and Gordon, Ltd.; Rowe Bros. and Co., Ltd.; Rumere, Ltd.; Sanutrene, Ltd.; Singleton Bros. (Instruments), Ltd.; Sobell Industries, Ltd.; Southern Engineering Group, Ltd.; Steel Furnishings, Ltd.; Sterling Engineering Co., Ltd.; Sturtevant Co. and Associated Companies; Sunvic Controls, Ltd.; Supervents, Ltd.; Thorn Electrical Industries, Ltd.; Uva Products, Ltd.; Vactric, Ltd.; Wilkins and Mitchell, Ltd.; Wilkinson Engineering Co.; Woodmet, Ltd.



Dial toaster, by British Diamix, Ltd.

Many of the appliances on view have been seen, and described in these columns,



New "Atlas" lamp fixture displayed by Thorn Electrical Industries, Ltd.

previously, but most of the manufacturers have on their stands at least one article of reasonable novelty. Among these may be mentioned the dial toaster illustrated here. This, a product of British Diamix, Ltd., has been designed by the Design Group, Ltd., and features a Post Office type telephone dial by means of which the appliance can be switched on and the cooking time selected. Two pieces of bread are inserted simultaneously and, when the dial has run slowly back to the stop, these are automatically ejected on to the table and the apparatus switches itself off. The toaster is made of metal and maroon plastic and the dial is chromium plated.

In the field of domestic lighting, there are several stands exhibiting ceiling and wall fittings, and the B.T-H. Co., Ltd., has a well-arranged exhibit illustrating the effects of badly planned and inadequate lighting. The prototype of a new range of fluorescent lamp fittings mainly intended for domestic use is to be seen on the stand of Thorn Electrical Industries, Ltd. One of these, designed for 30 W, three-foot tubes, has an enamelled down reflector and fluted Perspex covers for diffused general lighting, and is suitable for either single tubes or combinations of two or three tubes. Electric irons and cleaners are also being shown by this manufacturer.

(*To be continued*)

Company News

CLYDE VALLEY ELECTRICAL POWER CO., LTD.—Prft. 1946, incldg. £150 000 E.P.T. recoverable to date, £680 189. There is additnl. recovery of E.P.T. in respect of 1946 of £27 722. Fin. div. 5% (same), mkg. 8% (same) for yr., to conting. fund, etc., £325 000, fwd. £281 226 (£208 315).

REDFERN'S RUBBER WORKS, LTD. Trdg. etc., profits 1946 £75 216 (£67 135). Net profit is £28 522 (£23 911), less £5 775 (£4 500) intm. divs. Fin. divs. 3¾% on "A" and "B" pref., mkg. 7½%, 5% (6¼%) on ord., plus bonus 5% (2%), mkg. 15% (12%), and £2 634 (£1 768) to pension fund and £10 000 (nil) to gen. res. Fwd. £23 734 (£22 696). Current assets £233 784 (£199 330) and current liabs. £101 479 (£92 447).

MANAOS TRAMWAYS AND LIGHT CO., LTD.—Rcpt. for yr. ended April 30 last shows operatg. recpts. £110 131 (£111 092), plus res. for accidents not reqd. £1 500 (nil), diff. in exch. £982 (£423), int., etc., £70 (£279), less operatg. exes. £111 697 (£107 786), prov. for unpaid Govt. debts £1 060 (£1 733), gen. exes. £1 289 (£1 198), fees £354 (£850), taxn. nil (£51), deb. red. £1 400 (same), debit for yr. £3 118 (£1 224), incrsg. total debit car. fwd. to £7 077.

YORKSHIRE ELECTRIC POWER CO., LTD.—In a communication to shareholders, the directors announce that the annual meeting will be held this month, instead of February as was formerly the practice. This step has been taken to enable the meeting to be held at a time when the position under the Electricity Bill has become more clarified than it is at present. In the meantime, says the statement, the directors are actively considering what steps can best be taken to protect the interests of stockholders in face of the inadequate compensation fixed for their shareholdings.

R. A. LISTER AND CO., LTD.—Sir Percy Lister (chairman), presiding at the annual meeting, said that the manufacturing resources of their group of companies had been enhanced during the year by the acquisition of a modern factory in Sydney, Australia. A war-time built factory near Swindon had also been leased from the Admiralty, and in another factory in the development area at Cinderford, production work had commenced while the buildings were still under construction. Very considerable capital expenditure for increasing the output of the five main factories was now in hand, and he was confident, Sir Percy said, that as soon as the delivery of the requisite capital equipment and building materials permitted, this would result in better working conditions and a more economical utilisation of labour.

INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD.—Reference to the general tendency towards shorter working hours and higher wages was made by the Chairman (Sir Walrond Sinclair) in his annual speech to shareholders. While these might be desirable objectives, he said, unless they were accompanied by increased output in order to keep down the overall costs of production, it was difficult to foresee what their ultimate result might be. A further cause of disquiet was the marked rise in non-productive costs, due mainly to the expansion of administrative staffs necessary to comply with the many Government requirements in the way of statistics, questionnaires, etc. This, of course, was only a counterpart to what was taking place in the national adminstration, but it was giving rise to considerable misgivings, particularly when one realised that the time could not be far off when the existing sellers' market would have evaporated and British industry would have to dispose of its goods abroad on a competitive basis.

Metal Prices

	Monday, Price	Inc.	March 10 Dec.
Copper—			
Best Selected (nom.)...per ton	£125 10 0	—	—
Electro Wire bars ... „	£127 0 0	—	—
H.C. Wires, basis ... „	£144 0 0	—	—
Sheet ... ... „	£168 10 0	—	—
Bronze Electrical quality 1% *Tin*—			
Wire (Telephone) basis per ton	£165 15 0	—	—
Brass (60/40)—			
Rod basis ... ... „	1s. 1½d.	—	—
Wire ... ... „	1s. 5¾d.	—	—
Iron and Steel—			
Pig Iron (E. Coast Hematite No. 1) ...per ton	£8 19 0	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ... „	£34 5 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in.) ... ... „	£21 15 0	—	—
Lead Pig—			
English ... ... „	£71 10 0	—	—
Foreign and Colonial... „	£70 0 0	—	—
Tin—			
Ingot (minimum of 99.9% purity) ... „	£384 0 0	—	—
Wire, basis ... ... per lb.	4s. 10½d.	—	—
Aluminium Ingots ...per ton	£72 15 0	—	—
Spelter ... ... „	£70 0 0	—	—
Mercury (spot) ... per bott.	£21 0 0	—	—

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

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.*

BENNETT AND ESCOTT, LTD., Weymouth, electrical engineers.—January 29, mort., to Midland Bank, Ltd. securing all moneys due or to become due to the Bank; charged on 23, New Street, Weymouth, with fixtures.

ACE ELECTRONICS, LTD., London, S.W.—January 27, Land Registry charge, to Barclays Bank, Ltd. securing all moneys due or to become due to the Bank; charged on 17 to 21, Watt's Lane, Teddington. *——. August 30, 1946.

PHILIP GREENE, LTD., London, S.E., radio dealers — January 22, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 242, New Kent Road, Southwark. * Nil. December 31, 1944.

WHITFIELD AND ROBINSON, LTD., Coalville, manufacturers of electrical equipment.—January 16, £550 deb., to I. M. Whitfield, Burbage; general charge.

Applications for Discharge

TORKINGTON, Charlie, residing and carrying on business at 144, Stockport Road, Romiley, Chester, radio and cycle dealer. Court: Stockport. Day fixed for hearing: March 18, 1947, 12 noon, at the Court House, Vernon Street, Stockport.

LOCK, Frederick Reginald Arthur, and LOCK, Victor Charles (trading as Locke Brothers), residing at 3, Oakleigh Road, Oldswinford, Stourbridge, Worcs., and carrying on business at Union Street, Stourbridge, electrical engineers. (Separate application of Frederick Reginald Arthur Lock.) Court: Stourbridge. Day fixed for hearing: April 10, 1947, 10 a.m., at the Court House, Hagley Street, Stourbridge.

Coming Events

Friday, March 14 (To-day)

JUNIOR INSTITUTION OF ENGINEERS.—At 39, Victoria Street, S.W.1. "Fuel for Industry—Coal to Oil Conversion," J. Duguid. *6.30 p.m.*

INSTITUTE OF WELDING.—Birmingham. "Some Novel Developments in the Design and Operation of A.C. Arc Welding Plant," E. C. Davies.

I.E.E., N. EASTERN STUDENTS' SECTION.—Newcastle-on-Tyne. "The British Warship as an Electrical Engineer Sees It," G. F. Crisp.

I.E.E., SCOTTISH CENTRE, N. East Scotland Sub-Centre.—Aberdeen. "Industrial Applications of Electronic Techniques," Dr. H. A. Thomas. *7.30 p.m.*

Saturday, March 15

I.E.E., LONDON STUDENTS' SECTION.—Visit to the L.P.T.B. Signals School, Earl's Court. *2.30 p.m.*

INSTITUTE OF PHYSICS. — Birmingham. At the University. "The Acceleration of Electrons and Ions to Energies of the Order of 10^8 Electron-volts," Prof. P. B. Moon.

Monday, March 17

I.E.E., MERSEY AND N. WALES CENTRE.—Liverpool. "Rural Electrification. The Use of the Single-Phase System of Supply," J. S. Pickles and W. H. Wills. *6 p.m.*

Tuesday, March 18

I.E.E., N. MIDLAND CENTRE. — Leeds. Faraday Lecture: "The Generation and Wholesale Distribution of Electricity," J. Hacking. *7 p.m.*

I.E.E., S. MIDLANDS STUDENTS' SECTION.—Birmingham. Visit to Telephone House. *7 p.m.*

Wednesday, March 19

I.E.E., SOUTHERN CENTRE.—At the Queen's Hotel, Southsea. "The Electrical Engineering Aspects of Degaussing," I. S. Fraser, A. A. Read and B. E. Vieyra. *6.30 p.m.*

I.E.E.—London. Radio Section. "Velocity Modulation Valves," L. F. Broadway, C. J. Milner, D. R. Petrie, W. J. Scott and G. P. Wright. *5.30 p.m.*

Thursday, March 20

I.E.E.—London. "The Modernisation of the International Telephone Service and its Reaction on National Telephone Systems," E. P. G. Wright. *5.30 p.m.*

I.E.E.—Dublin. "The Patenting of Inventions," F. Kelly. *6 p.m.*

ILLUMINATING ENGINEERING SOCIETY.—Glasgow. At the Institution of Engineers and Shipbuilders. Annual General Meeting and Social Evening, with Presidential Address by J. S. Dow. *6 p.m.*

Friday, March 21

I.E.E.—London. Measurements Section. "The Design and Construction of a New Electron Microscope," M. E. Haine. *5.30 p.m.*

I.E.E. LONDON STUDENTS' SECTION.—Visit to the Osram-G.E.C. Glassworks, Wembley. *6.30 p.m.*

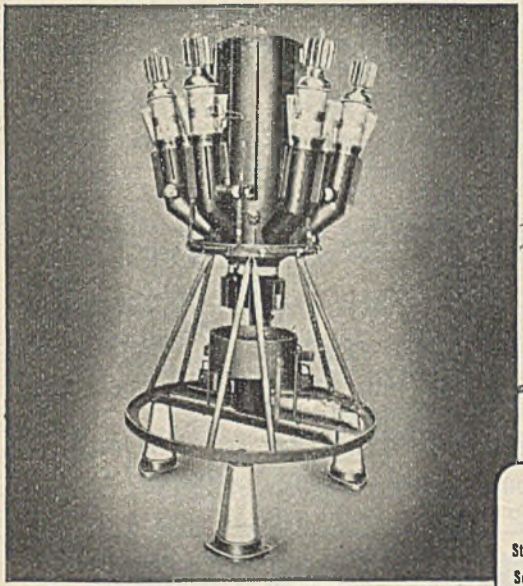
THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION.—London. At the Connaught Rooms, Great Queen Street. Annual luncheon and meeting. *12.30 p.m.*

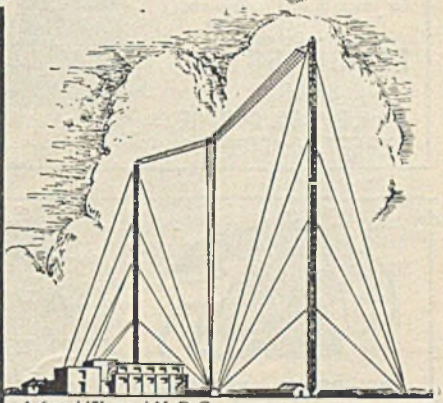
INSTITUTION OF MECHANICAL ENGINEERS.—London. "The Combination Torque-Converter and Fluid-Coupling Drive," discussion introduced by B. J. Tams. *5.30 p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—London. "Furnace Practice," film and discussion, introduced by W. H. Gamble. *6.30 p.m.*

"ENGLISH ELECTRIC"

Mercury Arc Rectifiers





A 600 kW, 15 kV D.C. pump-less steel bulb rectifier as used with radio transmitters.

THE English Electric Company's experience in mercury arc rectifiers embraces such applications of direct current as supplying ships in dock at 110 volts, traction service at 600, 1,500 and 3,000 volts, the largest rectifier installation in the British Isles for the electrolytic production of aluminium, and power for radio transmitters at 15,000 volts.

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- Steam Turbines
- Surface Condensers
- Feed-water Heaters
- Turbo-Alternators
- Water Turbines and Alternators
- Diesel Engines
- A.C. & D.C. Generators
- Electric Locomotives and Motor Coach Stock
- Diesel-Electric Units
- Tramcars and Trolley Buses
- Diesel-Electric and Turbo-Electric Equipments for Marine Purposes
- Aircraft
- Indoor and Outdoor Switching Stations
- Transformers of any size, type or voltage
- H.V. and L.V. Circuit Breakers
- E.H.V. and L.V. Switchgear
- Fusegear of all types
- Mercury Arc Rectifiers
- Synchronous Condensers
- Motor Convertors and Generators
- Electrical Equipment for Iron and Steel Works, Collieries, Mines and Industrial Undertakings
- Rolling Mill Motors
- Electric Winders
- Arc and Stud Welding Equipments
- A.C. and D.C. Motors and Control Gear
- Dynamometers
- House Service Meters
- Ignition Testers
- Electric Appliances for Domestic, Restaurant and Canteen use

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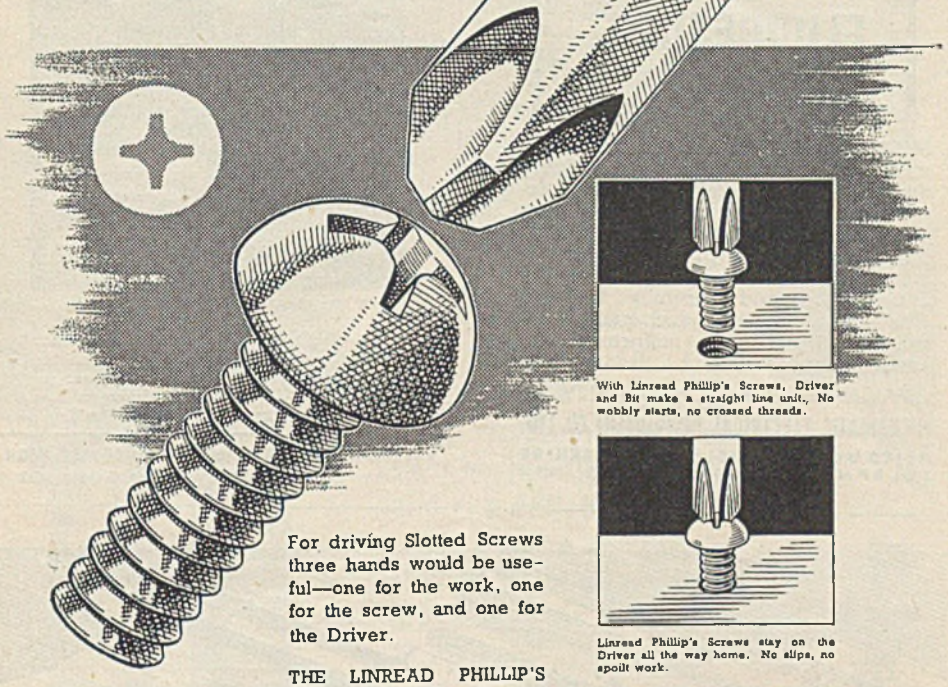
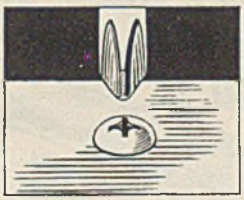
THIRD HAND INFORMATION ABOUT A FIRST RATE SCREW



With Linread Phillip's Screws, Driver and Bit make a straight line unit., No wobbly starts, no crossed threads.

Linread Phillip's Screws stay on the Driver all the way home. No slips, no spoilt work.



Linread Phillip's Screws give the better finish. No burrs or scratches spoil the completed work.

For driving Slotted Screws three hands would be useful—one for the work, one for the screw, and one for the Driver.

THE LINREAD PHILLIP'S SCREW BRINGS YOU THAT THIRD HAND. Put the Screw on the Driver and it stays there to the end of the driving. No slipping, no wobbling, no burrs.

The more screws you use, the more this screw that "uses its head" will benefit your work. It cuts down costs, saves time, saves screws and saves work.

A booklet on the Phillip's Screw giving more details is available. Write to Linread Limited, Department [P 18] Sterling Works, Cox Street, Birmingham, 3, for a copy. We are always pleased to advise on fastening problems.

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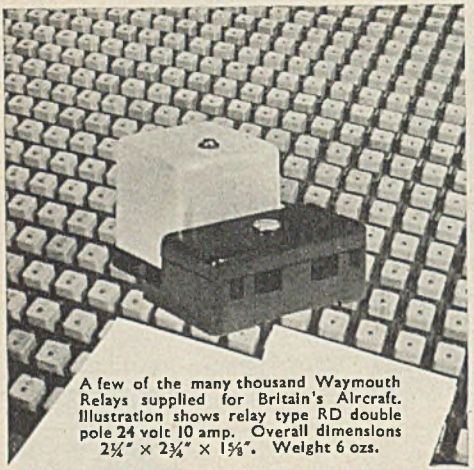

A few of the many thousand Waymouth Relays supplied for Britain's Aircraft. Illustration shows relay type RD double pole 24 volt 10 amp. Overall dimensions 2¼" × 2¾" × 1⅝". Weight 6 ozs.

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GAUGES & INSTRUMENTS
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Electrical Relays and Switches : Aircraft Fuel Gauges : Electrical Indicators : Diaphragm Pressure Gauges and other instruments.

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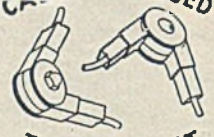

Bench, wall or universal conduit base

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INSTRUMENT WIRES
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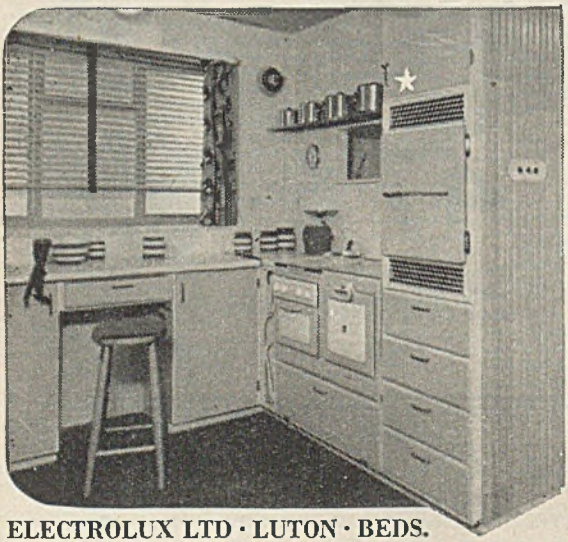
Electrolux *Silent* REFRIGERATION



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★ *in the Electric Kitchen*

Built in at convenient waist height, this Electrolux *Silent* Refrigerator is operated by Electricity.

Electrolux Refrigerators have no machinery, no moving parts. This means freedom from vibration, absence of wear and tear, low maintenance cost, all-round dependability and, above all, *absolute silence at all times.*

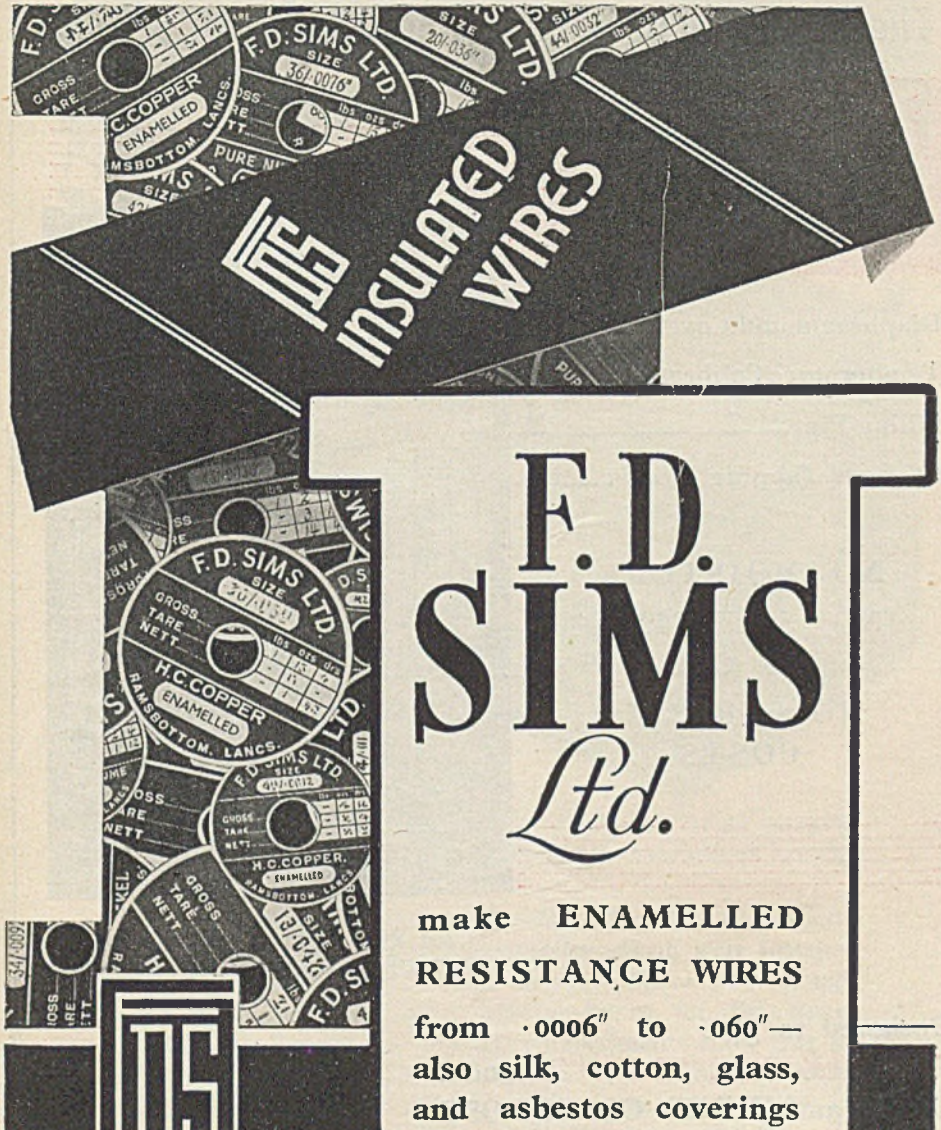
Deliveries of 'built-in' models will be made in 1947 for Housing Schemes.

"IDEAL HOME EXHIBITION"
(*Olympia* 4-29 *March*)

Stand No. 120 will show the latest range of 'built-in' and 'free-standing' models of Electrolux *Silent* Refrigerators.

Stand No. 325 will show the famous Electrolux *Quiet* Suction Cleaners (Models U116 and Z25).

royds



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