

ELECTRICAL REVIEW

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1872

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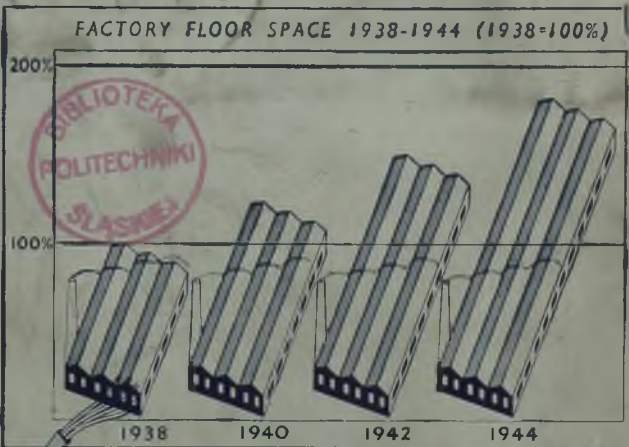
JANUARY 5, 1945

9d. WEEKLY

5.58 9.58/45/1
86 (1945) 2032 Nr. 3102-3527.

'ABERCABE'S'
SUCCESS
CHARTS

127



"... of course our factory is really a rather more handsome building than this simple factory symbol our charting man has drawn. The point he brings out, however, is that the place is growing steadily, year after year. ... And there's plenty of room for expansion as the demand for good quality cables increases."

*Aberdare
Cables*

Cases of PROTECTION



A.S.C.M. Steel Conduit is manufactured only by

ALMA & CRANMORE TUBE CO. LTD.

BARLOW, H. J. & CO. LTD.

ELECTRICAL CONDUITS LTD.

GENERAL ELECTRIC CO. LTD.

GRIFFITHS, ISAAC & SONS

HILDICK & HILDICK

MCDUGALL, JAMES LTD.

SIMPLEX ELECTRIC CO. LTD.

Comprising:

Credenda Conduits Co. Ltd.

Perfecta Tube Co. Ltd.

Simplex Conduits Ltd.

Stella Conduit Co. Ltd.

METALLIC SEAMLESS TUBE CO. LTD.

STEEL TUBE & CONDUIT CO. (Middlesbrough) Ltd.

TALBOT-STEAD TUBE CO. LTD.

TIPPER BROTHERS (Bilston) LTD.

WALSALL CONDUITS LTD.

Accepted practice in the Lobster World is a periodical shedding of his casing. Until its renewal he is unprotected.

Accepted practice in the Electrical World is permanent protection with A.S.C.M. Steel Conduit. Worlds of difference? Yes!

SPECIFY AND USE

A.S.C.M.



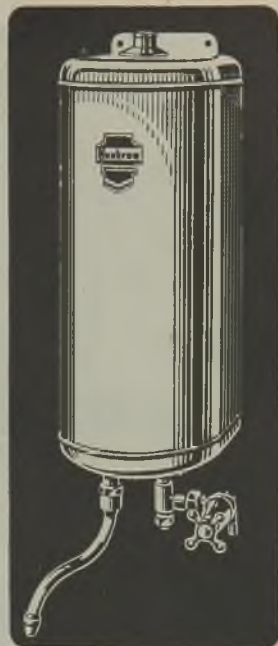


The VALUE OF CONTRAST

The positive—in all items of life (including Electrical practice) would be valueless without the negative. Both must oppose each other. Without difficulties by “negative” forces, “positive” advancement in design could never record increasing improvement. For it is the overcoming of existing difficulties that measures the pace of progress.

**LEADERS IN
ELECTRIC WATER HEATING**

HEATRAE



HEATRAE LTD., NORWICH

PHONE: NORWICH 25131

GRAMS: HEATRAE, NORWICH

Sole Manufacturers of “WESTMINSTER” ARC LAMPS

For
Photography
and
Medical
purposes



MAKERS OF—

Electric Welding Machines and
Patent Scrolling Machines.
Spot, Seam and Butt Welders.
“Westminster” Carbon Brush
Holders.
“Partridge” Earthing Devices and
Pressure Detectors.
Dynamos, Motors, Alternators
and Transformers Rewound
and Re-constructed

Telephone: Willesden 1700, 1701

Telegrams: “Regency, Phone, London”

The WESTMINSTER ENGINEERING CO. LTD.

VICTORIA ROAD, WILLESDEN JUNCTION
LONDON, N.W.10

THE “FACILE” TERMINAL



Send for Prices
and List of all
kinds of
Terminals

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

PINCHING SCREWS



to the specific re-
quirements of our
customers

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



MCLand REPETITION LTD.
Pool Lane Langley Birmingham.



McKechnie Non-Ferrous Ingots are uniform in composition and therefore easier to melt and handle. Produced by a perfect plant under constant supervision to the correct analysis, the McKechnie range of Non-Ferrous Ingots covers the entire need of the Brass Foundry. McKechnie Chill Cast Bars are closer in structure than Sand Cast Bars and possess greater homogeneity and resistance with an absence of segregation. They are clean, concentric and sound.

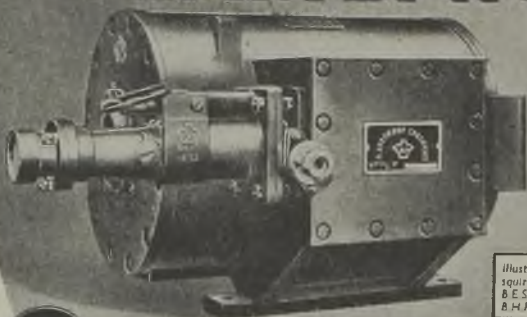
Apart from the saving on tool costs and labour which naturally follows the use of Chill Cast as against Sand Cast Bars the saving in scrap and turnings is very considerable.

MADE BY MCKECHNIE BROS. LTD.

Brass Rods, Stampings and Non-Ferrous Ingot Metal Manufacturers
ROTTON PARK STREET, BIRMINGHAM 16

Telephone: Edgbaston 3581 (7 lines)
 Telegrams: "McKechnie, Birmingham."

FLAMEPROOF MOTORS



BUXTON CERTIFIED

PEEBLES

... Unvarying reliability and efficient performance in continuous service are watchwords in the drive for increased production to meet the needs of war.

Peebles Flameproof Motors are playing an important part in the battle for fuel in a great number of mines, and are maintaining a high standard of reliability and efficiency under the most exacting conditions.

**BUILT FOR RELIABILITY
 DESIGNED FOR EFFICIENCY**

BRUCE PEEBLES & CO. LTD., ENGINEERS, EDINBURGH.

Illustration shows a typical flameproof squirrel cage induction motor fitted with B.E.S.A. plug & socket & I.P.C. adaptor, 15 A.H.P. 3-phase 50 cycle 600 volt 975 r.p.m.

MAIN CONTROL SWITCHES

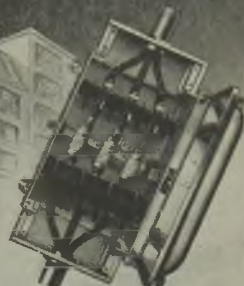
for all factories



*Bill "HRC" Fuse Switches
fitted with
"English Electric"
"H.R.C." Cartridges.*



Made for 30, 60, 100, 160, 200, 300
& 500 Amps., 600 Volts: Double,
triple and four pole and with
neutral links.
Fitted for Conduit, busbar chamber
flange or cable glands.



Easy Wiring. minimum maintenance

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

BIRCHFIELDS - SO11 (4 LINES)

BILL SWITCHGEAR LTD
BIRMINGHAM-20

MANCHESTER GLASGOW
BELFAST BURTON-ON-TRENT
EXETER - SOUTHAMPTON

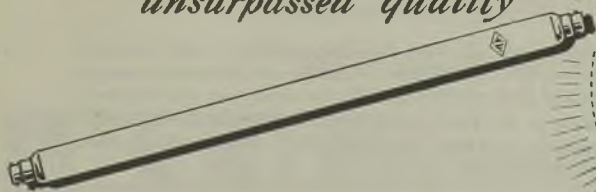
"AICO" BIRMINGHAM

SIEMENS



FLUORESCENT TUBES

*have established a reputation for
unsurpassed quality*



*Now
reduced
in price!*

Advt. of SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED, 38/39 Upper Thames Street, London, E.C.4
Branches at-Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, Nottingham, Sheffield.



THE BRITISH ARMY



THE BRITISH NAVY



THE BRITISH AIR FORCE

USE THEM

Why not you?



'ASHTON'

CABLES & FLEXIBLES

Used in the activities of all the fighting services and various Government departments, "ASHTON" Cables and Flexibles are in the front line for quality and reliability. There are types and finishes, including P.V.C. (Plastics), for every purpose; all manufactured under the strictest laboratory control throughout. Present supplies available for essential purposes.

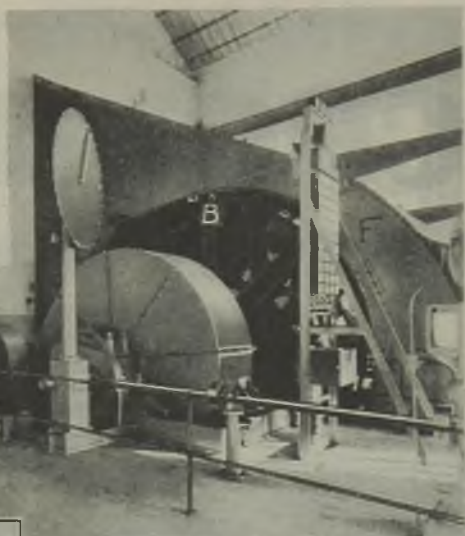
AERIALITE LTD.

STALYBRIDGE • CHESHIRE



ELECTRIC WINDING EQUIPMENT

**6,600 VOLT
A.C. WINDING
EQUIPMENT
AT A
SCOTTISH COLLIERY**



MOTOR

3,900 H.P. Peak, 423 R.P.M., 6,600 volts.

STATOR CONTROL

6,600 volt Reversing Contactors.

Three breaks in series per phase.

Electrical and Mechanical Interlocking.

Potential Interlocking on three phases.

D.C. Operating Magnets.

*BTH products include all kinds of electric plant,
Mazda lamps, and Mazdalux lighting equipment,
for service ABOVE or BELOW GROUND.*

SPECIFY BTH

BTH

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



A3483

AMPLE STOCKS

TO MEET THE GROWING DEMAND FOR

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FLUORESCENT TUBES

AND ACCESSORIES

at all these Crompton Branches

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Crompton House, Temple Gate
Telephone : Bristol 25363

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17 Charles Street
Telephone : Cardiff 8185

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Phoenix Works, English Damside
Telephone : Carlisle 1240

EDINBURGH

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Telephone : Edinburgh 24426

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LEEDS, 2

4-6 New York Road
Telephone : Leeds 30511

LIVERPOOL, 1

6 Stanley Street
Telephone : Central 8946/7

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Ferguson House, 124 City Rd. Tel: Clerkenwell 3234

LUTON

119 Dunstable Road
Telephone : Luton 3497

MANCHESTER

Lloyds Bank Bldgs., 33 Cross St. Phone : Blackfriars 3871

NEWCASTLE, 2

30 Handsides Arcade, Percy St. Phone : Newcastle 28622

NOTTINGHAM

Crompton House, Broadway
Phone : Nottingham 45678

PORTSMOUTH

30 Commercial Road
Telephone : Portsmouth 6089

SWANSEA

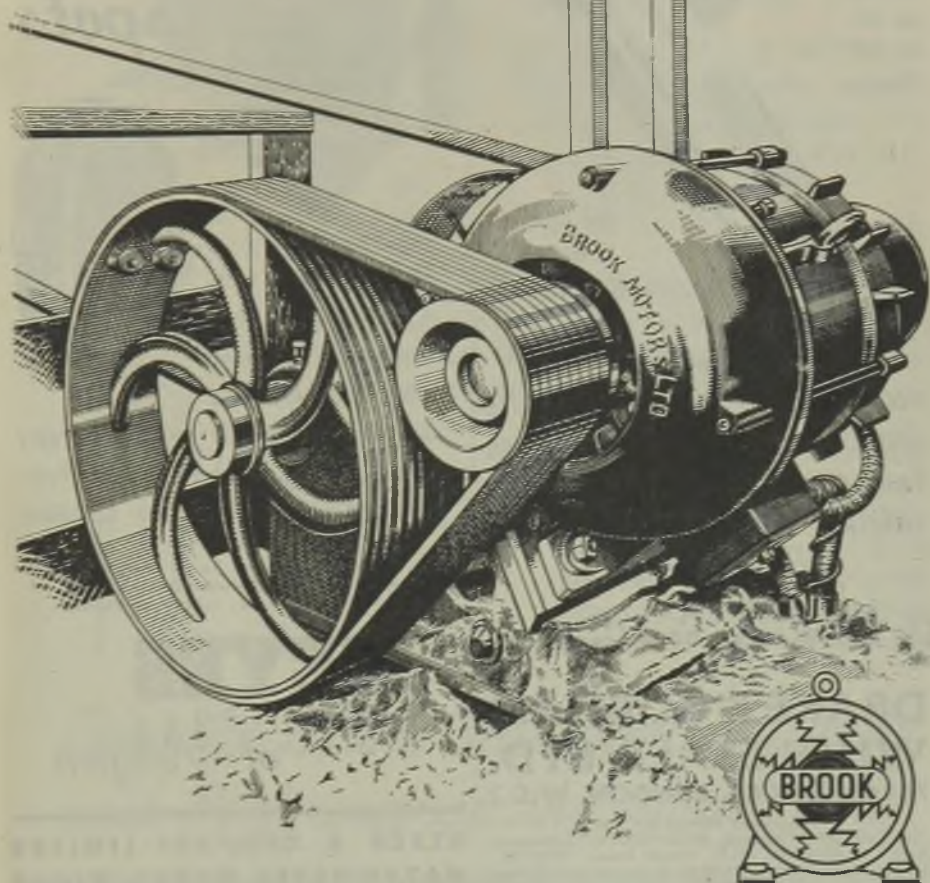
9 Dillwyn Road, The Cross, Sketty
Telephone : Sketty 88538

*The services of our Illuminating Engineering
Department are available without obligation
at all our branches*

CROMPTON PARKINSON LTD., ELECTRA HOUSE, VICTORIA
Telephone : Temple Bar 5911.

EMBANKMENT, LONDON, W.C.2.
Telegrams : Crompark, Estrand, London,

POWER *for* VICTORY BROOK MOTORS



EMPRESS WORKS • HUDDERSFIELD

THE POCKET TESTSCOPE

Size of a Fountain Pen

A convenient
rapid
fault-finding
instrument
for use
on AC
or DC
Circuits



for use
on
100-750 volts

FOR TESTING

SWITCHES	OPEN CIRCUITS
LIVE CONDUCTORS	LEAKAGES
EARTHS	INSULATION VALUES
NEUTRAL WIRE	POLARITY
CONTINUITY, ETC.	

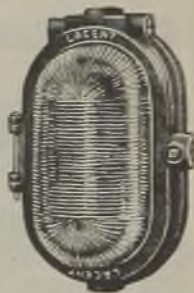
The Electrician's Good Companion

**DRAKE & GORHAM
WHOLESALE LTD.**
77 LONG ACRE, LONDON, W.C.2

Telephone : TEMple Bar 3993
MANCHESTER : 29 Piccadilly. BRIGHTON : 24 Marlborough
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2-4 Church St., Temple. DUBLIN : 2 Church Lane, College
Midland Representative : [Green]
W. T. BOWER, 184 Jockey Road, Sutton Coldfield

LIGHT

*the
danger
spots*



That corridor with
a blind corner, that
awkward stairway,
that doorway in a
dim corner—these are the danger
spots. Wigan and Lacent Pris-
matic Lighting is your solution.

Wigan and Lacent fittings comprise a
full range of units. Fully descriptive leaflets
and specifications are available on request.

HEYES
of Wigan

HEYES & COMPANY LIMITED
WATER HEYES WORKS, WIGAN

Agent : F. G. Ketelby, Gazette Buildings, Corporation St.
Birmingham.



FUSEGEAR

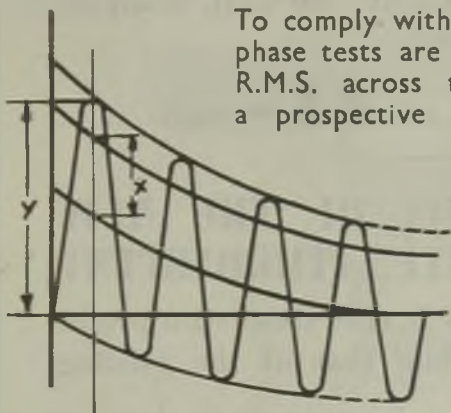


Illustration shows a 20-amp Type 'NS' Cartridge-fuse Link (actual size $\frac{3}{8}$ " dia.)
Type 'T' range available up to 800 amps

'ENGLISH ELECTRIC' TYPES 'NS' and 'T'

INDICATING CARTRIDGE-FUSE LINKS

possess a rupturing capacity of 25,000 kVA at 440 volts 3-phase, i.e. they comply with BSS88/1939 category of duty 440AC4 (A.S.T.A. certified)



To comply with category 440AC4 three single-phase tests are required each with 440 volts R.M.S. across the fuse terminals and with a prospective current of 33,000 amps

It should be particularly noted that the 33,000 amps specified is the R.M.S. symmetrical prospective current (X) not the peak asymmetrical prospective current (Y)

Accepted as the Standard of Quality and Performance the World Over

THE ENGLISH ELECTRIC COMPANY LTD.
— STAFFORD —

TWO IMPORTANT ANNOUNCEMENTS



FLUORESCENT LAMPS

1 **PRICE REDUCTION** of the ELASTA
FLUORESCENT LAMP (80 watt, 5 ft.) on
1st JANUARY, 1945,

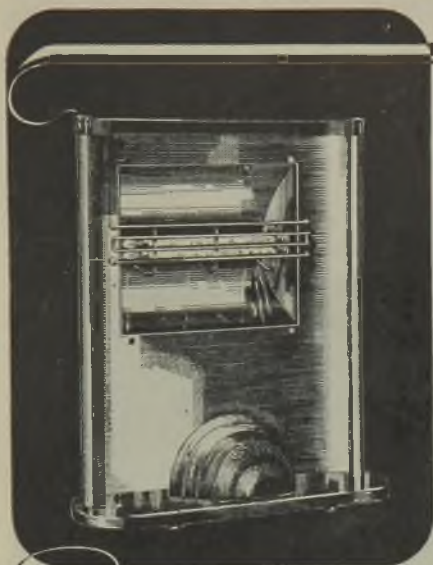
from 30/- each to **24/-** each

2 **INTRODUCTION OF THE NEW**
"WARM WHITE" FLUORESCENT
LAMP (80 watt, 5 ft.) for those who prefer
a warmer light than that of the existing
Daylight Colour.

*The New List Price shown above applies to both the
Daylight and Warm White Lamps.*

POPE'S ELECTRIC LAMP CO. LTD.
5 Earnshaw St., New Oxford St., London. W.C.2

Branches at: Manchester, Leeds, Birmingham, Leicester. Bristol. Belfast.



THE CORONA

This design, with illuminated disc decoration, proved so popular on its introduction shortly before the war began, that we plan to put it into production again as soon as conditions allow . . . to meet the more urgent demands of your customers for efficient radiant heating.

First

Foremost

Hottest

Ferranti

RADIANT

ELECTRIC FIRES

Ferranti Ltd., Moston, Manchester, 10.

London Office: Kern House, Kingsway, W.C.2.

WE REPEAT

another of our advertisements which first appeared early in 1942... and we remind you particularly of the message in the second paragraph!

LIGHT will be the order of the day and the night when the "all clear" sounds and then, once again, "REALUMINATION" will be in tremendous demand.

We have never failed our customers in normal times, but we shall be sorely pressed to keep pace with the demand that will inevitably ensue for "REAL" products!

R · E · A · L

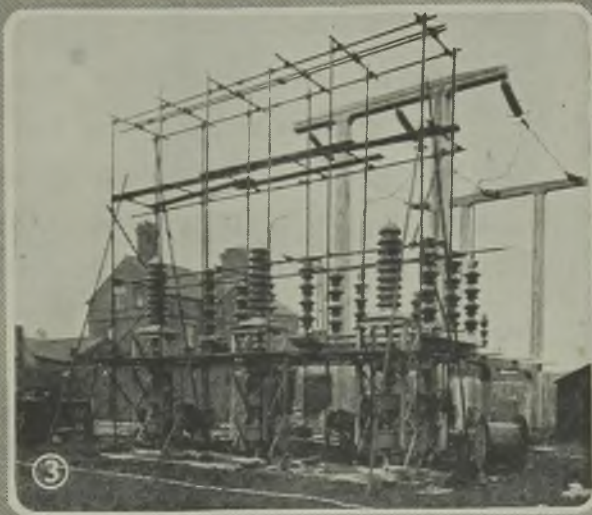
Rowlands Electrical Accessories Ltd., R.E.A.L. Works, Birmingham, 18.

TERMINATIONS FOR 132 kv. GAS CUSHION CABLES

- (1) Applying lead wire to the paper stress cone.
- (2) Lowering the internal pressure assembly into position.
- (3) A circuit termination prior to removal of the shelter scaffolding.



These terminations are part of a HENLEY 132 kv. Gas Cushion Cable contract recently completed. The contract included the manufacture and laying of 6,760 yards of 132 kv. single-core cable, also the construction and installation of all joints, terminations, etc. The complete transmission system is now in commission.



HENLEY
CABLE
INSTALLATIONS

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

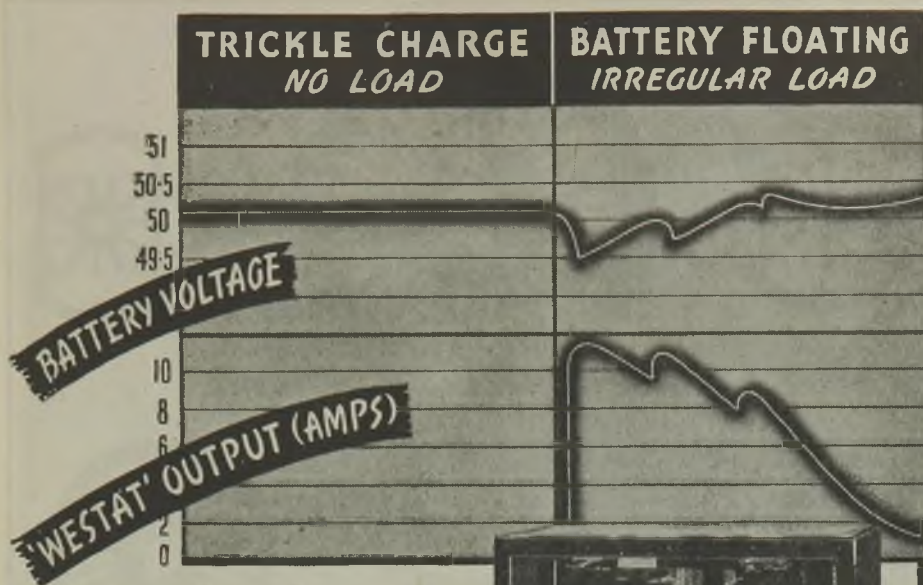


Already faint glimmerings are relieving this Night of War, and "Walsall" Conduit and Fittings are contributing to such lightening of the darkness.

Here's then, to the day when the fullest joys of Peace and the New Year may again be the common privilege of us all—and amongst them the thrills of lighted shop windows for the "younger" children.



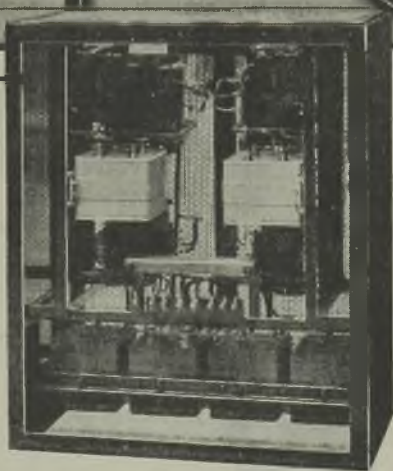
WALSALL CONDUITS LTD • WEST BROMWICH



◀ WESTAT ▶

CONSTANT VOLTAGE RECTIFIER EQUIPMENT

for use with batteries



A fully automatic floating battery system, in which the battery can always be maintained within the required limits of voltage, is now possible by the use of a "Westat" Constant Voltage Rectifier Equipment.

The curves show battery voltage and

"Westat" output current for a 50-volt battery under varying load conditions. Note (a) the battery voltage is maintained between limits of $\pm 1\%$ with constant mains, and (b) the instantaneous response of the "Westat" to changes in battery voltage.

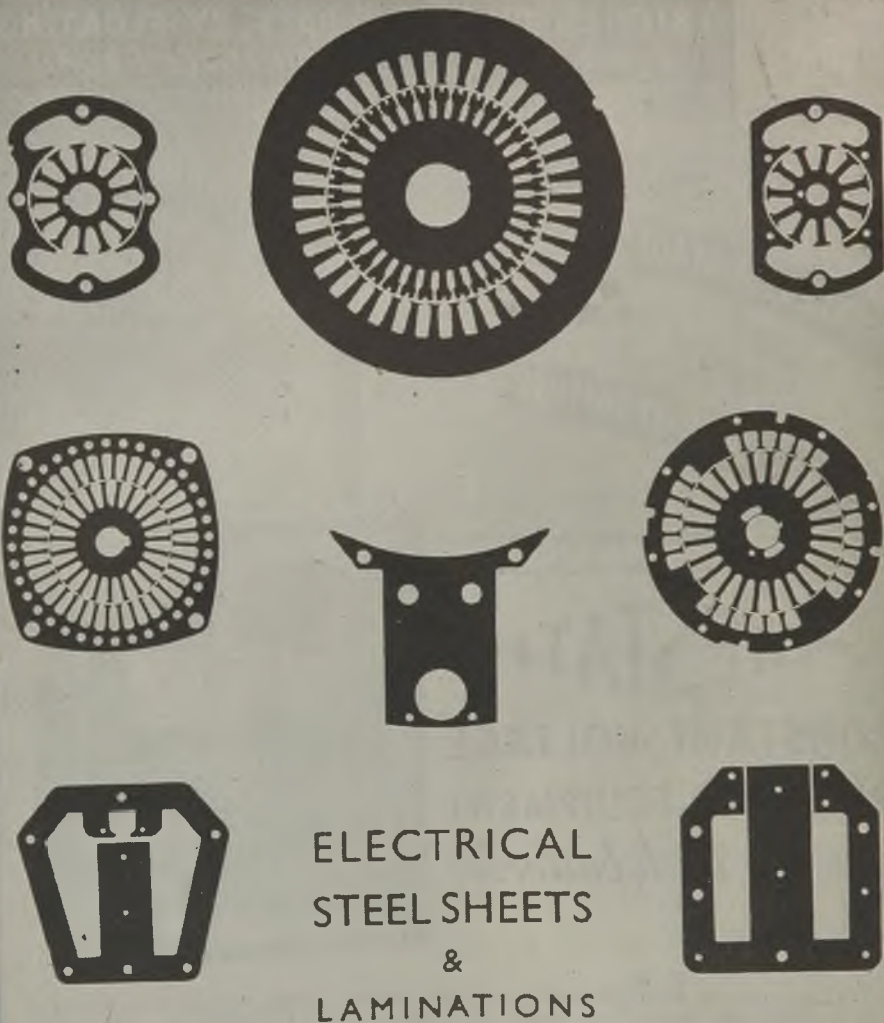


WESTINGHOUSE



WRITE FOR DESCRIPTIVE PAMPHLET No. 111

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



Brands :

"STALLOY," "MEDIUM RESISTANCE," "SPECIAL LOHYS," "LOHYS"

JOSEPH SANKEY & SONS LTD., BILSTON

LONDON : 168 Regent Street, W.1



No wonder the Public prefers Atlas Lamps : look at the value for money. No wonder the go-ahead dealer handles Atlas Lamps: just reckon up the extra profit. And remember that our advertising is appearing in every main thoroughfare and regularly in the National and Provincial daily and evening papers and magazines. Atlas dealers get extra good discounts, attractive sales aids and complete freedom to stock whatever make of other good lamps they like.



ATLAS LAMPS

Nothing better has come to light

THORN ELECTRICAL INDUSTRIES LTD., 105-109 JUDD STREET, W.C.1.

Northern Branch : 55 Blossom Street, Manchester.

N.E. Depot : 46 Sandhill, Newcastle-on-Tyne, 1.

'Phone : Euston 1183

'Phone : Central 7461

'Phone : Newcastle 24068

NIFE

ALL STEEL ALKALINE BATTERIES



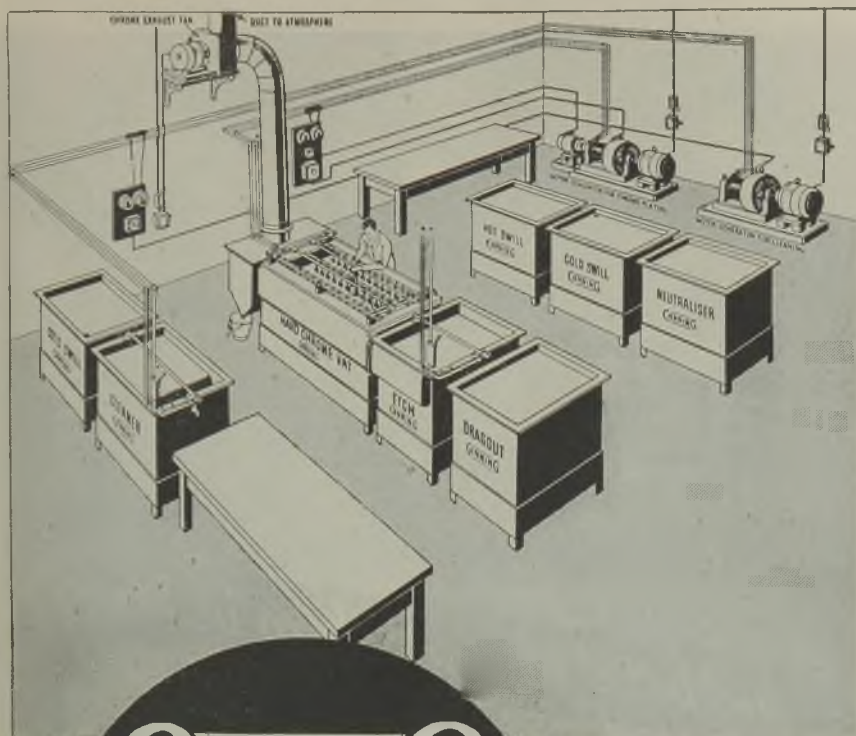
All steel construction ; plates which cannot buckle, grow or shed active material ; no sulphation ; no corrosive fumes ; unharmed by over-charging, rapid discharging or short-circuiting ; light in weight ; simple to operate and long life—all these characteristics will doubtless meet your battery problem with advantage.



NIFE BATTERIES LIMITED



HUNT END · REDDITCH · WORCESTERSHIRE



CANNING

EQUIPMENT FOR HARD CHROME DEPOSITION

For reclaiming and building up
Engineering products.

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

Let us help you with your reclamation
problems.

W. **CANNING** & CO. LTD

GREAT HAMPTON STREET, BIRMINGHAM 18



A 'pattern' of workshop lighting

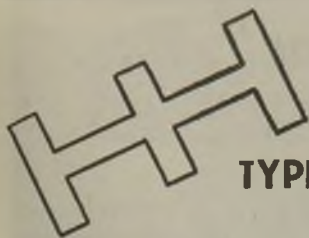


Workshop lighting should be a model of efficiency, and the pattern-shop illustrated is an excellent example of what a well-lit workshop should be. Whatever the lighting problem in your factory, Metrovick Illuminating Engineers will solve it for you.

Metrovick's 'Light'
product

COSMOS
and
METROVICK
LAMPS

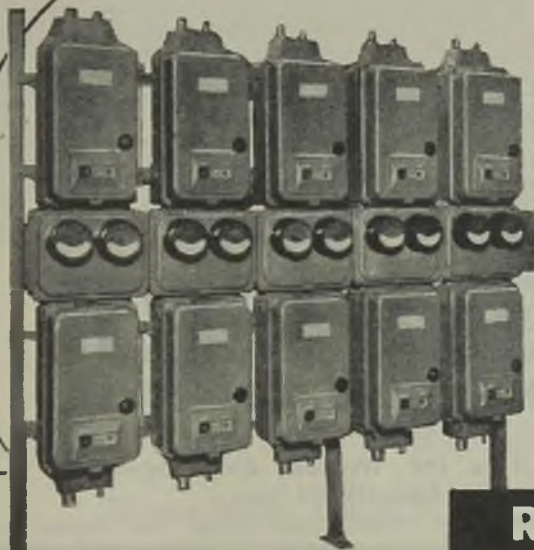
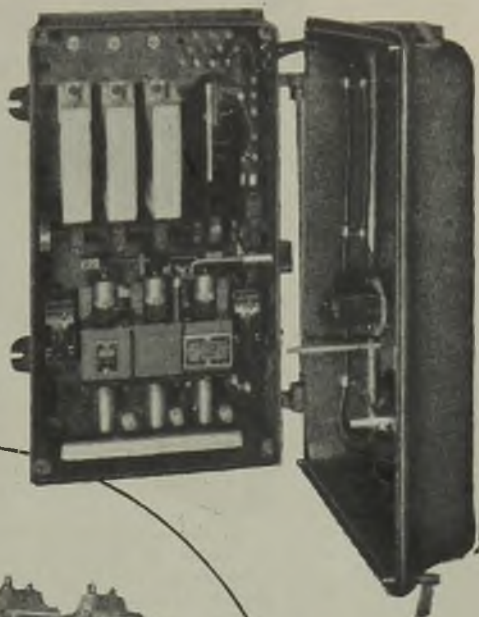
METROPOLITAN-VICKERS ELECTRICAL CO., LTD.
Number One Kingsway · · · London, W.C.2.



AIR-BREAK CONTACTORS

TYPE-GET : 75 AMPERES : 500 VOLTS

- TO B.S.775 : SEVERE-DUTY
MOTOR-STARTING
- UNIT CONSTRUCTION : METALCLAD
- INDIVIDUAL OR SEQUENTIAL
OPERATION
- ELECTRICALLY-HELD-ON
- LOCAL OR REMOTE ON-OFF
PUSH-BUTTONS
- UNDER-VOLTAGE AND SERIES
OVER-CURRENT PROTECTION
WITH BACK-UP CARTRIDGE-FUSES
IF SPECIFIED



BOARD BUILT UP OF UNITS

REYROLLE

HEBBURN-ON-TYNE

ENGLAND

The "Ha'p'orth of tar" . . .



Yes, Sir, the royal and ancient. A game for the man who takes even his pastimes seriously. You will notice how this gentleman keeps his eye on the ball and . . . of course,

Sir . . . on the etiquette of the course. The sack, Sir? Well, it seems to serve its purpose. Surely, Sir, the game's the thing. The hand that rocks the niblick rules . . . We beg your pardon, Sir? The man may be a golfer but he is no gentleman? No man with a sense of fitness would spoil the ship for a . . . ?

Yes, yes, Sir. We see your point. As a manufacturer you would naturally be particular about details. You would for example specify precision holding components by Newton. You would know that security, speedy assembly—and often safety—depend upon Newton accuracy and dependability.

Precisely, Sir, the ha'p'orth of tar . . .

NEWTON **HOLDING COMPONENTS**

Bolts, Nuts, Screws, Rivets, Precision Components

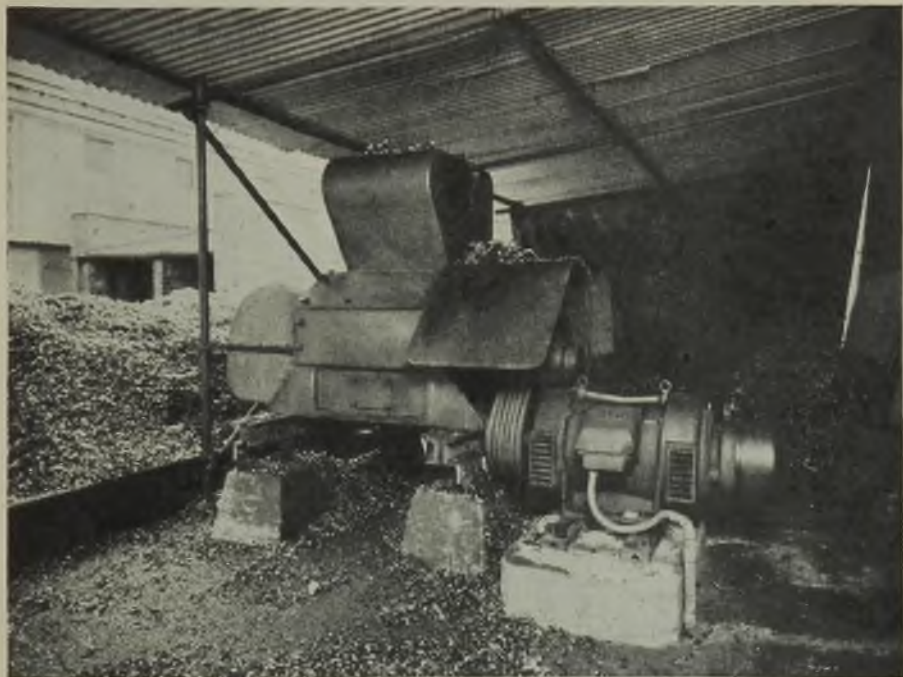
L. H. Newton & Co. Ltd., Nechells, Birmingham 7

Telephone: EASt 1551 (16 lines)

London, Coventry, Manchester, Bristol, Dublin, South Africa, New Zealand, India

Precision Speeds Production

BRUSH INDUCTION TYPE MOTORS



WHATEVER machinery is to be driven electrically you are sure of efficient operation by installing Brush Induction Motors.

These motors are suited for every class of industrial drive including individual drive of specific machines, also the operation of pumping units for water, or sewage or for motor generator units.

Brush Motors can be adapted to meet the requirements of various industries.

The photograph shows a typical application—a Brush Motor and Crusher installation.

Sizes from $\frac{1}{4}$ B.H.P. to 1,500 B.H.P.



Like the hallmark on silver and the carat sign on pure gold, the Moffat crest, which is found on the door of every Moffat Electric Cooker and Electric Refrigerator, is a guarantee of the highest attainable quality in cooking and refrigeration equipment.

The crest was adopted by Moffats Limited to identify their products, symbolizing as it does the characteristics that give them leadership in their field—the crown to express REGAL QUALITY;

the elephant a symbol of LONG LIFE AND STRENGTH; the effortless leaping of the antelopes, typical of the SPEED IN OPERATION AND STREAM-LINING IN DESIGN; and the beaver at the base of the shield signifies EFFICIENCY. The remaining intertwined letters represent the four senior members of the firm.

Truly a crest of quality—the mark of leadership in its own field, and a symbol known in all parts of the world.

MOFFATS LIMITED

BLACKBURN LANCASHIRE

Makers of the Famous Moffat Electric Cookers & Refrigerators

"Sold the World over"

C L A R K E ' S " A T L A S "

MICA *and*

TUBES : Round, Square or Rectangular, in Mica or Bakelite.

MICANITE : In Moulding, Flexible and Commutator qualities.

HEATER MICANITE for Domestic and other Electrical Appliances.

MICA : Uncut or cut to size and calibrated.

Contractors to Admiralty, Air Ministry, War Office and other Government Department lists.

MICA for all Electrical Gear and Domestic Appliances.

MICAFOLIUM · MICA PAPERS · MICA CLOTH · STEEL TUBES AND BARS INSULATED WITH MICA OR BAKELITE · LEATHEROID · FIBREBAKELITE SHEET, ETC.

H. CLARKE & CO.

(MANCHESTER) LTD.

Telephone : ECCLES 2001-2-3-4-5



ATLAS WORKS
PATRICROFT
MANCHESTER

Grams · Pirtoid, Phone, Manchester

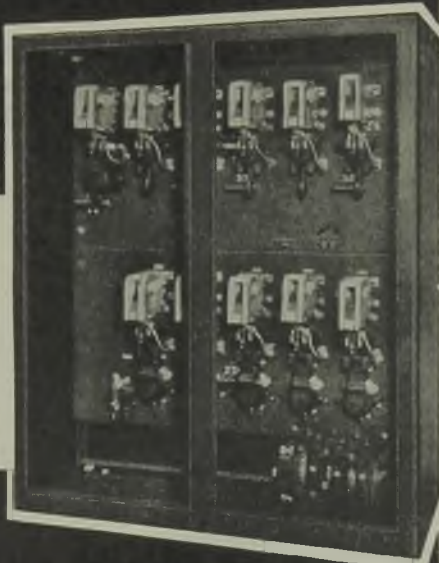
MICANITE

I N S U L A T I O N

IGRANIC
Electric Control Gear

Equip your electrically driven machines with the "right" control gear — IGRANIC, which will give positive protection to motor and machine and keep them working to secure maximum production.

Illustration shows IGRANIC Control Panel for Hoist motion of 6-ton Slab Charger for Steel Mill.



IGRANIC ELECTRIC CO. LTD.
BEDFORD & LONDON

CRYPTON

BATTERY CHARGING
EQUIPMENT



CRYPTON EQUIPMENT LTD. • REGD. OFFICE • GEORGE STREET • BRIDGWATER • SOM.

Associated Companies: Lancashire Dynamo & Crypto Ltd., Foster Transformers & Switchgear Ltd.

The same supplies –



—safe in the same containers

—but standing up to very different conditions!

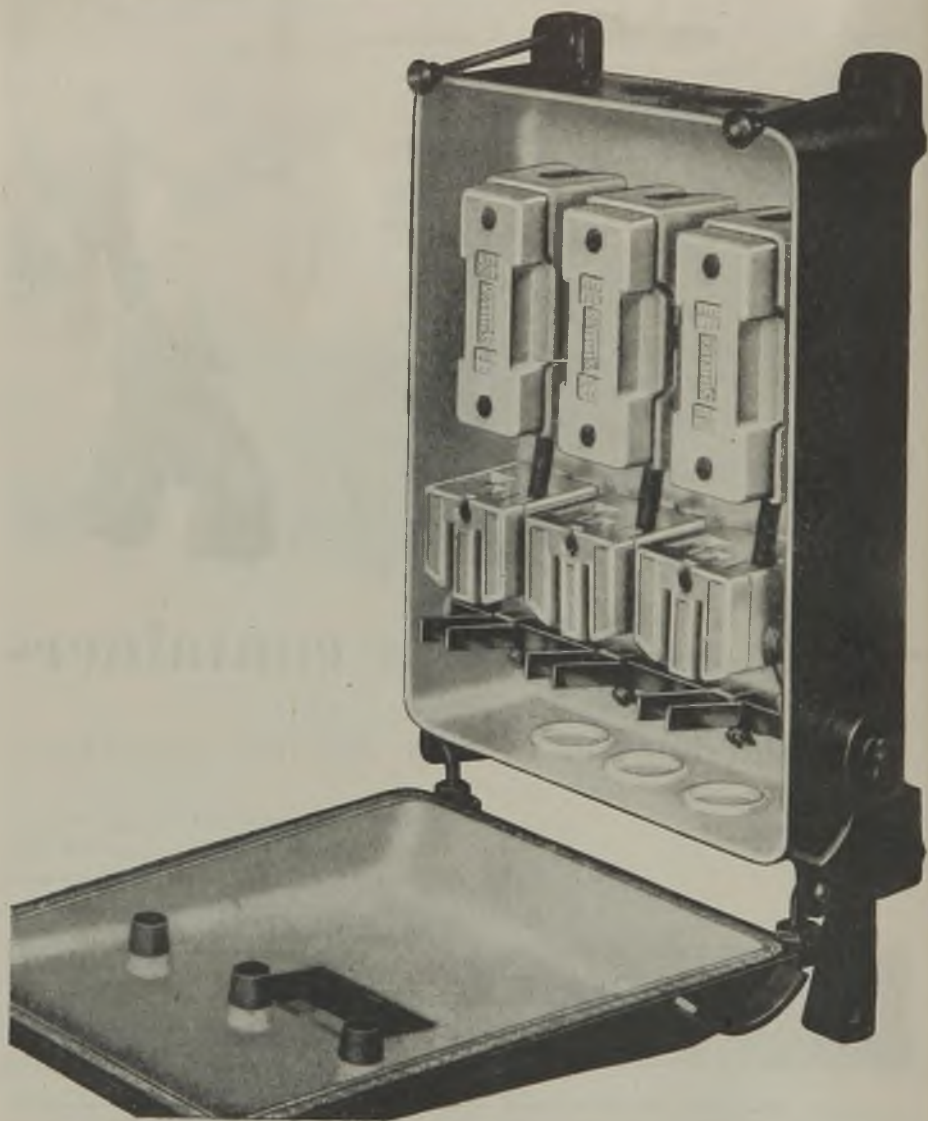
Medway Corrugated Cases are to-day doing a vital war job. Hundreds of thousands of tons of essential supplies are being delivered safely in this form of packing. And the sound reputation they achieved in the days of peace has been enhanced by the way they are standing up to the greater hazards of wartime transport. For safety—Medway—every time!

MEDWAY
CORRUGATED CASES

The Medway Corrugated Paper Co. Ltd., Larkfield, Nr. Maidstone, Kent

London Sales Office: Blackfriars House, New Bridge Street, London, E.C.4

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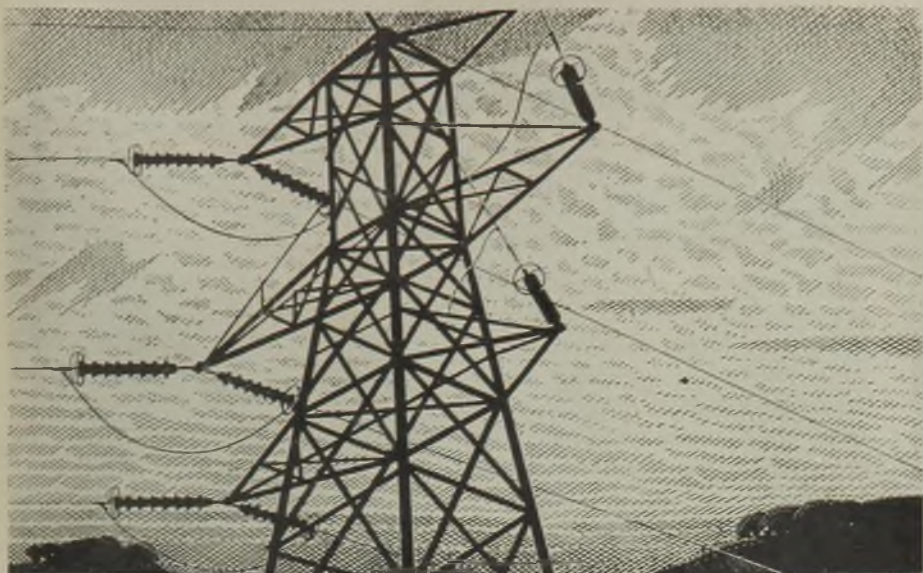
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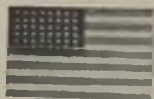
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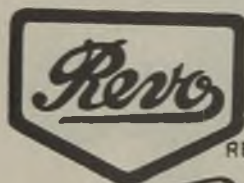
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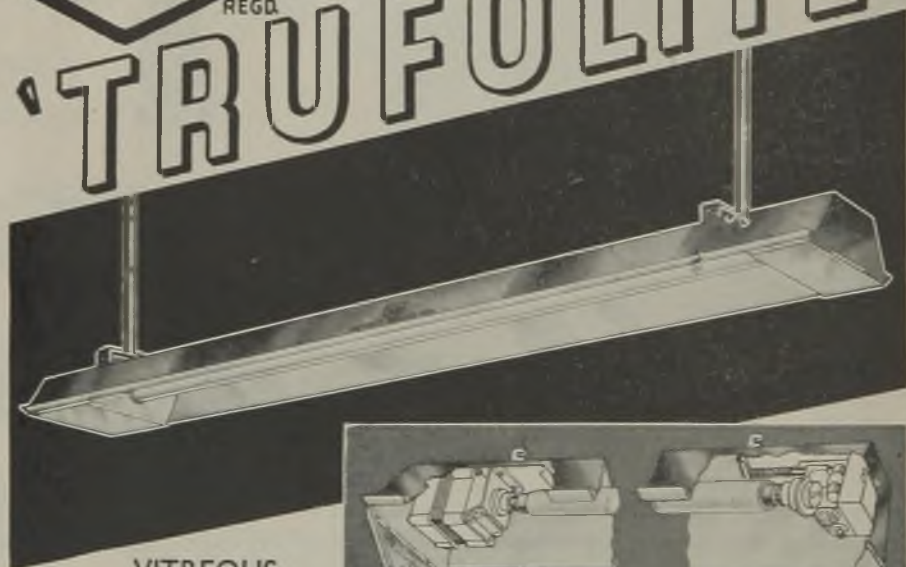
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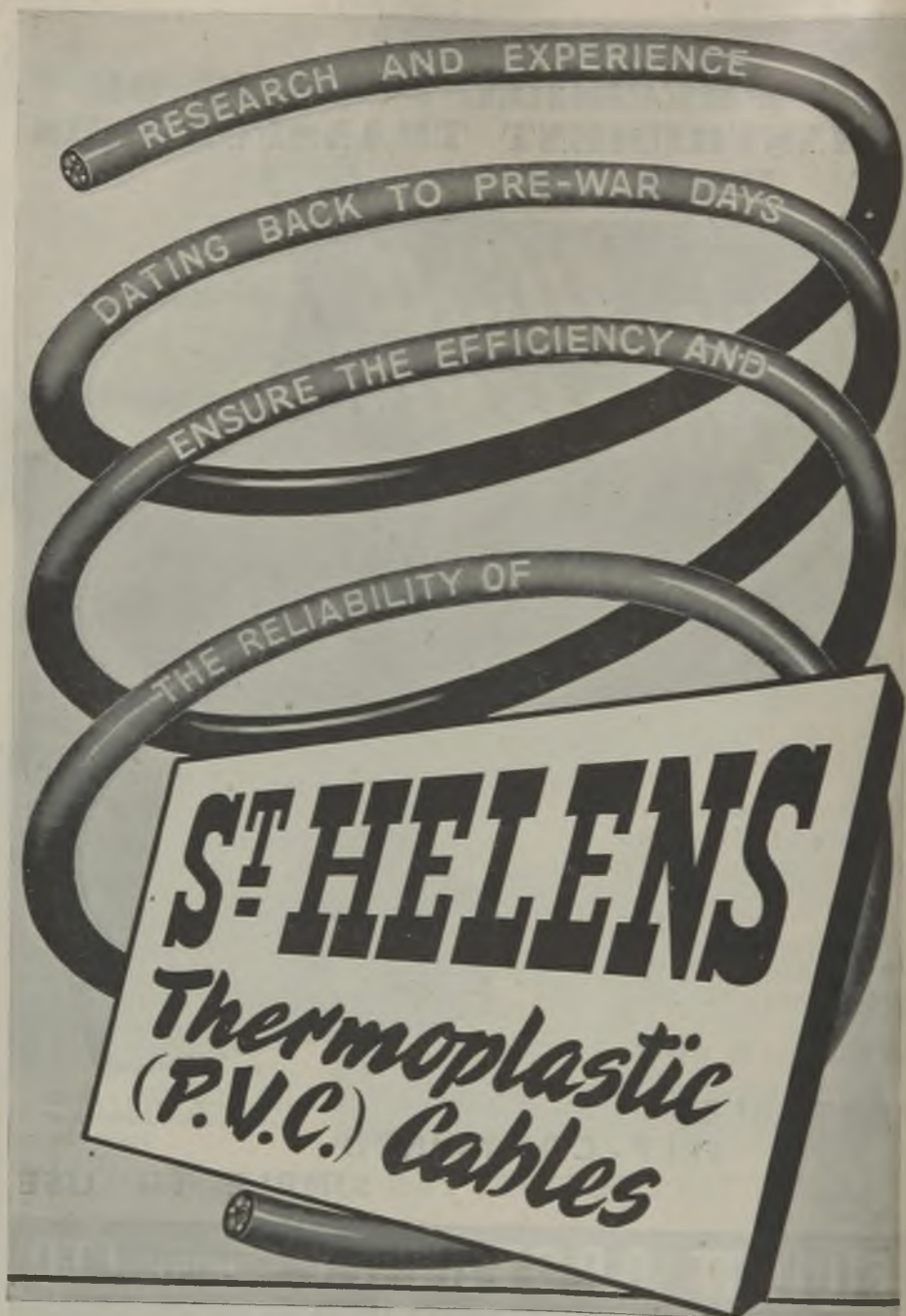
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ELECTRICAL REVIEW

January 5, 1945

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872



Vol. CXXXVI. No. 3502.

JANUARY 5, 1945

9d. WEEKLY

Good Reception

The Need for Early "Anti-Interference" Legislation

AN important recommendation of the recent I.E.E. Study on Electrical Installations (No. 11 of the Ministry of Works series) has tended to be overshadowed by other points at issue. The recommendation in question calls for legislative action to secure suppression of interference with wireless reception by the operation of electrical appliances, on the lines of the Institution's Report on Electrical Interference with Broadcasting.

This Report was prepared in 1936 by an authoritative committee representing all branches of electrical engineering as well as the wireless. Two years later it was stated in the House on behalf of the Postmaster-General that inquiries regarding the possible operation and scope of a new Wireless Telegraphy Bill, which would deal *inter alia* with interference, were being "actively pursued."

Worsening Situation

The activity mentioned seems to have been singularly unfruitful, possibly on account of delays in connection with other interests concerned. Indeed an omnibus Bill is an inappropriate way of dealing with electrical interference in which delay is as impermissible as it is unnecessary. The situation is rapidly worsening with the increasing number of electrical appliances sold with interference-producing characteristics, such as the indispensable series-wound fractional horse-power motor, and the development of high-frequency electronic devices will inevitably add to the trouble. Also provision will have to be made for a widely extended popularity of

television. In the circumstances it was not surprising to find virtual unanimity during the discussion opened recently by Mr. P. R. Coursey at the I.E.E. Radio Section in support of the legislative action envisaged in the Report of 1936.

Reasonable Precautions

Obstacles to legislation are not technical, though there may be doubts as to the precise quantitative level above which general prohibition of interference should be enforceable by statute. The best way to secure early consideration by Parliament appears to be that advocated by the *Wireless World* over many years. Our contemporary warns its readers that too rigid a specification would be a bad basis for a new law and would, moreover, make it unenforceable. What is needed is an *ad hoc* Bill under which it would be an offence at law to fail to take reasonable precautions to avoid interference.

The requisite regulations, the I.E.E. Report proposed, should be drawn up by the Electricity Commissioners, who are already responsible for regulations forbidding the use of electricity in such a way as to interfere unduly with the supply of electricity to anyone else. The enforcement of the new regulations was to be the province of the G.P.O., which has a specialist staff and which, as the recipient of the licence fees, has some moral obligation towards listeners.

In most cases interference is most effectually and economically suppressed at the source of its radiation. There is every reason to believe that British manu-

facturers would not be averse from legal provisions requiring the incorporation of suppressors in electrical appliances except that the cost of doing so, though small, might prejudice their sales position in competition with foreign importers. Some official mark would therefore be necessary to indicate that apparatus sold was free from legal objection. With the care and expense that have been devoted to the building up of a national broadcasting system, it is logical to urge that no effort should be spared to raise reception conditions as nearly as may be practicable to the level of technical excellence achieved by the B.B.C. transmission.

New Year Honours FROM the electrical point of view, the main interest in the New Year Honours List lies in the knight-hoods bestowed upon Dr.

A. P. M. Fleming and Alderman W. Walker. Prominent as an engineer, research worker and educationalist, Dr. Fleming has well earned this distinction. Alderman Walker has also done much good work for the electrical industry, for many years as chairman of the Manchester Electricity Committee and as a member of the Central Electricity Board from its inception until last year. He has done much to improve the conditions of electricity supply engineers. Another well-deserved honour goes to Sir Stanley Angwin, Engineer-in-Chief of the G.P.O., whose work in keeping communications going during the war is recognised by his appointment as a K.B.E.

Appointments for Engineers FROM time to time it has been suggested that the three leading engineering institutions should interest themselves in the welfare

of their members, that is, should help them to secure appointments when they need them and set up salary standards. But each time it has been contended by the councils of the institutions that such activities do not fall within the scope of their charters and in entering such a field they would be acting *ultra vires*. It has now been determined that while this attitude is a correct one there is nothing to prevent the institutions from taking an active interest in the work of an independent organisation designed to help engineers to find suitable posts. Thus while the funds of the Professional Engineers' Appoint-

ments Bureau which is being established may not be provided by the institutions themselves they are able to appeal to their members, as individuals, to come to the aid of the new body. They are also able to allow their presidents, secretaries and council members, again presumably as individuals, to form the governing board of the Bureau. So, while conforming to the letter of the law, they are meeting the desires of many members in taking an active part in the "economic" side of the advancement of engineering. Although in the I.E.E. announcement, summarised on another page, nothing is said regarding adequate remuneration, it is to be hoped that the point will not be overlooked.

Highland Village Supplies A GOOD example of the benefit that comes from taking broad views in regard to electricity supply is provided by the domestic

tariffs offered by the North of Scotland Hydro-Electric Board for its first two Distribution Schemes referred to on another page. These would clearly have been uneconomic (even supposing the giving of any supplies at all to be practicable on financial grounds) had the areas not been attached administratively to major schemes which envisage the production of several hundred times the amount of electricity that could be absorbed for such purposes in the hitherto unserved parts of the Highlands. The cost of lighting, cooking and heating at the proposed rates will compare very favourably with that of any alternative method and also with the charges in many large towns.

Controlling the Peak WARNINGS of summary disconnection have been sounded by Major Lloyd George and others if the

morning peak load becomes much greater. In the circumstances disconnection may be a literally painful necessity if industry is to get the power it needs. The sad feature of it is that the economical will suffer as much as the negligent, for in the pulling out of switches there can be no discrimination. Mr. E. B. Whetton, in a letter to the Minister of Fuel and Power, deprecates this and suggests instead bonuses for the careful and penalties for the wasteful. But penalties are already provided for, and a smaller consumption means a lighter bill—a self-provided "bonus."

Electrical Safeguards

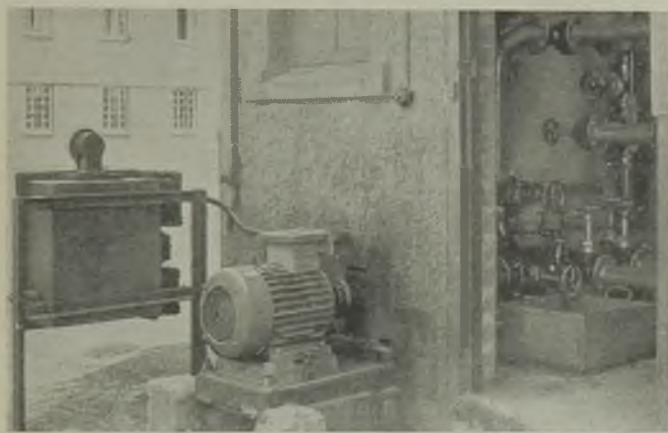
Precautions in an Explosives Factory

THE attendant and ever-present risks involved in the use of electricity in connection with equipment in a factory handling explosive and inflammable commodities calls for the adoption of methods and types of equipments superior in standard to, and often drastically different from, those which are normally used in industrial undertakings where the risks of fire and explosion are of relatively less importance. Bearing on this fundamental statement the following notes and accompanying illustrations relate to some of the safety features

relied on completely, and special thought has obviously been given to whether or not Buxton equipment is fully suitable in view of the likely presence of explosive dust and inflammable vapours.

The principle of the segregation of electrical equipment from its associated process plant is followed, in many instances in conjunction with both flameproof and non-flameproof equipment, and in all cases where the high-explosive material is processed the motor and its control gear are housed outside the process building in such a way that trans-

mission directly or indirectly is *via* a shaft through the partition wall with a sealing gland where the shaft passes through the wall. A particular aspect of segregation is repre-

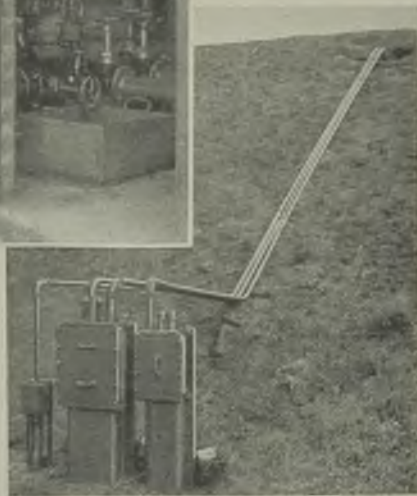


Probably the most important electrical safeguard is found in the widespread use of flameproof equipment; toluol pump drive

which we saw recently during a visit to a factory engaged in the manufacture of the high explosive T.N.T.

Probably the most important safety feature is the widespread use of flameproof motors and starters and switchgear. While in certain places within the factory specific types of specially constructed electrical equipment which is not fully flameproof in the Buxton certified sense is used, only flameproof equipment which has been certified by the issue of a Buxton group certificate is employed within or near process buildings and compartments where high-explosive materials are handled.

Examples of this are the driving motor and its associated equipment for handling the raw material toluol and the driving and control apparatus for such machines as those employed for flaking the solidified T.N.T. Even so, the safety qualifications of the Buxton equipment are in many cases not



A particular aspect of segregation is represented by the supplies to plants protected by traverses

sent by the supplies to plants within traverses, *i.e.*, protecting banks or earthworks around process buildings or storage equipments for particularly dangerous materials. It is not permissible to pass conduits and cable over the tops of the traverses, nor is the electrical engineer allowed to "go underground" in view of the possibility of acid in the soil. So, to cite a

particular case, the driving or lighting equipment within the traverse is reached by conduits from the flameproof switch pillars outside and at the base of the traverse, up the surface slope of the traverse for, say, two thirds of the way, and then through a ducting in the earthworks proper to the equipment inside.

The dangerous consequences of normal supply failures are so pronounced in the factory that special measures are taken to ensure a supply from a well protected source to certain essential drives, such as the nitrator stirrer drives, in the case of such a failure.

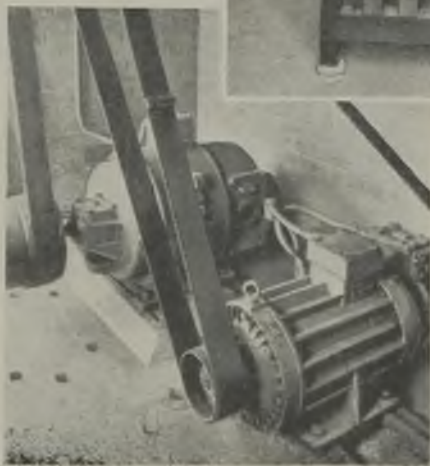
The supply source in question is a 250-V, 300-Ah battery arranged in three double-tier banks. This battery is of the lead-acid type and it serves six $7\frac{1}{2}$ -HP motors driving the stirrers on the nitration units. If the AC supply fails, mercury switches are de-energised and in consequence are automatically thrown over, by this means closing the emergency supply circuit and rendering available immediately a DC supply at the driving points.



Ready means are provided for rapidly shutting down plant in the event of serious trouble



An automatic emergency supply for essential drives in the event of normal supply failure is important



Each of the essential drives has a counterpart in a DC motor which transmits to the same shaft via a friction-clutch pulley and takes up the load automatically in the event of a normal supply failure

At each of these the 10-HP AC motor has a DC counterpart in the form of a motor which transmits by belt to the same shaft as the AC motor and is equipped with a centrifugal friction clutch pulley which normally runs idle. When the battery is put on circuit as we have just described the supply is immediately available at the DC motor terminals, so that this motor automatically starts up and the clutch comes into operation and the motor thereby takes over the load. An additional safeguard

against the possible failure of the automatic equipment is the provision of push-button starters in the DC circuits, so that the emergency motors can be run up under hand control.

Another call on the ingenuity of the installation engineers is the provision of means for readily and rapidly switching off motors in emergencies without subjecting the operatives to unnecessary risks. To this end "knock-off" switches are placed near the paths of the operatives when they are quickly leaving the scene of trouble. For instance, quick-release flameproof switches are placed on the hand rails near the stairs leading to and from the operation platform of the plant

where the T.N.T. is washed, so that in the event of trouble the operative can easily knock-off the stop button and thereby shut down the plant as he makes his way down any of the stairways.

It is impossible to over-rate the importance of adequate earthing in this type of factory, not only to obviate arcing and sparking through normal supply circuit leakages, but also to eliminate static electricity discharges. To this end then, first consideration and major importance is given to the provision of the best possible earthing means, and much experimentation has resulted in a particular form of earthing-point equipment which is standardised for use at numerous earthing points throughout the factory, at 24-ft. spacings near vital buildings. The earth plate thus adopted is of simple construction, consisting of seven turns

brought out to clamp connections on the base earthing conductor situated a few feet above the ground level and secured to the exterior surfaces of the building walls. To this base conductor, which may be regarded as the trunk line of the earthing system, are brought the tails from not only all the electrical equipment and conduits, etc., but from all metal components of the building

and equipment, such as hand rails and down pipes, which are bonded and earthed to form part of the lightning-conductor network. Throughout the factory all flexible tubes carrying cables and wires to and from motor terminals, etc., have drawn-in earth wires to ensure continuity throughout the whole of the earthing system, including, of course, motor frames, starter housings, and conduits.

An interesting example of normal earthing arrangements in the process buildings is that at the bagging station where the flaked T.N.T. from the flaking machines is weighed and bagged ready for despatch. One of the illustrations shows the earthing of the table, the platform scale, and delivery chutes. Where there are moving parts on equipment, such as the doors of the drying

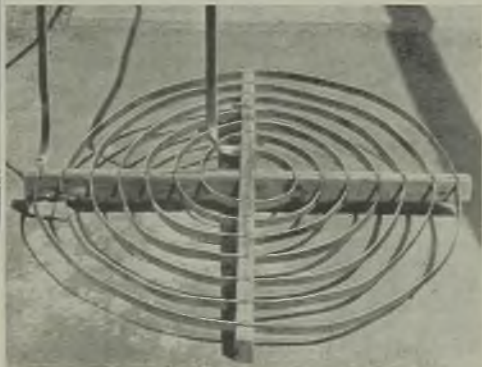


Earthing tails are brought out to the external base conductor; risers from earthing point



A good example of plant earthing is that at the chutes from the flaking plant to the bagging tables in a horizontal plane of 1-inch by $\frac{1}{8}$ -inch soft copper with the two lead-outs in one continuous length of about 90 ft. The spiral is built up on a wooden cross frame and the whole is buried several feet down to two feet below the static water level within four feet thickness of coke breeze, i.e., 2 ft. under the plate and 2 ft. above it.

These earthing-point equipments are all



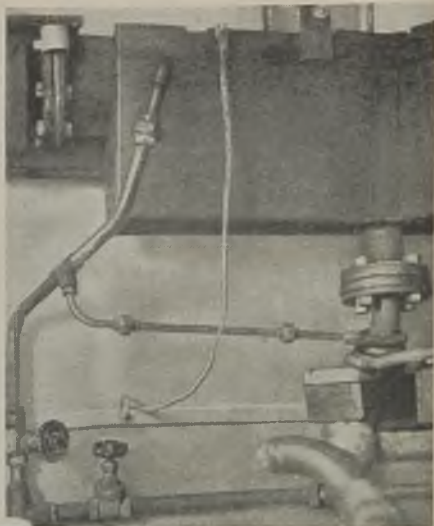
Numerous earthing points are provided throughout the factory; a standard "earth"

vessels, special flexible arrangements are necessary to "cover" the discontinuity of

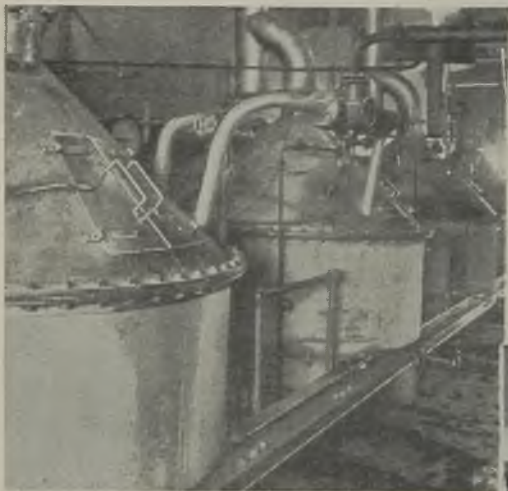
the metal. An outstanding example of such flexible earthing arrangements is that at a distribution box serving the T.N.T. drying plant. This box carries a lift-out filter which is connected to the main earthing conductor on the wall by a long flexible braid conductor with substantial lugs and bolts.

Then there is the problem created by the revolving shaft, and its solution is the slipping and brushes with tails to the earthing system. An outstanding example of the adequate bonding of joints in pipes, etc., is the bridging by stout copper links of the flanges of the overhead ducts which carry the molten T.N.T. about the works.

At the unloading bay for the toluol there are some other interesting examples of bonding which include flexible arrangements for the swivelled pipe lines for pumping out the liquid from the tank cars, and clip-on arrangements for earthing tank cars themselves. The railway sections are also adequately bonded and earthed at this bay. Throughout the factory all hand railings at



Flexible earthing arrangements for a lift-out tray filter at the washing plant and (left) doors of a line of drying vessels



operating platforms and stairways are spot welded at the joints and support points to ensure continuity of earthing throughout. In the actual T.N.T. loading bays the railway lines are made of phosphor-bronze and adequately earthed. Rail traffic is handled by Diesel-engine locomotives on which all the electrical starting equipment, lighting apparatus, etc., are of flameproof construction, and the exhaust is passed through flame-quenching devices. The buffers are covered with "Ferodo" to prevent sparking.

For lightning safeguards the protective system is regarded as an area rather than as individual points, and to this end numerous lightning finials on any one building are all connected by down tapes to the earth network.



Coupling of flanges of T.N.T. overhead duct

ensures that a break in the inner base tape does not leave the plant within unearthed. A disadvantage of belt drives has been greatly offset by the use of anti-static belting.

Universal Domestic Tariff

Simple Form which Avoids Present Anomalies

By J. L. Ferns, B.Sc., A.M.I.E.E., A.M.I.I.A.

ONE of the problems confronting electricity supply engineers is the form of tariff which could be adopted for domestic supplies if the Electricity Commissioners were instructed by Parliament to unify charges or if distribution were taken over by a national body. It is evident from the recent I.E.E. Report in which this subject was mentioned* that none of the existing tariffs is really adequate for this purpose.

The essential characteristics of a universal tariff are as follow. First, it must be promotional and possess an elasticity characteristic which would stay above unity for many years. The only instrument required should be one kWh meter per consumer and no calculations should be needed for ascertaining the fixed charge. Diversity must be encouraged as well as larger consumption. As domestic consumers are treated as a single class the tariff can legitimately be based on average domestic conditions and the old restrictions based on the dictum that lighting consumption justifies a high price per kWh must be forgotten.

Avoiding Special Determinations

The consumer should be encouraged to make and divulge increases of load. The tariff must anticipate the increasing use of electricity by all grades of domestic consumers and be uniform in application in any part of the country. It must recognise that there is no exact equation possible to couple cost of supply with kWh consumed and must avoid any special determinations (e.g. floor space) which have little connection with consumption. Being simple it should require no more than a meter reader's skill to obtain particulars from consumers' premises. The tariff should also be capable of being pictured on a graph in such a way that the consumer can at once see the effect of altering his loading conditions and should contain means whereby the charges can be easily raised or lowered to suit the changing conditions of supply. It must be different from all existing tariffs so as to avoid any feeling of favouritism or hardship arising.

To meet the above criteria the following universal domestic tariff has been devised

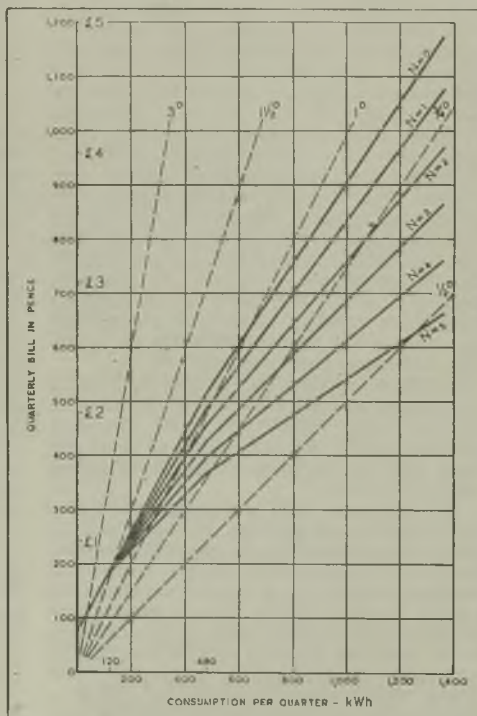
on lines which—so far as I am aware—have not previously been laid down. Cost per quarter = 78d. (i.e. 6d. per week), plus 1d. for each kWh up to 120, plus

12 — N d. per kWh between 120 and 480 and

10 — N d. per kWh over 480, where N = the number of types of heavy-load apparatus used by the

consumer, i.e., cooking, direct space heating, thermal-storage heating, refrigeration, power.

A discount for prompt payment of 1d. in the shilling would be allowed on kWh only. The effect of the tariff (with discount allowed) is portrayed in the accompanying figure, in which the dotted lines show how the average price per kWh falls with increase of consumption or change of N. Although



Curves showing how the average price per kWh falls with increase in consumption and change of N (number of types of heavy-load apparatus used)

* Electrical Review, February 4th, 1944.

the general statement of the tariff may appear a little algebraic, this difficulty vanishes when a definite value is allotted to N.

The tariff proposed satisfies the criteria detailed above in the following ways. It is promotional since the consumer is encouraged to use more and more electricity until the stage is reached when the home is all-electric. Greater consumption always reduces his average price per kWh. Only a simple kWh meter is required and the use of prepayment meters could be discouraged by a higher fixed charge. The fixed charge is the same for all domestic consumers (except prepayment) so there is no question of having to investigate rateable values or floor areas or the like before a consumer can be told what he has to pay. Diversity is encouraged because the consumer would obtain a bigger benefit by adding another form of heavy loading than by adding a similar load of an existing form. This point is important because the diversity of the domestic load more than makes up for the lowness of individual load factors.

Benefits of Uniform Fixed Charge

The anomalies of existing two-part domestic tariffs are such that in some instances steps have been taken to mitigate their effects, as for instance in the scaling down of the percentage of rateable value as the r.v. rises and in the arbitrary assessment for floor-area tariffs owing to the physical difficulties involved. The proposed charge of 6d. per week cuts out anomalies arising from lack of connection between fixed charge and demand for electricity. This charge fully covers the standing charge incurred by the undertaking in supplying a consumer, irrespective of his consumption. It can reasonably be made the same for all domestic consumers since averaging is an inherent principle of domestic tariffs; e.g. a consumer near the power station costs less to supply than one who is more remote.

Although electricity can be sold for lighting at a high price, the kWh used for the purpose is a very small proportion of the total and does not justify the installation of a second meter with the extra readings, maintenance and clerical work.

The proposed tariff definitely encourages the consumer to increase his load and to inform the undertaking of any such changes, since such notification carries with it a financial benefit. It is framed on the basis that in the near future few consumers will not be able to claim a value of two or three for N. Another point in its favour is that its application is unaffected by geography. The factors which control the cost of giving a particular small supply are so variable that the cost cannot be worked out exactly, and all should therefore be treated on a par.

Fixed charge assessments which bear no

relation to consumption are always introducing anomalies which tempt the engineer to set out amendments. Furthermore, non-electrical bases are greatly affected by geography, e.g. country houses are built on different lines from town houses and rateable value assessments vary with the district.

The fixed charge is kept low for two reasons. First, because the price per kWh starts at a fair level, viz. 1d., and secondly, because two-part tariff consumers who are on the 8s. to 10s. per quarter basis at present must not be deterred from agreeing to the change. With the aid of the figure a meter reader could explain the tariff to a consumer. The value of N need not be determined until the first meter reading when the meter reader would be competent to verify the figure for N claimed by the consumer and to check it at any future visit if he suspects from the readings that it is incorrect.

The figure, which only states a particular case, not a finally settled tariff, shows that the latter can be easily pictured. It has five stages which could be altered separately to suit changing conditions. It would not impose hardship on consumers who have not been accustomed to fixed charges in the past, apart from minimum quarterly bills.

The answer to the objection that the determination and revision of N places too much faith in the meter reader's acumen or devotion to duty is that he has a job to lose if he fails to carry out his duty and that his work is not unchecked in a well-run establishment. Also there would be a protective clause in the tariff designed to penalise consumers guilty of deliberate subterfuge, and it is very much easier for a meter reader to check the presence of certain apparatus than to make a detailed inventory. If a consumer does away with a type of heavy loading his consumption is almost certain to decrease and thereby draw attention to the change.

The only other objection which comes to mind is that each type of heavy loading gives the consumer an equal cost per kWh benefit irrespective of the consequent change in consumption. This particular feature is, however, aimed at improving load diversity and not total consumption, so that, taking the long view, it is undesirable to discriminate between the loads specified in the tariff.

Transformer Specifications

CONSEQUENT upon the withdrawal of the restrictions on the manufacture of transformers as imposed by S.R. & O. 1943, No. 1353, the war emergency amendments to the specifications B.S. 171, 1936 (Electrical Performance of Transformers for Power and Lighting) and B.S. 355, 1939 (Mining-Type Transformers) have been withdrawn. To give effect to this, amendment No. 2 to these specifications has been issued. Copies of this amendment (P.D. 297) may be obtained from the B.S.I. on receipt of a stamped addressed envelope.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE list of New Year Honours published this week includes the names of **Dr. A. P. M. Fleming** (for his services to education) and **Alderman W. Walker** (for services to municipal electricity supply) upon whom knighthoods are conferred. Dr. Fleming, a director of the Metropolitan-Vickers Electrical Co., Ltd., is well-known throughout the industry as a past-president of the I.E.E. and a leading authority

Guard. Major Eyre, who served in France during the last war, is the principal of the firm of **Alan Eyre & Co.**, wholesale electrical factors, of Chesterfield.

Major Robbins, who before joining the Army was on the sales staff of **Belling & Co., Ltd.**, has been mentioned in dispatches in recognition of gallant and distinguished services in Italy. It is understood that the mention is in respect of the Salerno landings. Major Robbins joined the Army in March, 1941, and is now with G.H.Q., Middle East.

Mr. E. H. Lanham, consumers' engineer at Preston since 1920 and an employee of the National Electric Supply Co. and Preston Corporation electricity undertaking for over forty-six years, retired on December 23rd, and was presented with a fishing rod and suitcase by his fellow employees. Mr.

G. A. Robertson, the borough electrical engineer, made the presentation. From members of the Preston branch of the Electrical Contractors' Association Mr. Lanham received a cheque, the presentation being made by Mr. J. E. Eaves.

Mr. L. Short, manager of the Dumbuck Works of **Babcock & Wilcox, Ltd.**, at Dumbarton since they were opened in 1915, has just retired. Mr. Short was apprenticed to **Charles Burrell & Sons, Thetford**, and in 1893 joined **Marshall, Sons & Co., Gainsborough**, with whom he held a number of responsible positions until 1905, when he became works manager to **Robey & Co., Lincoln**. Later he was manager and engineer to **Davy, Paxman & Co., Colchester**. Mr. Short will remain with **Babcock & Wilcox, Ltd.**, in a consultative capacity.

Mr. A. R. Chapman, deputy general sales manager of **Babcock & Wilcox, Ltd.**, has been appointed general sales manager.

Mr. L. Bunce has resigned his directorship of **Dudley Electrical (Wholesale) Supplies, Ltd.**, and has relinquished all interest in the company. **Mr. E. F. Williams** has now joined the board.

Mr. F. Riley, A.M.I.E.E., A.M.I.Mech.E., chief engineer of the **Calderstones Institution, Whalley**, is retiring after thirty years' service. Before this appointment he was chief assistant engineer at the **Rawtenstall** electricity works and had been in the service of other electricity undertakings. He has also been consulting engineer for the electrification and maintenance of quarries.

To mark the connection of the five-thousandth consumer to the mains of the **Alderley Edge and Wilmslow Electricity Board**, **Mr. P. E. Carlisle**, the chairman, recently presented **Mrs. Hulme, 46, Alma Lane, Wilmslow**, with a 2-kW radiator. Mr. Carlisle recalled that when the Board was formed in 1928 there were only 1,463 consumers,



Dr. A. P. M. Fleming and Alderman W. Walker, two new knights, and Sir Stanley Angwin (K.B.E.)

on technical education and training. **Alderman Walker** is a past-president of the Electrical Development Association, former chairman for many years of the Manchester Electricity Committee and a member of the Central Electricity Board from its establishment in 1927 until the end of 1942. **Dr. James Chadwick**, Professor of Physics in **Liverpool University**, is knighted for his services to the Department of Scientific and Industrial Research, and **Mr. R. N. Dale**, Joint Deputy Secretary, Ministry of Fuel and Power, is also among the new knights. **Sir Stanley Angwin**, another past-president of the Institution and Engineer-in-Chief of the G.P.O., is made a K.B.E. **Capt. Lord Reith** becomes a C.B. (Military Division).

Mr. Victor Vesnin, president of the Academy of Architecture of the U.S.S.R., has been awarded the Royal Gold Medal for 1945 of the Royal Institute of British Architects. Mr. Vesnin was responsible for the design of the great **Dnieper Dam** (which is now being restored) and for other hydro-electric works on the Volga.

Mr. W. F. Higgins, O.B.E., secretary of the National Physical Laboratory, has been appointed superintendent of the Physics Division of the Laboratory and **Mr. E. S. Hiscocks, M.Sc.**, succeeds him as secretary. **Dr. G. A. Hankins**, is to be superintendent of the Engineering Division.

Mr. R. J. Denman, Sutton District officer, London and Home Counties J.E.A., is due to retire on February 22nd but is being re-engaged in a temporary capacity.

Mr. William Black, Mavor & Coulson, Ltd., has been awarded the gold medal for the best fifth-year apprentice. **Mr. James Strain** has won the silver medal.

The M.B.E. has been awarded to **Major F. Alan Eyre** for services rendered in the Home

and that, while in 1929 sales of electricity amounted to between five and six hundred thousand kWh, they were now between ten and eleven million kWh a year. Lighting charges had been reduced by one-half and tariffs generally had been lowered.

Mr. F. D. Balshaw, chief technical assistant in the Willesden Electricity Department, retired on pension on December 31st. He had been in the Council's service for forty-two years.

Mr. Branson Nuttall, M.I.E.E., whose appointment as deputy electrical engineer at Huddersfield was announced in our issue of December



Mr. B. Nuttall

15th, is forty-two and a native of Manchester, where he attended the Central High School and the College of Technology, of which he is an associate. Following his apprenticeship course from 1918 to 1923 with Ferguson, Pailin, Ltd., in which he specialised in power switchgear and protective equipment, he became successively the company's contracts engineer, general engineering assistant and

deputy sales manager. In 1932 he took up the position of technical assistant to the Nottingham electricity undertaking, where he became chief technical assistant and constructional engineer, a position he now relinquishes to take up his new appointment. Mr. Nuttall is a member of the I.E.E. East Midland Sub-Centre Committee. He has contributed several articles to the technical Press and was awarded a premium for a paper published in the I.E.E. Journal.

Mr. C. W. Burr, assistant for special turbine work at the Swansea Corporation's Tir John power station, has resigned to take up an appointment with the Brush Engineering Co., Ltd.

Mr. E. Howard has been recommended by the Nottingham Lighting Committee for the position of lighting engineer at a salary of £750 per annum with effect from November 1st, 1944. Mr. Howard, as lighting superintendent, has been in charge of the department since March last.

The golden jubilee of the opening of Dewsbury electricity works on December 10th, 1894 (see *Electrical Review*, December 22nd, page 881) was celebrated in the Town Hall on December 21st. **Alderman A. Sugden**, J.P., chairman of Dewsbury Electricity Committee, who presided and responded to the toast of "The Dewsbury Electricity Department," said that sometimes his political friends on the Council wondered why he, as a Socialist, was in that position on a committee which was the vendor of a commodity of private enterprise. In that connection he took a long view because he was of opinion that the day was not far distant when coal, power and transport would be under State ownership and control. He therefore welcomed all those great schemes of unification as a means to an end. In the next half century, with the industry properly organised

and controlled, there would be no need for any village or hamlet in Great Britain to be denied a supply at a reasonable tariff.

Sir W. Murray Morrison is retiring from the position of managing director of the British Aluminium Co., Ltd., next March after fifty years' service with the company. He will remain on the board. **Mr. Geoffrey Cunliffe**, general manager, and **Mr. George Boex**, technical manager, have been appointed to succeed Sir Murray as joint managing directors.

Mr. C. B. Kingsford, manager of the switchgear sales department of the British Thomson-Houston Co., Ltd., has retired after forty-two years' service with the company, and at a recent meeting at the Willesden Switchgear Works was presented with a gift from his friends and colleagues. He is succeeded by **Mr. L. Drucquer**, M.I.E.E., who joined the company in 1920, and after experience in the test and outside construction departments, entered the switchgear sales department in 1925, becoming assistant manager.

The Western Centre of the Institution of Electrical Engineers has formed an Installations Group. **Mr. A. N. Irens**, chief electrical engineer of the Bristol Aeroplane Co., has been elected the first chairman and the hon. secretary is **Mr. H. R. Beasant**.

Mr. James Williamson has resigned his appointment as chief engineer and director of Sir William Arrol & Co. as from December 31st, and **Mr. Gilbert Roberts** has been appointed to succeed him. Mr. Williamson, who was a member of the Cooper Committee on hydro-electric development in Scotland, is to act as one of the civil engineering consultants for several of the proposed hydro-electric schemes.

Obituary

Mr. C. R. Riber, who retired on June 1st, 1940, from the position of factory manager of the engineering departments of Siemens Bros. & Co., Ltd., died on December 17th. Mr. Riber

entered the company's service in 1907, as factory manager of the apparatus department, his first task being to reorganise the manufacturing methods and to introduce mass production for such apparatus as telephones. At that time the department employees numbered 218, and the floor space of the workshops, stores and offices was approximately 46,000 sq. ft. At the close of the last war Mr. Riber was appointed factory manager for all engineering departments and with the installation of modern machine tools, expansion took place to such a degree that the apparatus department employees at the time of his retirement numbered over 5,000 and the floor space was nearly half a million sq. ft. Mr. Riber was keenly interested in the social and welfare organisations of the company.

Will.—The late **Mr. W. H. Collis**, electrical engineer, of Wavertree, Liverpool, left estate valued at £20,724 (£18,535 net personality).



The late
Mr. C. R. Riber

CORRESPONDENCE

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

Pensions for Professional Men

ON page 803 of your issue of December 8th you suggest that there should be a general pension scheme for professional men.

Why stop at sectional arrangements? Why not, as I suggested to Sir William Beveridge when he was preparing his report, a compulsory, general, contributory pensions scheme, premiums collected at the same time as income tax, and the amount of pension to be some factor of the total payments made by each member throughout his working life?

This would make for a better interchange of talent between industry and Government service and would automatically take care of periods of unemployment and/or low earning capacity.

London, S.W.17.

A. J. FELSTEAD.

Transformer Economics

IN your report of my contribution to the discussion at the I.E.E. Transmission Section meeting on December 13th, recorded on page 895 of your December 22nd issue, the third paragraph is not quite correct. What I said was:—

"... Any radical reduction in iron loss levels would require the use of still higher grades of steel for economic designing" and not:—"... Any radical reduction of the iron loss would require the use of too high a grade steel for economic design," as reported.

As this is rather an important point I should be glad if you would make a note of this correction.

Trafford Park,
Manchester.

A. G. ELLIS,
Chief Engineer,
Transformer Dept.,

Metropolitan-Vickers Electrical Co., Ltd.

Electricity Supply Reorganisation

AFTER reading "Electron's" letter in your issue of December 22nd, I certainly think he was personally very wise in deciding to remain anonymous. If anyone ever merited the title of "unconscious humorist" I suggest it is your correspondent, as I cannot conceive that anyone would knowingly rush into print with statements so diametrically opposite to the actual facts as those contained in his letter.

I think it has long been known to practically everyone of any standing in the industry that the Brown and White Memoranda on Post-War Reorganisation were not merely approved by the I.M.E.A. Council, but were, in fact, placed before two extraordinary general meetings of the Association specially

convened for the purpose which all members were invited to attend. These meetings were held in London in March and April last, and it was not until after the April meeting, at which the proposals were approved by a very substantial majority, that they were submitted to the Minister of Fuel and Power.

In these circumstances it is quite untrue to say that it is a case of the pot calling the kettle black when the Association of Municipal Corporations is very rightly criticised in the *I.M.E.A. Journal* for acting unconstitutionally by putting forward on behalf of its members proposals which had merely been considered and approved by the General Purposes Committee of the Association and regarding which (unlike the I.M.E.A.) the general body of members had been given no opportunity of expressing their approval or otherwise.

A. J. C. DE RENZI.

Newcastle-under-Lyme.

I.E.E. Examinations

THE coming changes in the syllabus for the associate membership examination of the Institution of Electrical Engineers seem to me to be a step in the right direction, especially when one remembers that the true test of an institution lies in the quality rather than quantity of its membership.

For several years I studied under considerable difficulties—air-raids, C.D. duties, long working hours, etc.—the Higher National Certificate course in electrical engineering, and on completion of the course I received the two certificates. Now that I wish to make use of this qualification, I find that it is not considered to indicate a high standard of technical education, primarily because of the great diversity in the type and standard of the questions set by the various colleges. I have been given to understand that the certificates would be better recognised if the examination papers were common throughout the country and set by the Institution.

May I, therefore, suggest that the Institution should set the examination papers for both the Ordinary and Higher National Certificates?

Essex.

EX-STUDENT.

WHILE entirely agreeing that a high standard of attainment should be required for associate membership of the Institution of Electrical Engineers, I do feel that some consideration should be given in Part 1 of the examination to persons over thirty-five years of age who have been con-

nected with the industry for at least ten years. I took Part 1 for the third time last November and spoke to fifteen "hopefuls" all over thirty-five years who were all trying to pass Part 1 at their third attempt; all had passed in the three subjects at different times in the two previous examinations.

It is more or less accepted that if any of the over thirty-fives do not get through in the forthcoming May examination, there is little hope of their getting through under the new regulations unless concessions are made for persons over thirty-five.

The University of London has permitted candidates to take the matriculation examination in two parts because of the present emergency. Has the examining body of the I.E.E. made any such concession? Further, why should it take nearly three months before any results can be received? Also surely some indication could be given as to how many marks or what percentages are required.

Other educational bodies are doing their utmost to foster further education for the not so young; the new I.E.E. regulations seem to frustrate any attempt at improving one's education.

Kent.

BELAC.

Cutting-off of Supplies.—Mr. E. B. Whatton, A.M.I.E.E., has sent us a copy of a letter which he has addressed to the Minister of Fuel and Power on the subject of the possible cutting-off of electricity supply at peak-load times. Mr. Whatton points to the impossibility of distinguishing between essential and non-essential uses and suggests that instead of cutting off supplies bonuses should be paid to those who can prove economy since 1939 (especially during the winter quarter of 1944) and that those whose consumption has increased without real justification should be prosecuted.

Irish Electricity Bill

A MEMORANDUM issued by the Department of Industry and Commerce of Eire on the Electricity (Supply) Amendment Bill, 1944, states that the cost of the rural electrification programme approved by the Government is estimated, at pre-war values, at £17,000,000. The main object of the Bill is the provision of a simple and expeditious means of enabling the Electricity Supply Board to prepare and undertake, by the authority of Statutory Orders, the development of power schemes on any river found suitable. The Erne development is estimated to cost £3,500,000 (pre-war basis).

Under the Bill the Minister for Finance is authorised to make advances to the Board for the purposes of rural electrification up to a maximum of £5,000,000. Only half of this total will be repayable by the Board, the other half being made payable to the Central Fund out of voted moneys, thus representing a State grant towards rural electrification. The sum provided will, it is estimated, suffice to enable

the Board to carry out the work in the immediate post-war period. In this period experience will be gained of actual costs and probable revenue, so that when further advances are needed it will be possible to make more concrete provisions in legislation both as regards the total commitment and the State's liability in the nature of free grants, having regard to the probable revenue from consumers.

The E.S.B. is to be enabled, with the approval of the Minister for Industry and Commerce, either by itself or in conjunction with other interests, to secure the manufacture in Eire of electrical plant and other items needed in the development of its programme. Under this enabling clause, however, arrangements are contemplated whereby existing firms in the State will be given an opportunity to demonstrate their ability to produce the required equipment in quality and quantity before authority is given to the Board to undertake production.

Provision is also made empowering the Minister for Finance to advance to the Board additional money up to a maximum of £7,500,000 apart from the advances for rural electrification.

Forthcoming Events

Friday, January 5th.—*Chesterfield.*—Station Hotel, 6.30 p.m. Association of Mining Electrical and Mechanical Engineers (Midland Branch). "Electrical Testing and Measuring," by D. Blake.

Bath.—Pump Room, 7.15 p.m. Bristol Students' Section. "Principles of Television Transmission and Reception," by D. J. Clatworthy.

Monday, January 8th.—*Cardiff.*—South Wales Institute of Engineers, 5 p.m. Joint meeting of I.E.E. Western Centre and the Institution of Post Office Electrical Engineers. "Merging of Line and Radio Technique," by A. H. Mumford.

Birmingham.—Grand Hotel, 6 p.m. I.E.E. South Midland Centre and Institution of Post Office Electrical Engineers. Discussion on "Training of an Engineer," to be opened by D. B. Hoseason.

Newcastle-on-Tyne.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "Influence of Resistance Switching on the Design of High-voltage Air-blast Circuit-breakers," by H. E. Cox and T. W. Wilcox.

Tuesday, January 9th.—*London.*—Lighting Service Bureau, W.C.2, 5.30 p.m. Illuminating Engineering Society. "The Poetry of Light," by R. Gillespie Williams.

Glasgow.—Royal Technical College, George Street, 6.15 p.m. I.E.E. Scottish Centre. "Transmission and Distribution of Electricity to Mines," by B. L. Metcalf.

Wednesday, January 10th.—*Bristol.*—Merchant Venturers' Technical College, 2.30 p.m. Same as January 8th (Cardiff).

Thursday, January 11th.—*London.*—39, Victoria Street, S.W.1, 4.30 p.m. Association of Mining Electrical and Mechanical Engineers (London Branch). "Electrical Aspects of American Mining Machinery," by R. Crawford.

Saturday, January 13th.—*London.*—Lighting Service Bureau, 2, Savoy Hill, W.C.2, 2.15 p.m. Association of Supervising Electrical Engineers. "Theatre Lighting," by L. G. Applebee.

All-Electric Kitchens

E.D.A. Models for Post-war Houses

FULL-SCALE models of the four all-electric kitchens designed by the British Electrical Development Association for post-war houses (see *Electrical Review*, November 17th, page 709) can now be seen at the Building Centre, 23, Maddox Street, London, W.1. Two of them are in full working order and practical tests have been made

As in all four kitchens, the electric cooker is of the horizontal type embodying a raised oven (thermostatically controlled) and two

General view of kitchen No. 1



by housewives and cooking experts who are submitting reports to the Association. In the first model a dining kitchen (134 sq. ft.) has a laundry utility room (60 sq. ft.) adjoining. Special attention has been paid to securing a convenient sequence for food preparation, cooking and washing-up. The sink is almost out of sight from the meals table, while a separate portable table under the counter top next to the refrigerator may be used in the centre of the kitchen.

capacious hot-cupboards. Besides the grill-boiler there is one fast hotplate, loaded at 2 kW and provided with four-heat control including simmering. The 4-cu. ft. refrigerator, built in 3 ft. from the floor, is large enough, in conjunction with adequate wall cupboard accommodation for non-perishable foods, to make a separate larder unnecessary. Fitted in one corner, close to the sink, is a new 20-gal. "two-in-one" type water heater serving the whole house.

The working area is lighted by two totally-enclosed fittings placed on a diagonal line to avoid shadows, a separate light being provided over the meals table. A reflector fire fixed over the door from the living-room warms the meals space: it is controlled from a shoulder-high switch near the door. A tubular heater serves as a supplementary source of warmth in the working area, besides furnishing heat for drying tea-cloths. Three utility plugs are spaced conveniently round the working area, the one forming part of the cooker control unit and intended primarily for the kettle being fitted with its own fuse unit.

The utility room contains cupboards for cleaning materials and brooms, as well as the washing machine and an electric drying cupboard large enough for the whole of the family wash. The washing machine may either be used alongside the sink or in front of it. When not in use the top of the machine



The new horizontal type cooker which has valuable storage space underneath

forms an additional table. The plug for the iron is fixed high up so that the flexible cord is kept out of the way of the user.

Kitchen No. 2 (115 sq. ft.) is intended for a house in which meals are taken in a separate dining room or dining recess off the living room. Laundry facilities are provided, a hand-

absence of convenient outdoor drying space, no attempt has been made to include facilities for washing clothes in this kitchen, the

Sink and washing machine in the utility room of kitchen No. 1



operated wringer being erected on a special bracket between the wash-boiler (of a new square cabinet type) and the sink, so that its operation transfers the clothes from one to the other without heavy lifting. The cooking, heating, water heating and lighting arrangements are similar to those in the first kitchen, but an added refinement is an extract fan, included on account of the proximity of the cooker to the living room door. A compact design of intake and meter unit is mounted inside the broom cupboard.

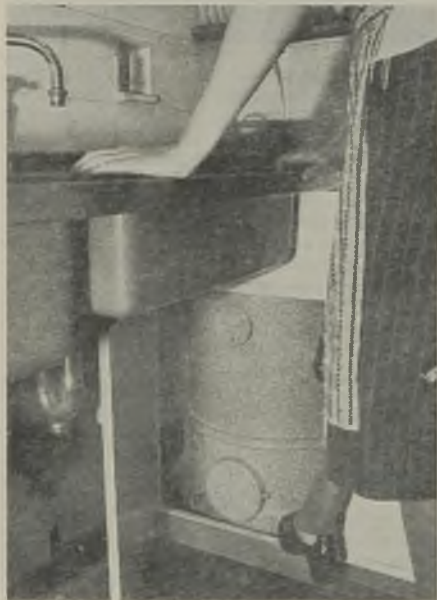
Designed as a dining kitchen for the

assumption being that a communal laundry will be provided for the use of the tenants. An electric convector is shown as an alternative to the radiant heaters indicated in the other plans. The very similarly equipped kitchen No. 4 (68 sq. ft.) is meant for flats of a higher rental than No. 3 where the tenants prefer to dine in an adjoining room. Special features are the use of fluorescent lighting and a well-arranged service hatch, china cupboards and cutlery drawers communicating with the adjacent living room.

E.D.A. is to be congratulated not only on the excellence of the designs but also on their presentation, particularly in view of the difficulty of procuring suitable materials, which has made it impossible fully to portray what the post-war kitchens *can* be. This applies particularly to the colour schemes. It is pointed out that, while the kitchens have been designed primarily for permanent houses, there is no reason why many of their features should not be incorporated in the temporary houses to be built.

Engineering Chair at Cambridge

A FEW months ago the Institution of Electrical Engineers offered to endow for a period of years a Professorship of Electrical Engineering at Cambridge. The *I.E.E. Journal* states that at a Congregation held in November the Grace establishing the professorship was passed by the Regent House. As was reported in the *Electrical Review* of August 18th last, the acceptance of this offer is a departure from the normal requirement that a professorship shall be permanently endowed. The Council of the Senate recommended that the University should undertake the responsibility of making any necessary further provision for the professorship if no permanent endowment were obtained from external sources. In commenting on the matter we expressed the conviction that the electrical profession and industry would see that no financial difficulties interfered with the operation of this very excellent plan.



"Two-in-one" water heater, showing foot switch

Council-built type of flat, the third model (88 sq. ft.) is fitted with a cooker, refrigerator and a slightly smaller water heater (15 gal.) than in the kitchens already described. On account of the restricted floor space and

Emergency Housing

Well-equipped Dwellings at Poplar

POPLAR can claim the distinction of being one of the few places where emergency bungalows have actually been built and are in use. About 250 "Uni-Seco" wood and asbestos insulated temporary hutments have now been completed and are fully equipped with electric lighting, cooker, 3-kW washboiler, and 1-kW radiator in one of the bedrooms.

A specimen "Arcon" house, which will be occupied shortly, is much more extensively

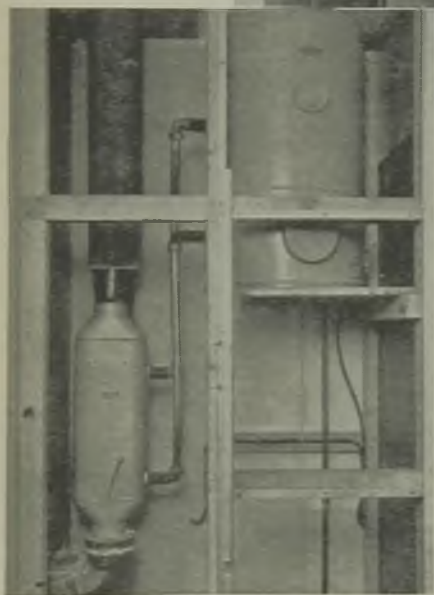
equipped with electrical apparatus. One of the "Poplar" kitchen units designed by Mr. R. Illingworth, electrical engineer and general manager of the Poplar Electricity Department, incorporates a cooker, refrigerator, airing cupboard, clock, air extract fan and a plug for kettle and iron, as well as ample cupboard and shelf space. Any make of cooker or refrigerator or any other apparatus can be accommodated in this kitchen unit.

The washboiler provided can be housed under the sink unit when not in use and there is room in one corner of the kitchen for a washing machine or drying cabinet. The kitchen, which measures 12 ft. by 9 ft., is warmed by a new type of inset convactor.

Operating in conjunction with a 20-gallon 3-kW "two-in-one" "Sadia" water heater (which by the use of two elements gives a small quantity of hot water immediately and the full 20 gallons in a short time) is a "Sadia



Above: "Poplar" kitchen unit in an "Arcon" house. Left: "Sadia" water heater and "Circoil" unit



Circoil" unit which takes the form of a spiral of piping inserted in the chimney stack of a solid fuel space heating stove and connected with a calorifier in the water heater tank. The elements of the water heater are thermostatically controlled.

Four plug points are provided in the living room and three in each of the bedrooms. Only three fuses (single-pole) are provided, for lighting, power ring main and kitchen unit. Throughout this house and the "Uni-Seco" hutments the new Dorman and Smith fused plug and sockets are employed.

Occupiers of the "Uni-Seco" hutments are receiving their supplies of electricity at 1½d. per kWh through prepayment meters, this charge including all rentals, while for the "Arcon" house the tariff will be 2s. 6d. per week fixed charge and ½d. per kWh.

Views on the News

Reflections on Current Topics

IT is pleasant after five years of manufacturing restrictions to be able to write of domestic apparatus production again. Plans are being made for the manufacture of appliances in increasing numbers and some of them at any rate have got past the prototype stage. This month should see the first of the mass-produced cookers which have been specially designed by members of the B.E.A.M.A. Domestic Cooking Section for installation in "emergency" houses.

I saw the prototype of these cookers a few weeks ago and it should be possible to give full details very shortly. There is nothing "utility" about it (in the derogatory sense of that term) and the high quality achieved both in design and appearance is a strong argument for standardisation and mutual co-operation in mass production. Even in other models which manufacturers will produce standardisation will be found in a marked degree in such matters as dimensions and replaceable parts.

A few weeks ago it was reported that orders for the kitchen units for the first 93,000 houses were to be in the ratio of two to one in favour of gas. But, as was pointed out in the *Electrical Review*, the pre-war ratio was about four to one, so that the growing preference for electricity has not been ignored. Also it must not be forgotten that the contracts are only the initial ones and that future orders can be adjusted to meet the demand.

Actually, from a study of the choice of local authorities so far, particularly those getting a thousand or more in the first allocation, it seems that those people who thought that at least half of the houses should be all-electric were if anything underestimating the demand. Some authorities want all their houses to be electric, among them being Sunderland (1,000 houses in the first allocation) and Bedford (143). Hull Corporation, after deciding to have the first 100 houses all-electric, has followed up with a vote for two-thirds of the next thousand to be electric. At Norwich 680 of the first thousand bungalows are to be electric, while among those authorities wanting "fifty-fifty" are Manchester (total of first allocation 3,000), Croydon (1,500), Portsmouth (1,400) and Coventry (1,000). In fact I have only heard of one town so far getting more than 1,000 houses in the first allocation which wants less than half the houses all-electric. Furthermore, all the 250 "Uni-Seco" hutments which Poplar has already erected, are equipped with electric lighting, cooker, wash-boiler, and a bedroom radiator.

When they are freed from their wartime duties cooker manufacturers will be able to turn their attention to making cookers in large numbers but at the moment, with their available factory capacity, they may find it difficult to meet the increasing demands. Accordingly it may well be that, should gas cooker manufacturers be in a better position to turn their attention to their peacetime products, local authorities may, on account of the extreme urgency of the matter, be persuaded to accept whatever apparatus is available. So now it seems largely up to manufacturers how many of the bungalows can be adequately electrified.

After Durham and Lincoln, a row over proposed power station extensions is brewing at York. The matter has been raised in the *Yorkshire Post* by Captain W. Braxton Sinclair, who says that the proposal to erect three 170-ft. high cooling towers at the power station will have a disastrous effect upon the whole æsthetic character of the city. He contends that any new plant required could be erected somewhere else; or alternatively that there is enough water in the Ouse to make cooling towers unnecessary.

The Dean of York says: "If so much power and efficiency can be packed in the compass of an aeroplane or a ship of war—incidentally making these craft beautiful as well as efficient—it is unbelievable that electrical engineers cannot find a way to erect a plant that will not lay that devastation of ugliness upon our landscape." The Dean cannot realise the amount of spares and maintenance which the use of aero engines would involve, apart from other minor difficulties.

It is hoped in a comment in this issue on the new Professional Engineers' Appointments Bureau that the question of adequate remuneration will not be overlooked. Many recent instances have underlined the necessity for attention to this point. In the *Daily Telegraph* of December 22nd, an A.M.I.E.E. said that he was working fifty-four hours a week or more for a salary at the rate of £7 a week, while workers in aircraft factories, presumably without his qualifications, receive much higher pay. The trouble is that even if he could find a better post he couldn't take it because his employers are able to prevent his leaving them. If the job is worth only £7 a week and the correspondent thinks he is above this grade he is being wasted and something should be done about it.

REFLECTOR

COMMERCE and INDUSTRY

Wigan Overhead Line Inquiry. Negotiated Plant Contracts.

New Essential Work Order

THE Minister of Labour and National Service has made an Order, incorporating in the Essential Work (Building and Civil Engineering) Order, 1942, provisions corresponding to those contained in the Essential Work (General Provisions) Order, 1944. The Order, the Essential Work (Building and Civil Engineering) Order, 1944, came into force on January 1st.

The purpose of the new Order is to improve the method of dealing with cases of persons dismissed on the ground of serious misconduct by making it possible, where the Local Appeal Board has found that dismissal was not justified on grounds of serious misconduct but reinstatement is nevertheless not directed, for the worker to be given a right to guaranteed wages under the Order for the period between the date of dismissal and the date on which the final decision is communicated to the parties concerned.

Two minor amendments of a technical character are also made. One relates to the calculation of the net guaranteed wage payable to a successful appellant who has been in other employment since he was provisionally dismissed for serious misconduct; the other defines what is meant by the exclusion from the Order of members of the armed forces of the Crown.

Erection of Overhead Line

Mr. A. D. Erskine, O.B.E., of the Electricity Commission, and Mr. A. R. Dent, of the Ministry of Town and Country Planning, held an inquiry at Wigan into the appeal by the Lancashire Electric Power Co., Ltd., under Section 10 of the Town and Country Planning Act, against a condition imposed by Wigan Rural District Council in granting permission for the erection of a low-voltage overhead electric line for the supply of electricity to Beechwood Colliery, Harrock Hill, Wroughtington.

It was stated that the approval of the Wigan Council was a limited one and provided for the erection of an overhead line for the period of the war, after which the main would have to be placed underground. This work, the company stated, would cost a total of £534. Wigan Council's objection to the overhead line was that it would injure the amenities of the district and detract from the beauty of the view.

The inspectors visited the area. A decision will be announced later.

Inspectors' Remuneration

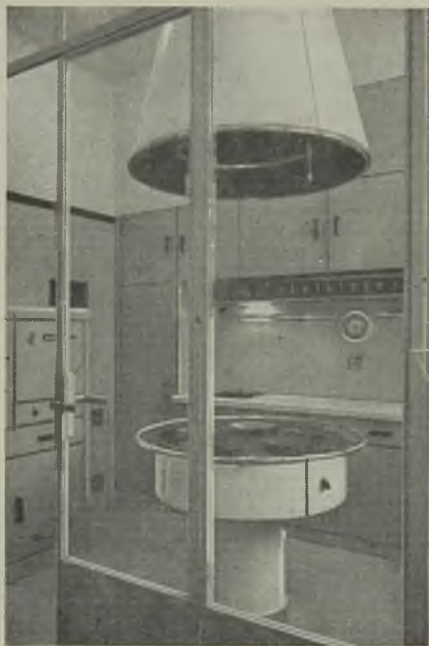
The National Arbitration Tribunal on December 13th heard evidence in a claim by members of the Amalgamated Engineering Union employed as inspectors by Ferranti, Ltd., for an increase of 10s. a week on the rates of pay already in force for the three grades of inspectors. The claim was based on the grounds that men in the production department whose work had to be examined by the inspectors were earning more than the inspectors and that the rates paid to the latter were not commensurate with the ability demanded of them.

Evidence showed that the present rates for a 47-hour week were as follows:—Ordinary skilled inspectors, 114s. 6d.; floor inspectors, 119s. 6d.; and leading inspectors, 124s. 6d. The company contended that the three grades were already being paid 15s., 20s. and 25s. respectively above the nationally agreed rate.

Having carefully considered the statements and submissions, the Tribunal in its Award No. 670, finds that the claim has not been established.

Circular Cooker

A complete break-away from conventional design has been achieved in the electric cooker



Circular cooker recently introduced in Argentina

illustrated. Produced by Francisco Salamone, it has been introduced in Argentina for use in domestic kitchens.

London J.E.A. Repair Depot

After considering architects' reports on the extension of the existing cooker and other apparatus repair shop at Burford and, as an alternative, the erection of a suitable building at Leatherhead, the Local Distribution Committee of the London and Home Counties J.E.A., has recommended the adoption of the latter alternative. It is proposed that meter testing should still be carried out at Burford and that the

vacated buildings there should be used as a central depot for the mains department of the Leatherhead and Dorking areas. An exact estimate of the cost of the Leatherhead extension cannot be given but it is thought that the cost will be in the neighbourhood of £15,500.

"Hope for the North-East"

Under this title the Newcastle-upon-Tyne Branch of the Association of Scientific Workers has published a survey of industry on the North-East Coast with suggestions for ensuring the maximum employment in the area. The proposals for finding work for over 100,000 extra men during the first five post-war years are based largely on the efficient use of coal in the chemical and power industries. Improved transport and housing, the maintenance of the agricultural industry developed during the war and the re-orientation of the fishing industry are also dealt with. Reference is made to finance, research and education.

Farmers and Electricity

The *Farmer and Stockbreeder* reports that at the last meeting of the Council of the National Farmers' Union news was given of the Union's delegates to New Zealand. They were said to have been impressed by the abundant and cheap supply of electricity to New Zealand farms.

It was also announced that following informal discussions with the Incorporated Association of Electric Power Companies it was proposed to set up a joint liaison committee. The proposal was approved and four representatives to the committee were appointed.

New Foster Subsidiary

Foster Electrical Supplies, Ltd., Morden Road, South Wimbledon, S.W.19, whose registration was recorded in the *Electrical Review* of December 22nd, is a subsidiary of Foster Transformers & Switchgear, Ltd., within the Lancashire Dynamo & Crypto group of companies. Its purpose is to deal with the lamp sales and other sections separately from the manufacturing side of the business. The directors are Messrs. Milton V. Ely (chairman), A. J. Sturgeon (managing) and R. V. Ely; the new company commenced operations on January 1st. It is stated that the sales policy inaugurated by the original Foster Engineering Co., Ltd., in 1907, for which the chairman and managing director were responsible, will be continued.

Placing of Contracts

The Sheffield Corporation Electricity Committee recently placed a contract amounting to £69,448 for a cooling tower at the Neepsend generating station with Mitchell Engineering, Ltd., without inviting competitive tenders. The City Council called for a report by the Electricity Committee upon this action, and this has now been presented to the Council. In the report it is stated that the town clerk had asked Sir John Kennedy, deputy chairman of the Electricity Commission, whether he would have suggested that the contract should be negotiated, or that competitive tenders should be obtained. Sir John replied that at the time he would certainly have suggested, in fact recommended, that a contract should be negotiated with a single firm.

In the course of its report the Committee states

that the Central Electricity Board controls the Corporation's power stations as regards the generation of electricity. The Heavy Electrical Plant Committee, a wartime creation of the Ministry of Production, says, through its chairman, that a general reversion to competitive tender would have most serious and far-reaching effects because of the wartime demands on the productive capacity of the manufacturers of heavy electrical plant. Whilst the Electricity Commission and the Heavy Electrical Plant Committee, adds the report, do not possess any specific powers to enforce their requirements, indirectly the financial and other controls which they exercise are considerable, and, as a last resort, the powers to make Orders under the Defence Regulations are available to them, an example of which the Committee has recently experienced in connection with its proposals to increase tariffs.

The Electricity Commissioners have informed Birkenhead Electricity Committee that they do not require the Corporation to obtain competitive tenders in respect of plant required for the proposed new generating station at Bromborough and raise no objection to orders being placed with the manufacturers approved by the Heavy Electrical Plant Committee. Negotiations are proceeding for the acquisition of the site of the new station.

Retail Sales Without Licence

Henry Milliken, trading as Lauder's Radio, 824, London Road, Glasgow, was fined £30 with the alternative of three months' imprisonment at Glasgow Sheriff Court recently for a contravention of the Location of Retail Businesses Order, 1942. Defendant admitted having sold flash-lamp batteries and bulbs, electrical fittings, cycle repair outfits and accessories without the authority of a licence from the Board of Trade. Mr. T. H. Souter (Depute-Fiscal) stated that in this particular area there were already five shops within a short distance retailing similar articles.

Fatalities

Bathroom Fatality.—A fifteen-year-old apprentice electrician, Peter Robert Smith, of Upminster, who had warned members of his family not to use an electric bowl fire in the bathroom, did so himself and received a fatal shock. This was stated at the inquest at Romford last week. A label attached to the fire also gave a warning against taking it into a bathroom unless it was permanently fixed out of reach. A verdict of "Accidental death" was recorded.

Cable Joiner's Death.—At an inquest at Sheffield on Albert Edward Gillott (43), a joiner employed by the Sheffield Corporation Electricity Department, who met his death at an electricity substation, a verdict of "Death by misadventure" was recorded. Gillott was electrocuted while working on a cable which was believed to be dead. The coroner said that responsibility for identifying the cable was Gillott's own, and he was satisfied that the man was given sufficient instruction to enable him to identify it correctly.

Another Joiner Killed.—A verdict of accidental death was returned at the inquest on December 26th on Geoffrey N. Lee a joiner

employed by Kettering Electricity Department, who was found dead near a transformer kiosk at Thorpe Malsor (near Kettering) on December 22nd. At the inquest, Lee's mate said that they were installing electricity at a farm when witness suddenly found that Lee was not with him, and looking for him found him lying on the ground a few yards away from a transformer kiosk, holding an electric drill connected to equipment in the box. When witness touched the drill he received a shock so he pulled the leads out of the box. Lee had used the drill two days before when it seemed to be in order.

Reginald Groome, assistant mains engineer, said that he had examined the equipment and found the drill and kiosk equipment in good order. If the wires were interchanged the case of the drill would have become alive. In a poor light it was possible for the colours of the wires to be confused. No previous complaints had been made about the drill.

R.A.F. Officer's Death.—Squadron-Leader Arthur Stanhope Owen (37), a senior flying control officer, recently received a fatal electric shock while helping to lay a new type of electric flare path. At the inquest a verdict of "Death by misadventure" was recorded.

Coal Shortage in Australia

The Australian Fuel and Coal Co-ordination Committee has reported to the Federal Government on proposals for the rationing of electricity and gas throughout the Commonwealth. Executives of electricity generating stations are in regular consultation to ensure united action. Shortage of coal supplies, with no apparent improvement in outlook owing to the many strikes, has led to developments which are now becoming serious.

Oxford Exhibition

An exhibition of post-war electrical appliances and a modern all-electric kitchen is being held jointly by the City of Oxford Electricity Supply Department and the Wessex Electricity Co. at the Electricity Showrooms, 37, George Street, Oxford. It is being opened to-day (Friday) by Captain Quintin Hogg, M.P.

Electric Discharge Lamps

In view of the issue of the Discharge Lamp Lighting (Revocation) Order, 1944 (S.R. & O. 1370), which revokes the control Order of 1943 (S.R. & O. 1201), the War Emergency Code of Practice C.P.3.1944, "Limitation of Electric Discharge Lamp Lighting," is now inoperative.

Peruvian Electrical Imports

During the June quarter imports of electrical apparatus into Peru were valued at 2,967,000 soles (£114,000) against 3,263,000 soles (£125,500) in the June quarter of 1943.

Strength of Wooden Poles

An abridged edition (27 pp.) of Wade's Tables for pocket use has now been made available at 5s. by Gabriel, Wade & English, Ltd., Gilberdyke, Brough, East Yorks. This includes twenty-four tables giving particulars of strength and other characteristics of single "A," "H" and "Rutter" wooden poles under various conditions likely to be encountered in practice. The data have been compiled by Mr. Christopher Wade in collaboration with

various authorities from 1907, when the relative strengths of single and double poles were first published, with revisions and additions to meet changes in regulations or new developments, such as the "Rutter" pole. It is hoped to issue additional tables after the war, when the question of revising standard conductor sizes with different wind and ice loadings has been determined and records of experience with light-line construction are available.

Power Engineers' Salaries

The rise in the cost of living during the past six months necessitates an increase in the salaries of the technical staffs employed in electricity supply undertakings. We hope to publish the revised schedule in our next issue.

Inquiry from New Zealand

The London agents of New Zealand importers inform us that their principals wish to obtain a sole New Zealand agency for sewing machine motors. We shall be pleased to pass on the names of any interested manufacturers.

E.I.B.A. (Northern Counties)

The annual general meeting of the Northern Counties Area of the Electrical Industries Benevolent Association will be held on Monday, January 29th, at 3.30 p.m., at Tilley's Restaurant, Blackett Street, Newcastle-upon-Tyne, under the chairmanship of Mr. E. Charlton.

Machine Shop Lighting

Because of the exacting visual tasks carried on in their works, Mellor, Bromley & Co., Ltd., Leicester, recently completely reorganised their machine shop. The overhead shafting and belting has been removed, each machine tool individually motorised, and a completely new lighting system installed. The scheme was prepared to give a service intensity of 15 ft.-candles, supplemented by local lighting units in special cases where the operational point was other than the horizontal, or where other difficulties prevailed. To illuminate the shop 203 300-W, 62 200-W and 16 150-W "Mazda" lamps housed in "Mazdalux" l.t. dispersive overlamp reflectors were used. "Mazdalux" three-arm adjustable-arm reflectors with B.T.H. 3-phase s.f.t. transformer units were installed for local lighting using 50-V "Mazda" lamps. There are approximately 60 of these units. The installation was carried out by the Electrical Equipment Co. (Leicester), Ltd.

Change of Address

The Federation of Associations of Specialists and Sub-Contractors has moved to Millbank House, 2, Great Peter Street, London, S.W.1 (telephone: Whitehall 9609).

Calendars

A special hatching calendar which will prove useful to all who run incubators has been issued by Lawrence G. Western (Incubators), Ltd., of East Hanningfield, Chelmsford. A charge of 1s. will be divided equally between the Red Cross Agriculture and Electrical Industry Funds.

Calendar refills are now available from Brookhirst Switchgear, Ltd., on request from holders of the company's calendar frame, a nominal charge of 3d. being made.

Export Trade

Pre-requisites for Post-War Expansion

THE Government's aim outlined in the White Paper on Employment Policy, namely, to endeavour to bring about conditions favourable to the maintenance of a high level of employment, by which it appreciates the necessity of expanding our export trade, will no doubt have led many manufacturers to give serious consideration to the possibilities of export trade as soon as circumstances will permit.

Events have been very discouraging to exporters and their sad experience of markets becoming closed to them—markets on which they had expended much money in advertising and popularising their products—compel them to treat with caution the prospects of a bright but brief period of false prosperity in conducting new trade with countries which they were not supplying before the war.

During this war the Government first encouraged then later discouraged export trade with certain overseas countries. These conflicting decisions were no doubt very necessary but they brought results which were neither encouraging nor profitable to many manufacturers. Opportunities for greatly expanding their former exports and commencing new business in other countries will exist, but the great outlay of money and energy in securing and establishing these markets demands some real guarantee that the results of whatever efforts the manufacturers make will be lasting.

Protection in Overseas Countries

In considering the possibilities for new export trade with overseas countries which were closed to them before the war owing to tariff barriers, manufacturers fear that when the industries of those countries get working fully again, the tariff barriers will reappear. Again, in the Dominions particularly, many new industries have commenced since the war started and these will probably be encouraged to continue. However, the manufacturer who has a rival in the country where he has formerly had a good sale for his product need not assume that these new industries will necessarily serve the total requirements of that country.

All these points lead to one conclusion. The Government must make known as soon as possible how it proposes to deal with the question of assuring manufacturers that their efforts will be worth while. It must appreciate the very high cost to manufacturers of introducing and popularising their goods in a new market—a cost which can only be based on a long-term policy and for some time will be out of all proportion to

By "Sala"

returns. It is a heavy expense which manufacturers *must* make and one which will be even greater if they are to meet the keen competition of the manufacturers of other nations in the post-war drive for export markets.

The Government must remove the fear of many manufacturers that export trade is a gamble in which the manufacturer is always on the losing side, and do what it can to convince them that they are not going to be misled by a short period of prosperity with no assurance that it will continue. The Government can assist, through its trade departments, by making readily available to industry all the information and statistics it can glean which might encourage manufacturers to make their bids for export markets. Let it provide that information in a simple and lucid manner. If it expects so much of industry it must play its part in assisting it to obtain the desired results.

Appointment of Agents

Efficient and adequate selling and distributive organisations are needed to assist home manufacturers to build up their sales abroad. It should not be beyond the bounds of possibility to prepare, with the co-operation of the Government Departments of other countries, a list of dependable overseas agents in various trades, particularly in those Continental countries where tariffs previously excluded many British manufacturers. No manufacturer can get on with his job of developing new export trade if he is at the same time experimenting with one unsuitable agent after another.

The manufacturer realises that in endeavouring to secure and develop Continental markets he will have to visit them himself and probably do a large amount of the initial spade-work. Nevertheless, many manufacturers, particularly the smaller ones, will still need a reliable agent with an adequate organisation to handle and distribute their goods. The proper development of those markets can never be achieved if they have no representatives in those countries to assist the sales and carry stocks to meet the demands which it is hoped to create. Farther afield in Europe, in Asia and in the East, the need for reliable agents is even more apparent and a process of trial and error is very undesirable.

Finally, over-cautiousness on the part of manufacturers will inevitably lead to the loss of overseas markets. It is up to them to have their plans ready, judiciously choosing as their objects the markets of those countries where, in their judgment, the greatest scope

exists for their products. They should, however, keep in mind all the time the sales possibilities in other markets and be ready to enter those markets as soon as they are convinced that the expenditure of money and effort will be worth while. Let them get out of their heads any idea that export trade will be a highly profitable venture. It can be, if based on a maximum volume of busi-

ness. Generally, it will be found that keen competition for the markets will necessitate prices which show only a small margin of profit, but rather than be discouraged by this meagre margin the manufacturer must strive to achieve his ends by going full out to secure the maximum sales. Such expansion of his regular trade will no doubt give him opportunities for economies in manufacture.

Electrical Materials

The Trend of Supply and Demand

This review, prepared for us by the Metal Information Bureau, shows that, generally, the metals employed in the electrical industry were in adequate supply during 1944. Stocks of natural rubber were further reduced but the output of the synthetic type continued to rise.

Copper

THE past year has seen war demand for copper in Britain pass its peak. Towards the end of the year the Ministry of Supply declined to renew its buying contracts with Empire producers on the same scale as in previous years. With the Government the only buyer of copper here and Continental countries not yet in a position to buy freely Empire producers are in a very difficult position, and protracted negotiations have been going on (and at the time of writing are still unconcluded) with a view to reaching a solution of the problem.

In the United States, demand for copper has remained very active through the greater part of the year, taking a fresh upward trend in the closing weeks with the increased demand for ammunition. At various times during the year the American authorities expressed fears of a shortage of copper, but these did not actually materialise. It was possible, in fact, to build up reserve stocks of the metal to an estimated current level of 400,000 short tons. On both sides of the Atlantic an easing of the restrictions on the use of copper developed as the year advanced, but in Britain shortage of labour and lack of manufacturing capacity for civilian goods prevented any very substantial production of non-essential articles.

If the European war ends this year, war needs of copper will suffer a sharp reduction, and until the undoubtedly large potential civilian requirements of the Allies and liberated countries can be translated into firm orders, a period of surplus production may well ensue, aggravated by the undoubtedly large tonnages of war scrap that will come back on to the market.

Increased competition may be expected to develop from aluminium in the electrical and other fields as it now seems fairly certain

that the light metal will be available after the war at relatively lower prices than was the case up to 1939.

Tin

Tin consumption having been previously brought into line with supplies still available to the Allies, the past year witnessed no particular problems so far as supplies of raw metal were concerned. There are good grounds for believing that when tin supplies are freely available again many consumers will wish to return to pre-1942 standards in such items as solder, tinsplates, bronzes, etc., as in few instances have the low tin or tinless substitutes which have of necessity been used proved thoroughly satisfactory. Producers are looking ahead and considering plans for restoring production in Malaya and the Dutch East Indies, notably as regards placing orders for dredges which take anything up to three years to build and install. There seems general agreement in the industry that more must be spent on research and development work after the war. American stocks have been eaten into during the past year, but are still believed to amount to upwards of 110,000 tons.

Lead

No serious lead supply problems have been faced by the Allies during the past year, consumption in this country having been tightly controlled, particularly in the early months. This was necessitated by shipping scarcity as much as on account of the metal itself. Towards the end of the year it was found possible for the Control to release more metal for civilian consumption, particularly for pipes and sheets and other building trade products. The battery industry was consistently busy throughout the year, and was probably the largest individual consumer of lead. Cable makers also continued to take large quantities, although consumption in this direction showed some falling off so far as war needs were concerned towards the end of the year. Undoubtedly there will be a very big demand for lead for cables and batteries when housing and other

civilian requirements and overseas orders can be freely met, but labour scarcity and lack of plant facilities restrict activity.

Zinc

The tight supply position which prevailed during most of 1943 gradually gave way to a very comfortable situation in 1944, and by the end of that year zinc was sufficiently plentiful to be released for almost any purpose provided labour and manufacturing facilities could be obtained. But the change-over to civilian production has not yet reached large dimensions as labour is not available, although the way has been cleared for expansion as soon as other conditions permit. The brass trade has become definitely quieter during the year owing to a falling off in direct war orders which has been only partially offset by civilian production. So far as can be seen at present there is no likelihood of shortage of raw zinc supplies holding up manufacturing activity in the brass, zinc alloy die-casting, zinc rolling and other zinc-consuming trades when conditions permit.

Aluminium

Aluminium, after ranking as one of the major "scarcity" metals in the early years of the war, became a "surplus" metal during 1944. The tremendous expansion in productive capacity more than met all war needs, and as a result both in America and in this country output has had to be cut down, but even so large stocks have accumulated. Metal is now freely available for non-

essential production but labour and plant are not. The aluminium industry of the world is fully aware of the task facing it in finding outlets for its present huge potential production, and a determined effort will undoubtedly be made to expand the use of this metal in the land, sea and air sections of the transport industry, in construction work and in the electrical field, as well as in domestic hollow-ware and other directions. It is fully anticipated that prices will be lower in relation to other metals than they were before the war.

Rubber

Very heavy war requirements during the past year have resulted in Allied reserve stocks of natural rubber being severely depleted, and as the end of the year approached consumption had to be reduced to the absolute minimum. Output of synthetic rubber, particularly in America, has meanwhile risen to high levels. For most purposes a proportion of natural rubber has to be mixed with the synthetic, and although this is in adequate supply the situation is acute so far as natural rubber is concerned.

There seems little chance of improvement until Malaya and the Dutch East Indies are freed. How long it will be after the Japanese are evicted before the plantations can be put into full production it is as yet impossible to say. It is perhaps interesting to note that British imports of natural and synthetic rubber in 1943 were 78,000 tons compared with 65,000 tons in 1942 and a wartime peak of 203,000 tons in 1940.

Engineers' Appointments Bureau

Three Institutions as Sponsors

IN the December *Journal* of the Institution of Electrical Engineers the early setting-up of a Professional Engineers' Appointments Bureau is foreshadowed. The Bureau is being formed under the joint auspices of the three leading institutions but distinct from them as the terms of their charters do not cover such activities as this. The Institution has been advised, however, that it is not improper for the Council to take an interest in the affairs of a body distinct from the Institution and constituted as a separate entity, by nominating to its governing board such engineers as the Council may select.

The Bureau's principal aim is the resettlement into normal positions of engineers whose services have been devoted to special work during the war. In this it will co-operate with the Ministry of Labour in the machinery which is being set up for guiding and planning the redistribution of technical man-power in the years immediately after the war. The governing board will consist of the presidents and secretaries of the three institutions together with three nominees from each of their councils—fifteen in all. Under the board there will be three committees dealing respectively with civil, electrical and mechanical engineers.

Each committee will comprise the five members of the board nominated by the institution concerned with six additional members nominated by that institution.

The objects of the Bureau are defined as follows:—To receive inquiries from employers and to seek to meet their needs. To receive applications for registration for employment from engineers who by reason of their qualifications are members of the Institutions of Civil, Mechanical or Electrical Engineers, or from persons whose engineering qualifications for election or admission to one of those bodies have been approved by the respective councils. To keep lists of organisations willing to receive engineering pupils, apprentices or assistants under agreement. To give advice generally in matters relating to the employment of professional engineers.

The Institutions cannot directly contribute the funds necessary to establish the Bureau before it becomes self-supporting (from registration and engagement fees). Consequently letters are being sent to the members of the three institutions and other organisations which will benefit from the Bureau's operations asking them to contribute to the Bureau's funds.

Transformer Protection

Differential Circulating-Current Principle

If the differential circulating-current protection schemes the Merz-Price arrangement is the most usual. This system, when applied to power transformers, affords protection against phase-to-phase and, where the transformer neutral is earthed, against phase-to-earth faults. When the neutral point is not earthed only capacity currents, which may be insufficient to operate the relay, flow when a phase-to-earth fault occurs. The Merz-Price scheme does not give a direct indication of an inter-turn fault on any one winding unless the resulting out-of-balance current actuates the relay. Such a fault, however, generally develops into an earth fault with consequent operation. Merz-Price protection depends upon the exact matching of two current transformers connected in the primary and secondary

By H. E. Forrest

currents in the current transformers are equal in magnitude

and in phase and no current flows in the relay circuit. Any fault which upsets this current balance will result in a current flowing through the operating coil of the relay as shown in Fig. 1 (b). Where the current transformers are accurately matched the system is stable to through faults, *i.e.*, to faults which occur outside the zone bounded by the transformers.

The primary current ratings of the current transformers are inversely proportional to the voltages of the main transformer windings with which they are associated. The secondary currents are equal. On account of this balance and the relatively high impedance of the operating coil no current flows in the relay circuit. If the current transformers have similar magnetisation characteristics the system will be stable to through faults.

Should a fault occur at point F, Fig. 1 (b), the secondary currents are no longer balanced but differ in magnitude. The difference $i_1 - i_2$ between the two currents flows through the relay coil and if it is sufficiently large operates the relay.

Conditions of Balance

The ideal conditions of balance shown in Fig. 1 (a) are not easily attained in practice. Errors are introduced by discrepancies between the magnetisation characteristics of the two current transformers. As the primary ratings of the current transformers are inversely proportional to the voltage ratio of the main transformer, if the current transformer in the 6.6-kV winding had a ratio of 600/5 A the secondary current corresponding to a load current of 500 A would be 4.17 A and the difference between the two secondary currents 0.83 A. Unequal balance may be caused by varying the voltage adjusting tapplings on the main transformer over a wide range and also by different pilot-lead resistances. The foregoing troubles can generally be overcome by the use of one or more of the following:—Relays which are set to operate on a percentage differential current basis rather than at one fixed current value; restraining coils; tapped current transformers; and equalising auto-transformers.

The best possible balance must be obtained, however, in the design stage and any auxiliary compensation adopted only as a last resort.

If the two current transformers have different magnetisation characteristics large out-of-balance currents can occur on heavy overloads. This is particularly true when

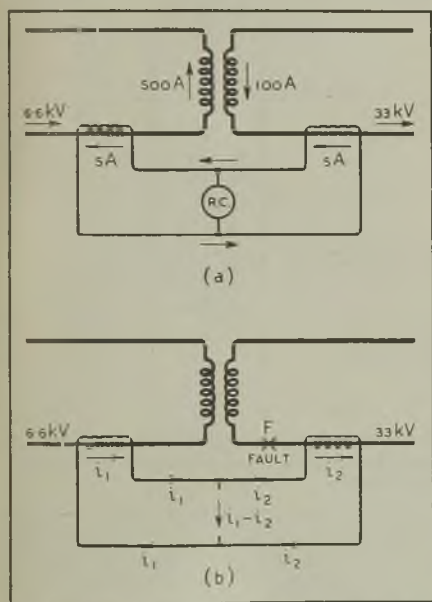


Fig. 1.—Merz-Price protection applied to a 3,300-kVA 6.6/33-kV single-phase transformer. Arrows indicate instantaneous direction of current. (a) Zero current in relay coil. (b) Unbalanced current flows through relay coil

windings of the main transformer. The secondary windings of the current transformers and the relay circuit, which is connected across equipotential points, are interconnected as shown in Fig. 1 (a). Under normal working conditions the secondary

bushing-type units are balanced against others of the wound-primary type although the same applies equally to current transformers of similar construction. If in Fig. 1 (a), the current transformers on the 6.6-kV side

was very good and the out-of-balance current never exceeded one ampere for any overload up to and including fifteen times normal full load. The out-of-balance was insufficient to trip the relay so that, in this

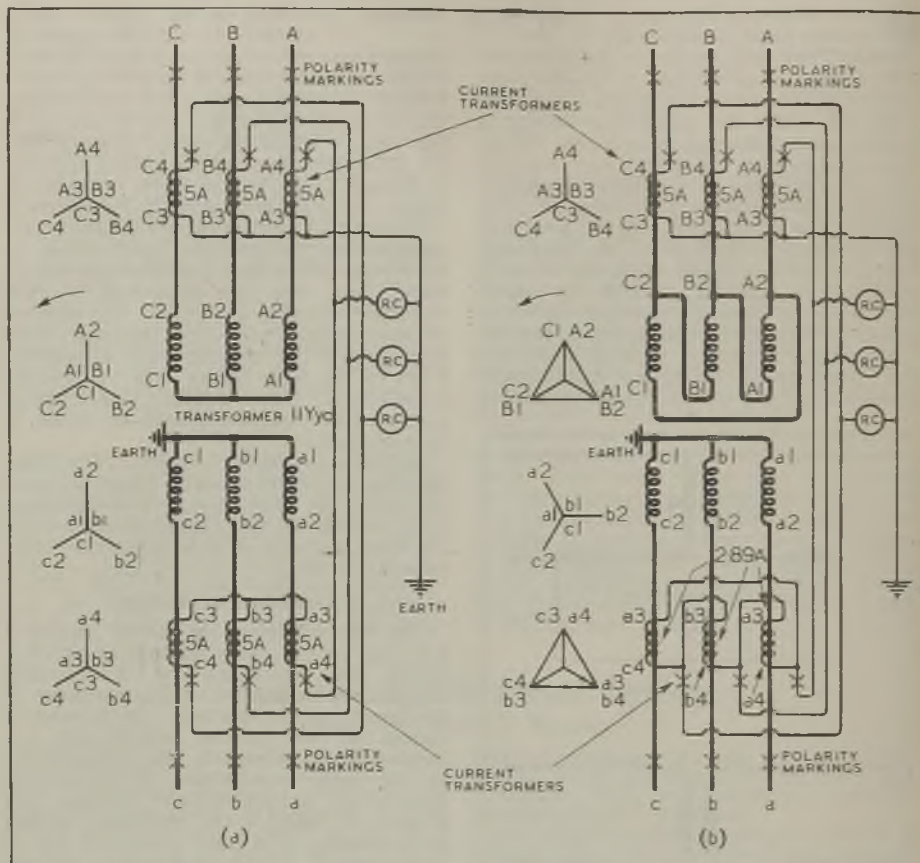


Fig. 2.—Differential protection for three-phase power transformer. (a) Connected in star-star. (b) Connected in delta-star

are bushing-type and those on the 33-kV side are wound-type units the balance between them would probably be good on normal full load but not under overload conditions. For example, during a test at fifteen times normal full load the measured secondary currents in the 6.6-kV and the 33-kV current transformers were respectively 87 and 95 A. The out-of-balance current was therefore 8 A.

The above test was repeated with the bushing-type current transformer replaced by a wound-type unit having identical magnetisation characteristics with the current transformer on the 33-kV side. In this instance, even allowing for transients, balance

case, the system would be stable to through faults up to fifteen times normal full-load current. As the current transformers cost but a fraction of the transformer to be protected a little extra spent on them may be money well invested.

Phase Relationship

When a three-phase transformer is protected care must be taken in connecting the current transformers to ensure that the phase relationship is identical between the set on the primary and that on the secondary of the main transformer. Fig. 2 (a) illustrates the circuit when Merz-Price protection is applied to a three-phase power

transformer connected star-star, *i.e.*, B.S.S. Group 11Yy0. There is no phase shift between the windings of the main transformer and, if the two sets of current transformers are also connected in star, there can be no phase shift between them. If the power transformer has the neutral of one winding earthed a circuit exists on that side for a zero-phase-sequence current, while the un-earthed side is an open circuit to such currents. The current transformers must be delta-connected to suppress this current.

If the sets of current transformers are connected in star, with a common return, an unbalanced zero-phase-sequence current will flow in the protective circuit when an external fault occurs and the main transformer carries a zero-phase-sequence current. This current may be sufficiently large to

connecting the two sets of current transformers this phase shift must be taken into account. This is done by connecting the two sets star-delta as shown in Fig. 2(b) from which it is obvious that the vector groups of the current transformers have the same phase relationship, *i.e.*, points A_4 and a_4 , B_4 and b_4 , and C_4 and c_4 coincide and can, therefore, be joined together.

The current transformers on the star-connected side of the main transformer must be connected in delta so that any out-of-balance currents set up by an external fault circulate in the delta and not in the relay circuit. The delta-connected current transformers must have a secondary rating of $5/\sqrt{3}$ A. The corresponding line current of 5 A will then balance that from the star-connected bank. If the current transformers

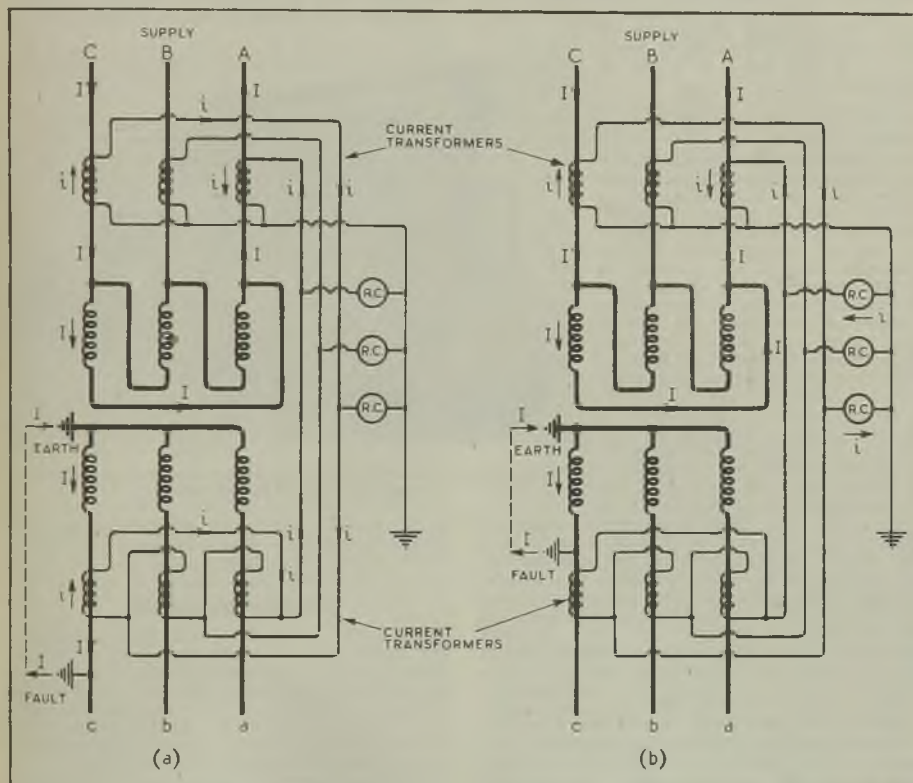


Fig. 3.—Earth fault on lower-voltage side of three-phase step-down transformer. (a) Outside and (b) inside protected circuit

trip the relay and the stability of the system to through faults is lost.

When the power transformer is connected delta-star, *i.e.*, B.S.S. Group 41Dy11, there is a 30 deg. phase shift between the primary and secondary windings. When inter-

were inserted in the phase leads of the delta winding of the power transformer no special connection would be required and the set could be star-connected. The high-voltage bushings would not, of course, be protected if this were done.

At the instant of switching-in the power transformer there is a surge of magnetising current in the primary windings. As far as the protective gear is concerned this out-of-balance cannot be distinguished from a fault and, to prevent operation, the relay must be short-circuited by time-limit "kick-fuses." Fig. 3 shows the direction of currents

when a three-phase power transformer, supplied on the high-voltage side, develops a single-phase fault on the lower-voltage side (a) outside and (b) inside the protected zone. In (a) the relay does not operate and the system is stable to through faults. In (b) the relay and the protective gear are caused to operate.

Two-Stroke Diesel Engine

Low Fuel Consumption

THE range of Diesel engines made by W. H. Allen, Sons & Co., Ltd., has now been extended by a two-stroke design rated at 135 BHP per cylinder at 375 RPM and built in sizes ranging from three to eight cylinders. We recently inspected a six-cylinder, 810 BHP engine of this type on the test bed. It is of the vertical, airless injection, compressed-ignition type, with cylinder dimensions of 11.42 in. bore, and 18.52 in. stroke and a piston speed of 1,156 ft. per min.

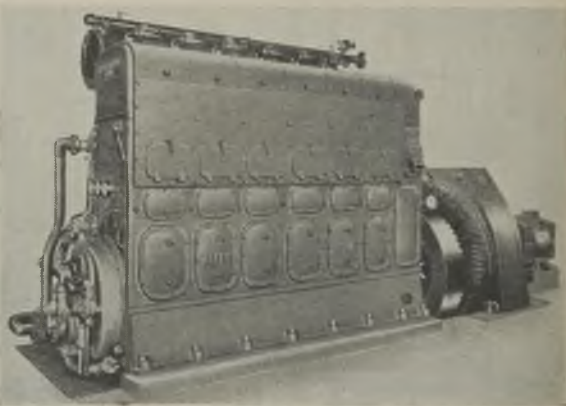
Scavenging is on the Harland & Wolff—Burmeister & Wain inflow system, in which inlet air is passed to a belt around the cylinder liners by a positive-displacement rotary blower of the Rootes type, the whole periphery being available for inlet ports which are designed to give a vertical swirl to the scavenge air. At the end of the power stroke, inlet air under pressure enters the cylinder through the uncovered inlet ports and sweeps the gases out of the cylinder through two vertical poppet valves, which are operated by a single push rod and forked rocker lever.

At full load, the engine works at the conservative B.M.E.P. of 75.5 lb. per sq. in., and low fuel consumption of 0.37 lb. per BHP-hr. at which the temperature of the exhaust gases is 665 deg. F. Fuel consumption per BHP and exhaust temperature at other loads are: $\frac{1}{4}$ load, 0.53 lb. and 300 deg. F; $\frac{1}{2}$ load, 0.41 lb. and 420 deg. F; $\frac{3}{4}$ load, 0.375 lb. and 545 deg. F. C.A.V. injectors and individual fuel pumps are fitted to each cylinder, the fuel pumps being operated by the governor through rack rods. The fuel first passes through twin-compartment filters to the fuel pumps and thence to an individual edge-type filter at the inlet to each of the fuel injectors.

The governor is of the spring-loaded centrifugal type gear-driven from the camshaft through a flexible coupling. It is mounted as a self-contained unit, and so designed that, after uncoupling the operating link, the complete unit can be removed. The speed may be varied through a wide range, while running, by a hand-wheel on the governor. The engine speed is at all times controlled by the governor between the limits prescribed in B.S. 649/1935.

The forced-lubrication oil pump, of the gear type, is driven from the free end of the crankshaft, and supplies oil through an oil cooler and a double-compartment gauze filter to the engine pressure system. A hand-priming lubricating

oil pump is fitted to the engine to ensure that all bearings are adequately supplied with lubricant before starting up. Compressed air at 300 lb. per sq. in. is employed for starting, and is admitted to three cylinders by independent starting valves actuated from the camshaft. For this type of engine an enclosed cooling water system is preferred and an integral cooling



Six-cylinder, 810-BHP Allen two-stroke Diesel engine direct coupled to a 550-kW alternator

water pump passes the water through the cylinder block to a heat exchanger. All parts of the engine are readily accessible.

Engine Research

BEFORE the war the internal-combustion engine industry of this country made a large contribution to our export trade. To enhance the national importance of the industry co-ordinated research on a basis covering the whole industry is necessary, and to this end the non-profit-making British Internal Combustion Engine Research Association was formed.

The three principal aims in engine research on the "whole industry" basis are the attainment of maximum reliability, higher functional efficiency, and lower all-in costs. An important step forward has just been taken by the Association in obtaining laboratory and allied premises, equipment and a number of skilled personnel, ready for immediate service, and with room for expansion. The group of buildings at which research is already in progress is at Buckingham Avenue, Slough.

Scottish Inquiry

Objections Against Hydro-Electric Schemes

ALLEGATIONS that the erection of a generating and pumping station on Loch Lomondside, as proposed by the North of Scotland Hydro-Electric Board, would seriously interfere with amenities and the supply of water for post-war residential and industrial development in Western Scotland, were considered at an inquiry in the Court of Session, Edinburgh, last week.

The chief objectors, Dumbarton County Council, stated that Loch Sloy, from which the generating station would be fed, had been earmarked as a potential source of water supply, and that appropriation of the water by the Board would seriously affect development. The Council also wished to preserve Loch Lomondside amenities. Objections were also lodged by Perth, Kinross and Inverness County Councils, the inquiry being concerned in addition with the Board's proposals for Morar and Lochalsh.

Change of Site

It was announced at the opening of the inquiry that, as the result of boring which failed to find rock at 60 ft., the original site of the generating station had been changed. Fear was expressed by counsel for the objectors that the pipe lines, originally planned to be placed in a valley, would as now proposed mar the beauty of the hillside.

Mr. Hill Watson, for Dumbarton County Council, asked that the inquiry should be postponed for about a month. Amendments which the council had not had time to study had been made by the Board. After an adjournment the Commissioner (Lt.-Comdr. John Cameron, K.C.) said that, while he felt some sympathy with the objectors, the Board was charged with an urgent duty the discharge of which was a public interest and could brook no undue delay; therefore the inquiry must proceed.

Mr. R. P. Morrison, K.C., for the Board, said that if the scheme were approved during the next few weeks the engineers were emphatic that work, if started early in 1945, could be completed by the winter of 1947-48. The scheme was financially and technically sound and a market already existed for the energy to be generated. There had been a cry about amenity, but it was an old cry and perhaps somewhat failing now. In support of the scheme, Lord Airlie, chairman of the Board, said that it was of great importance to the future not only of the Highlands and Scotland generally but of the entire country.

Mr. J. D. Peattie, deputy chief engineer of the Central Electricity Board, said that if they did not get the energy from Sloy in the winter of 1947-48 there would be no readily available method of making up for the loss. It would not be possible to rely on assistance from the grid in neighbouring areas, because the position there was equally critical. The C.E.B. viewed with the greatest concern any possibility of delay in the completion of the Loch Sloy project. That could not fail to result in a grave risk of curtailment of supplies to consumers in Central and South Scotland. Cross-examined, Mr.

Peattie said that in Central and South Scotland requirements in 1947 were estimated at 868,000 kW compared with 580,000 kW in 1938. They hoped to get from extensions at Bonnybridge and Glasgow an additional 19,000 and 90,000 kW, respectively, and from Loch Sloy roughly 100,000 kW.

Mr. S. B. Donkin, one of the five technical advisers to the North of Scotland Board, gave evidence bearing on the costs and capacity of the Sloy scheme. He said he had made an estimate of the capital cost at present-day prices and the figure was £4,100,000, including lands, civil engineering work, etc. He considered that it would not be possible to build a new steam station in Scotland which could deliver energy to the C.E.B. system in Glasgow at a lower cost than from the Sloy scheme. Mr. J. Williamson, another technical adviser, also gave evidence.

When the inquiry resumed on December 28th, Mr. A. E. MacColl, deputy chairman and chief executive officer of the North of Scotland Board, said he considered that the Loch Sloy scheme, in spite of the enhanced cost of construction, would be able to deliver power at a cheaper rate than any existing power unit. He gave detailed comparisons, adjusted so as to be strictly comparable, of costs of production at Ironbridge (West Midlands J.E.A.) and at Loch Sloy. Cost at Ironbridge on a two-part tariff was £2 12s. 4d. per kW and 0.235d. per kWh. Figures for Sloy would be £2 0s. 11d. per kW and 0.0325d. per kWh, on a two-part tariff. Costs in the case of a steam station built at to-day's capital expenditure of at least £30 per kW would work out at £3 18s. 5d. per kW and 0.163d. per kWh.

Second Distribution Scheme

Distribution Scheme No. 2 of the North of Scotland Hydro-Electric Board, as approved by the Electricity Commissioners, was published on December 20th and can be obtained for 3d. from the Board's offices at 16 Rothesay Terrace, Edinburgh, 3. It covers two parishes in the Morar area in the County of Inverness. The Board states that it expects to supply electricity to all premises in the area that are within a short distance of the proposed lines within 1½ to 2 years from the start of construction of Morar power station at which the electricity will be generated.

Subject to regulations to be made by the Secretary of State, the tariff will be the same as for No. 1 Distribution Scheme, the publication of which was referred to in the *Electrical Review* of December 29th, viz. for the first 30-36 kWh per room per annum, 5d. per kWh; for the next nine times that amount, 0.75d.; for all kWh in excess, 0.5d. It is envisaged that lighting will in effect be charged for at the highest rate, cooking, ironing, etc., will come on the intermediate scale and space heating and water heating at the lowest rate. Attractive rates are to be offered for power for the fishing industry at Mallaig and other light industries which are expected to be established in the neighbourhood.

Television Receivers

Frequency or Amplitude Modulation?

A DISCUSSION on the television-receiver sound channel by the I.E.E. Radio Section on December 19th was opened by MR. G. W. EDWARDS, deputising for DR. D. C. EPSLEY. Reference was made to the main points in assessing receiver performance, viz., sound quality, pre-emphasis of sound, frequency modulation v. amplitude modulation (suggesting that wide-band amplitude-modulated systems might not be markedly inferior in practice), relative powers of sound and vision carriers (justifying a significant increase of sound-field strength by 6 to 10 db.), suppression of interference (preferably at source), and relationship between sound and vision carrier frequencies (recommending the B.B.C. practice of placing the former below the latter).

Constancy of carrier spacing (sound-vision) reduced the flexibility of receiver design. In a single-programme system the vision channel might be pre-set, and double frequency changing would enable the sound intermediate frequency to be placed at a more convenient level. Present trends in i.f. amplifier designs would, he believed, cause difficulties at high intermediate frequencies.

In summing up the subsequent discussion, the chairman said that the rival claims of frequency modulation and amplitude modulation could not be settled by theoretical considerations alone. A big improvement in signal-to-noise ratio would have to be proved to justify the higher cost of a frequency-modulation system.

Coal for Industry

Relative Price and Quality

SPEAKING at the Fuel Luncheon Club on December 21st, DR. E. S. GRUMELL discussed standard qualities of coal and reasonably relative prices. In 1911 Imperial Chemical Industries installed its first chain-grate stokers using a slack which never contained less than 20 per cent. of ash. The result of successful operation of this and other plants was that the price of these slacks increased, with the ultimate result that his company took 75 per cent. of its supplies from another coalfield mostly as washed graded coal.

In 1932 his company spent £5,000 on blending plant in order to use coke breeze. Again the price went up, this time from 6s. per ton to 12s. 6d., so that the use of coke breeze was abandoned and it again became a drug on the market. Later he arranged a contract for 50 per cent. slurry, previously regarded as useless, loaded on top of 50 per cent. washed slack in wagons. It was successfully used, though with difficulty. At the end of the year the colliery offered to renew the contract for another 2s. per ton. The contract was not renewed.

In 1935 his company planned to erect two pulverised-fuel-fired boilers of 200,000 lb. per hr. evaporative capacity to use dry fines at mutually agreeable prices. Since then flat-rate increases raised the price from 14s. per ton to 19s. in 1938 and to 38s. in 1944. It would now pay handsomely to buy washed graded fuel.

The producer did not know what the consumer wanted and, may be, the consumer

himself did not know and certainly could not plan until he knew what was going to be produced and at what relative prices. There should be a revision of the price structure and the selling of coal on relative values as recommended by Lord Melchett's 1926 National Fuel and Power Committee.

The coal industry could not reasonably be expected to clean coal unless it obtained a fair and stable relative price for the products. It was hoped that at the conference organised by the Institute of Fuel to be held in Manchester on February 28th, the coal industry would present a true statement of the costs of cleaning coal and the industrialists would state their real requirements. He hoped the Ministry of Fuel and Power would do something towards standardising qualities of coal at reasonably relative prices. It could be done.

During the past three years fuel consumption had been reduced by 7 to 10 million tons per annum, valued at £14 to £20 million, without appreciable capital expenditure. Much of this saving would be permanent. Since licensing for new materials had been permitted within the last six months, plant to the value of £2 million had been licensed, which would save a further 500,000 tons of coal per annum.

Technological Education

Suggestions by London Conference

A REPORT recently presented to the London County Council by its Education Committee contains a survey and recommendations made by a conference of education authorities in London and the Home Counties for presentation to the Departmental Committee for Higher Technological Education which was appointed in April last.

It is recommended that the evidence to be submitted to the Departmental Committee should put forward the following points:—

(i) Degree qualifications should be made available for students attending approved technological courses.

(ii) (a) The University of London should be urged to establish a Faculty of Technology and to confer appropriate degrees; (b) in the event of the University's not agreeing to this the establishment of a national body for conferring degrees in technology should be urged.

(iii) The work of technical and art colleges should be kept under constant review for the purpose of ensuring that it is properly co-ordinated on a regional basis.

(iv) (a) In the national interest, it is desirable to establish a number of advanced technological institutions, housed, equipped and conducted so as to command respect by world standards; (b) as an interim measure, pending the establishment of the institutions referred to in item (iv) (a) selected departments in technical colleges should be developed to the highest level for particular forms of technology.

(v) Having regard to its national importance, adequate provision should be made for post-graduate study.

(vi) The authorities controlling advanced technological courses should give the staff concerned every encouragement to undertake such research, consulting work and testing for industry as would be likely to enhance the value of their teaching.

ELECTRICITY SUPPLY

Hull's Temporary Houses. New Southend Tariff

Angus.—RURAL SUPPLIES.—The County Council on December 20th heard a report from Sir Herbert K. Ogilvy on a meeting with the Grampian Electricity Company. The question of the county taking bulk supplies and doing its own distribution in villages was raised, but the company was against this. The Council's representatives also pressed the company to make electricity available to everyone in the county. A new agreement with the Grampian Company for the supply of power to all County Council properties was referred to the Finance Committee.

Ashton-under-Lyne.—DISPOSAL OF PLANT.—It was explained at a meeting of the Town Council why the disused electricity generating plant at the power station had not yet been disposed of. Authority had been given for the sale of the plant for £12,000 to a firm which, it was understood, intended to dispose of it to the French Government. At the end of November the French Government was still not in a position to proceed. The town clerk told the Council that if the plant were to be sold at the moment he was afraid the Corporation would not obtain the price it had hoped to get.

Hull.—GAS-ELECTRICITY DEBATE.—A recommendation of the Housing and Town Planning Committee that two-thirds of the temporary houses should be equipped with electrical domestic equipment and one-third with gas, except for lighting, was debated at a special meeting of the City Council.

Councillor W. E. Body, who moved an amendment that electricity should be used for all purposes in all the houses, said that the Council should benefit by past mistakes, and quoted the East Hull housing estate where out of 2,380 houses, 2,179 were converted from gas to electricity. The new houses would be for young people, who were definitely in favour of electricity. Councillor E. G. Carr, supporting the amendment, said that gas was going out of date for lighting and would soon be out of date for cooking. Councillor I. Robinson, another supporter, could not understand why two services should be put in when one would do, and Councillor W. O. Honor quoted figures showing how economical electricity was.

The argument that there should be freedom of choice was put forward by Councillor G. K. Spruit, on behalf of the Housing and Town Planning Committee, and Councillor T. R. Broadbent made the same point; while agreeing that most young people would "plump for electricity," he considered that many people preferred gas for cooking.

On a division 32 voted for the amendment and 38 against.

Iford.—ELECTRICITY PROFIT.—Reporting to the Council on the 1943-44 accounts of the Electricity Department, Alderman C. A. Farman, chairman of the Electricity Committee, said that these showed a net profit of £7,169 against a deficit of £1,619 in the previous year.

Isle of Thanet.—PROPOSED EXERCISE OF PURCHASE OPTION.—Last September the Margate and Broadstairs Councils decided to purchase

the undertaking of the Isle of Thanet Electric Supply Co., Ltd., on December 31st, 1945. The Electricity Commissioners have now notified them that they can give statutory notice to the company requiring the transfer of the undertaking in accordance with the Margate, Broadstairs and District Electricity Act, 1937.

Middlesbrough.—FACTORY SUPPLY.—The Town Council proposes to borrow £3,000 for supplying electricity to a new factory. Tenders are to be obtained for the materials and equipment.

Nelson.—POWER FOR COTTON MILLS.—The Town Council has decided to place a report by the electrical engineer on the use of electricity in cotton mills before the Cotton Employers' Association.

Preston.—POWER STATION EXTENSIONS.—The Electricity Committee recommends early application to the Electricity Commissioners for sanction to borrow £2,127,000 for completing the Ribble power station. If sanctioned the work is expected to take two or three years.

Renfrewshire.—DISCHARGE LIGHTING NOT PERMITTED.—The burgh's main street lighting by new mercury vapour lamps has been banned. Now an almost complete black-out prevails in the main streets. The new lamps, which gained for Renfrew the reputation of being the best lighted town in the country, had only been in use for a short time when the instructions to extinguish them were issued. It appears that the lamps could not be screened to conform with the "dim-out" regulations.

Rotherham.—POWER STATION EXTENSIONS.—Reporting on the scheme for the extension of the Prince of Wales power station the Corporation Electricity Committee estimates the cost at £650,000 and states that the extensions include one turbo-generator set of 30,000 kW with boiler plant.

CHOICE OF SERVICE.—The Housing Committee has decided that in all permanent houses electric lighting shall be installed and points provided so that tenants can use gas or electricity for heating and cooking.

Southend-on-Sea.—NEW BLOCK TARIFF.—At present the Council's domestic electricity consumers have a wide choice of tariffs. These rates are to be superseded by a new block tariff with a charge of 5d. per kWh up to a specified quarterly consumption and thereafter 7d. per kWh, or 1d. where a cooker or water-heater is used. The specified consumption will be calculated by adding 1/4 kWh per £1 of rateable value to a basic figure of 30 kWh. Prepayment supplies will be 6d. per kWh, or 6d. and 7d. where a cooker or water heater is used. All rentals are to be made payable at the end of the quarter instead of at the beginning, and apparatus now the subject of "free hire" agreements will be transferred to simple hire.

It is proposed to give all power supplies (apart from special contracts) either under a block rate of 3d. per kWh for the first 1,000 kWh per quarter, 2d. per kWh for the next 5,000 kWh and 1d. thereafter, or under a two-part rate

comprising a fixed charge per kVA and a "unit" charge of 1d. with coal at 32s. 6d. per ton (variation 0.005d. for each 6d.). The little-used restricted hour rate is to be abolished after two years; in the meantime the charge is amended. Business tariffs are also modified.

Surcharges to outside areas and meter rents are to be discontinued, but there will be a minimum charge of 10s. per quarter.

These recommendations are contained in a report by the borough electrical engineer and manager (Mr. A. C. Johnson) which was approved at the last meeting of the Council. The new tariffs, which come into operation this month, are estimated to provide a post-war net income (based on 71 million kWh sold to 39,000 consumers) of £429,000. This compares with £399,500 on pre-war tariffs and £457,000 when war additions are included.

It is proposed that domestic consumers shall be given the option of transferring to the new block rate at the end of any quarter, but will be required to do so after two years.

Tynemouth.—ELECTRICAL EQUIPMENT SPECIFIED.—The Housing Committee has agreed to the provision of all-electric domestic equipment in temporary houses.

Overseas

Canada.—PURCHASE OF POWER COMPANY.—It is reported that the Hydro-electric Power Commission of Ontario has purchased the system of the Northern Ontario Power Co., a subsidiary of the Canada Northern Power Corporation, for \$12,500,000.

Russia.—ARCTIC POWER SCHEME.—According to the *Soviet War News*, after being held up by the war, work has recently been resumed on the

construction of a large new hydro-electric power plant on the Kola Peninsula beyond the Arctic Circle. The station will utilise the power of the River Niva which flows into the White Sea.

Sweden.—HYDRO-ELECTRIC OUTPUT INCREASES.—The production of hydro-electric power during 1943 totalled over 11,000 million kWh, a new record figure and an increase of 12.5 per cent. compared with 1942.—*Reuter's Trade Service*.

TRANSPORT

Hastings.—PROPOSED ACQUISITION OF TROLLEY BUSES.—At a meeting of the Town Council on December 29th, it was decided to confirm a previous decision to take over the town's trolley-bus undertaking from the Maidstone & District Motor Services, Ltd., although the Finance Committee submitted a letter from the Minister of War Transport stating that he could not consent to the exercise of borrowing powers until he was satisfied that the project was essential to public needs or war requirements.

L.N.E.R.—SHEFFIELD-MANCHESTER ELECTRIFICATION.—Before the war a beginning was made with the work of electrifying the L.N.E.R. line between Sheffield and Manchester. Part of the structural overhead work had been erected, and the whole scheme will, it is now hoped, be completed in the first year after the war.

South Africa.—PLAN TO ELECTRIFY VEREENIGING LINE.—During a recent visit to Vereeniging the Minister of Transport (Mr. F. C. Sturrock) stated that it had been decided to electrify the railway line between Johannesburg and Vereeniging and provide a 45-min. service between the two towns.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Engineering & Lighting Equipment Co., Ltd., has declared an interim ordinary dividend of 3 per cent., against 4 per cent. last year. Explaining this reduction the directors state that the company's articles of association provide for a sum to be set aside each year for preference share redemption. The effect of this for the year 1943-44 was that £15,544 which would otherwise have been available for ordinary dividend (equivalent to over 15 per cent.) had to be set aside for redemption or paid in income tax. It is pointed out, however, that the redemption of the preference capital has increased the value of the ordinary capital by more than £30,000 up to March 31st, 1944. The interim accounts up to September 30th last show an increase in turnover and profits.

E. K. Cole, Ltd., report a net profit of £318,165 for 1943-44, after providing for depreciation and taxation, against £82,093 for the preceding year. A final dividend of 12 per cent. has been declared on the ordinary stock, making 20 per cent. for the year (against 15 per cent.). A participating dividend of 3 per cent. is again to be paid on the preferred ordinary shares.

S. Smith & Sons (England), Ltd.—At the annual general meeting held on December 28th, Mr. Walter Henderson-Cleland, the chairman, said

that while plans were already far advanced for the proper allocation of the group's factories for post-war production, the works were, generally speaking, still 100 per cent. on war production and must remain so, at least until the Germans were defeated.

New Companies

Power Accessories, Ltd.—Private company. Registered December 31st. Capital, £1,000. Objects: To carry on the business of manufacturers and wholesale distributors of radio and television receivers and components, batteries, accumulators, etc. Directors: H. G. Dredge and Mrs. G. Dredge, both of 10, Langley Oaks Avenue, Sanderstead. Registered office: 48, Tooting High Street, S.W.17.

United Components, Ltd.—Private company. Registered December 14th. Capital, £500. Objects: To carry on the business of manufacturers of, and dealers in, electrical and wireless goods and components, etc. Directors: V. J. L. Gooding, 153, Rendlesham Road, E.5; and J. Robertson, 188, Ferry Hill, S.E.6. Registered office: 21, Warwick Grove, Clapton, E.5.

Engineering Service Installations, Ltd.—Private company. Registered December 21st. Capital, £100. Objects: To carry on the business of electricians, mechanical, heating and ventilating engineers, etc. Subscribers: G. Conrad, 103,

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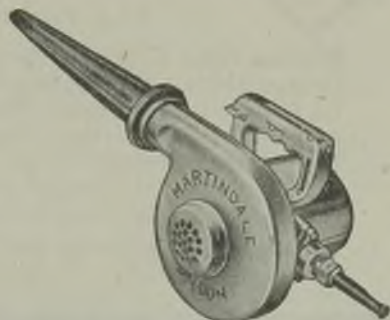
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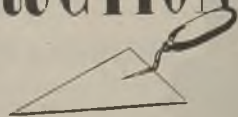
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Phyllis Avenue, New Malden, and E. W. Rosier, 1, Grunhurst Road, S.E.27. Solicitors: Clifford-Turner & Co., 11, Old Jewry, E.C.2.

Radio Electric (Durham), Ltd.—Private company. Registered December 21st. Capital, £1,000. Objects: To carry on the business of radio dealers and engineers, etc. Subscribers: R. G. Price, 50, Queen Street, and P. Maurice, 69, High Street, West, both Sunderland. Registered office: 10, Market Place, Durham.

David Phillips, Ltd.—Private company. Registered December 14th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical goods, motor, radio and general engineers, etc. Subscribers: F. J. Fisher, 18, The Heights, Northolt Park, Greenford; and J. S. Davis, 7, Vesta Avenue, St. Albans. Solicitors: J. N. Nabarro & Sons, 211, Piccadilly, W.1.

Torbinia, Ltd.—Private company. Registered December 13th. Capital, £5,000. Objects: To carry on the business of engineering contractors, electrical engineers, refrigeration and motor engineers, etc. R. Oldham, Holmwood, Albert Road, Cleethorpes, is a permanent director. Secretary: H. B. W. Parker. Registered office: Cosgrove Street, Cleethorpes.

British & Overseas Radiovision, Ltd.—Private company. Registered December 9th. Capital, £2,000. Objects: To carry on the business of electrical, mechanical, radio, gramophone and television engineers, photographers, etc. Subscribers: J. A. Pickering, 160, Purley Downs Road, Sanderstead; and L. De S. Tufnell, Bear Lane House, Ashwell, Herts. Registered office: Temple Chambers, Temple Avenue, E.C.4.

Redifon Electronics, Ltd.—Private company. Registered December 4th. Capital, £10,000. Objects: To carry on the business of manufacturers of, and dealers in, wireless, electrical, telephone and electronic equipment, etc. Subscribers: Lilian M. Weston, and W. H. Craig, both of Alder House, Aldersgate Street, E.C.1. Solicitors: Sydney Morse & Co., Alder House, E.C.1.

Companies' Returns Statements of Capital

William Geipel, Ltd.—Capital, £25,150 in 25,000 preference, 100 "A" ordinary and 50 "B" ordinary shares of £1. Return dated August 15th. All shares taken up. £23,650 paid. £1,500 considered as paid. Mortgages and charges: Nil.

Chesham & District Installations Co., Ltd.—Capital, £200 in 200 ordinary shares of £1 each. Return dated December 22nd, 1943 (filed August 8th, 1944). All shares taken up. £200 paid. Mortgages and charges: Nil.

Christy Bros. & Co., Ltd.—Capital, £225,000 in £75,000 preference and £150,000 ordinary stock. Return dated August 17th. All stock taken up. £176,083 paid. £48,917 considered as paid. Mortgages and charges: Nil.

United Telephone Cables, Ltd.—Capital, £1,000 in £1 shares. Return dated August 17th. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Mirrlees Watson Co., Ltd.—Capital, £600,000 in £100,000 5½ per cent. preference and £500,000

ordinary shares and stock. Return dated August 3rd. £71,000 preference and £466,000 ordinary stock taken up. £302,500 paid on £71,000 preference and £231,500 ordinary stock. £234,500 considered as paid on £234,500 ordinary stock. Mortgages and charges: Nil.

Increases of Capital

General Cable Manufacturing Co., Ltd.—The nominal capital has been increased by the addition of £100,000 in 400,000 ordinary shares of 5s. each beyond the registered capital of £150,000.

V. & E. Friedland, Ltd.—The nominal capital has been increased by the addition of £14,000 in ordinary shares beyond the registered capital of £1,000.

Mortgages and Charges

Bourne Radio & Electric, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital dated December 1st, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

Liquidation

Claybury Electrical Supplies, Ltd., 8b, Claybury Broadway, Woodford Avenue, Ilford.—Mr. Carl Fine, Furnival House, 14-18, High Holborn, London, W.C.1, was appointed liquidator on December 14th.

Bankruptcies

E. C. Mould (trading as the Empire Electrical Co.), 24, Westrow Gardens, Seven Kings, Essex, lately Ilford and Goodmayes, Essex, electrical retailer.—This debtor, who failed in 1937, was granted his discharge from bankruptcy recently at Chelmsford. He was stated to be now employed as a works manager at a salary of £750 per annum. When he failed he had liabilities of £2,800, with no assets. It was stated that his employers were prepared to find £250 to be paid into Court immediately if the discharge were granted. An order for immediate discharge was made, subject to judgment for £250.

H. C. Jeffery, T. H. Carter and Daisy Carter, trading in partnership as the Wrexham Electrical & Cycle Co., Wrexham, Denbighshire, electrical and cycle dealers. (Separate application of T. H. Carter and Daisy Carter).—At the County Hall, Wrexham, recently, the last-named debtors applied for their discharge. T. H. Carter stated that he was now in employment and upon giving an undertaking not to resume trading on his own account he was granted his discharge, subject to 12 months' suspension. His wife, Daisy Carter, was also granted a discharge.

N. E. Butcher, battery manufacturer, trading as the Herts Electrochemical Co., 2, Woodfield Road, Welwyn Garden City.—Proofs for dividends by January 15th to the trustee, Mr. S. P. Child, College Hill Chambers, Cloak Lane, London, E.C.4.

H. J. Gill, 10, High Street, Keynsham, Somerset, electrical engineer and radio dealer.—Debtor's application for discharge was heard recently at the Guildhall, Bristol, and was granted.

STOCKS AND SHARES

TUESDAY EVENING.

THE New Year opened in Stock Exchange markets with a continuance of conditions not very dissimilar from those of twelve months ago when the cheapness of money, the absence of new issues and the rising hopefulness in regard to peace—a hopefulness which last year failed to fulfil—were outstanding factors. The first two have had the effect of bringing about a practically all-round rise in prices. Business came spasmodically to the Stock Exchange markets. On the whole, 1944 will be remembered as a good year for holders of securities, though not so satisfactory for those who, having money to invest, were hard put to it to find a reasonable rate of interest from good-class securities. The prospect of expansion in price values remains in evidence. With the complaint that prices are already very high there will be ready agreement. For all that, the outlook favours the impression that the advance in market prices will go further. Towards the end of last year, a mild bout of excitement occurred in shares of radio manufacturing companies.

This Week's Fluctuations

Home Railway stocks have come again into request, for which the near approach of the dividend season is held to be responsible. The junior stocks have appreciated to some extent, the yields being high by comparison with the returns obtainable from Home industrials. Changes amongst electricity supply shares are confined to a florin rise in Nigerian Electricity and a sixpenny fall in Perak Hydro-Electric, making the prices 37s. and 12s. 6d. respectively. Movements in the equipment and manufacturing group are few, but mostly upward. Christy Bros., at £4, are 2s. 6d. up, De la Rue $\frac{1}{8}$ better at 9 $\frac{3}{4}$ and English Electrics 1s. higher at 56s. 6d. There are smaller gains in Associated Electrical, Ever Ready and General Electric 6 $\frac{1}{2}$ per cent. preference.

The radio group retains its advanced prices. Philco are 6d. harder at 15s. "Emis" hold their ground at 35s. 6d. Cossors at 32s. 6d. and Pye deferred at 33s. 9d. have kept the $\frac{1}{8}$ which each gained last week. E. K. Cole, another member of this section, finished the year at 37s. 6d., against 25s. 6d. at the end of 1943, when "Emis" were 27s. 3d., Cossor 22s. 6d. and Pye deferred 26s. 3d.

G.E.C. Preference

No little surprise has been aroused by the rejection by the Stock Exchange New Issues Committee of the application for permission to deal in £2,000,000 4 $\frac{1}{2}$ per cent. General Electric "C" preference stock. This decision was reached last week, and at the same time, notice was given by the Committee that

it was subject to the right of appeal. The whole £2,000,000 stock was sold by the company, it may be recalled, to a firm of bankers at 20s. The bankers in addition received a fee of £30,000 for their services in the matter. The Treasury professed to approve this method of making an issue which was to repay a loan raised by the G.E.C. before the war.

The Probable Premium

The Treasury point was that the G.E.C. has more than 27,000 shareholders and that, if the offer of new shares had been made to them, instead of the issue being sold to the bankers, a broad and active market in a new security might have been created. This was held to be contrary to the policy of the authorities, who wish to encourage the maximum support by individuals for current Government loans. It was well known that orders were being placed in the market to buy these new 4 $\frac{1}{2}$ per cent. preference shares when Stock Exchange permission to deal in them had been granted. It was assumed that the opening price would be about a guinea to something over, giving the original purchasers a useful profit if they cared to sell. The next move is awaited with lively interest. The action of the Stock Exchange Committee has met with unqualified approval by those who consider that the G.E.C. shareholders should have the right of applying for the new shares at the attractive figure that the banking house gave for them.

Shares on Offer

The range of choice offered to an investor in ordinary shares of the electricity supply companies is circumscribed, but it is still possible to buy such shares, although at prices offering little temptation from the point of view of income. For example, 1,000 Midland Electric Corporation ordinary shares can be bought at 44s. 6d., October and April dividends, to pay £4 0s. 9d. per cent. on the money, and in the Provincial group, Llanelly & District at 27s. 3d. return £4 8s. per cent. The latter company raised its dividend to 6 per cent. in each of the last two years, following 5 $\frac{1}{2}$ per cent. dividends. Lancashire Electric ordinary, of which there are 3,000 on offer at 37s. 3d., give a return of 4 $\frac{1}{2}$ per cent. at that price, and British Power & Light, of which 2,500 are obtainable in the market at 32s. 9d., afford the same income.

Price Movements in 1944

The second and final half of the review of net movements in Stock Exchange prices during 1944, of which the first instalment appeared last week, opens with a further list of shares in the manufacturing and equipment

(Continued on page 34)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend		Middle Price Jan. 2	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Jan. 2	Rise or Fall	Yield p.c.
	Pre- vious	Last					Pre- vious	Last			
Home Electricity Ordinary						Equipment and Manufacturing					
Bournemouth and Poole	12½	12½	62/6	..	£ s. d. 4 0 0	Aron Elec. Ord.	15	15	61/-	..	£ s. d. 4 18 4
British Power and Light	7	7	33/-	..	4 4 10	Assoc. Brit. Eng. Assoc. Elec. :	6	7	57/6	..	2 8 9
City of London ..	7	5½	30/-	..	3 13 4	Ord.	10	10	58/-	+6d.	3 9 0
Clyde Valley ..	8	8	42/-	..	3 16 0	Pref.	8	8	40/-	+6d.	4 0 0
County of London	8	8	43/-	..	3 14 5	Automatic Tel. & El.	12½	12½	67/6	..	3 14 0
Edmundsons ..	6	6	31/-	..	3 17 5	Babcock & Wilcox	11	11	53/-	..	4 3 0
Elec. Dis. Yorkshire	9	9	45/6	..	3 19 6	British Aluminium	10	10	46/-	..	4 7 0
Elec. Fin. and Se- curities	12½	13½	60/6	..	4 9 0	British Insul. Ord.	20	20	52/-	..	3 9 0
Elec. Supply Cor- poration	10	10	50/6	..	3 18 6	British Thermostat (5/-)	18½	18½	21/3	..	4 7 0
Lancs. Light and Power	7½	7½	37/-	..	4 1 1	British Vac. Cleaner (5/-)	30	30	32/6	..	4 12 3
Llanelli Elec. ..	6	6	26/6	..	4 10 7	Brush Ord. (5/-)	8	9	11/-	..	4 1 9
Lond. Assoc. Electric	3	4	26/-	..	3 1 6	Buroco (5/-) ..	15	15	16/6	..	4 11 0
London Electric ..	6	6	30/6	..	3 18 8	Callender's ..	15	20	52/-	..	3 9 0
Metropolitan E.S.	8	8	43/-	..	3 14 5	Chloride Elec. Storage	15	15	85/-	..	3 10 7
Midland Counties	8	8	41/6	..	3 17 0	Christy Bros. ..	12½	17½	80/-	+½	4 7 6
Mid. Elec. Power	9	9	44/-	..	4 1 10	Cole, E. K. (5/-)	15	20	37/6	..	2 13 4
Newcastle Elec.	7	7	32/-	..	4 7 6	Consolidated Signal	24	27½	62/-	..	4 1 6
North Eastern Elec.	7	7	34/6	..	4 1 2	Cossor, A. C. (5/-)	7½*	10*	32/6	..	1 10 9
Northampton ..	10	10	50/-	..	4 0 0	Crabtree (10/-)	17½	17½	44/-	..	3 19 7
Northmet Power	7	7	41/-	..	3 8 4	Crompton Parkinson Ord. (5/-) ..	20	22½	33/6	..	3 7 3
Richmond Elec.	6	6	26/-	..	4 12 4	De La Rue ..	35	40	92/-	+½	4 2 0
Scottish Power ..	8	8	40/6	..	3 19 0	E.M.I. (10/-) ..	6	8	35/6	..	2 5 1
Southern Areas ..	5	5	23/-	..	4 7 0	Elec. Construction	10	12½	61/3	..	4 1 8
South London ..	7	7	30/-	..	4 13 4	Enfield Cable Ord.	12½	12½	64/-	..	3 18 2
West Devon ..	5	5	24/-	..	4 3 4	English Electric	10	10	56/6	+1/-	3 10 6
West Glos. ..	4½	3½	25/-	..	2 16 0	Ensign Lamps (5/-)	25	15	21/3	..	3 10 8
Yorkshire Elec. ..	8	8	43/-	..	3 14 5	Ericsson Tel. (5/-)	22*	20*	53/9	..	1 17 8
Public Boards						Ever Ready (5/-)	40	40	42/6	+6d.	4 14 3
Central Electricity :						Falk Stadelmann	7½	7½	34/6	..	4 7 0
1955-75	5	5	115	..	4 7 0	Ferranti Pref. ..	7	7	31/9	..	4 8 2
1951-73	4½	4½	106	..	4 6 0	G.E.O. :					
1963-93	3½	3½	104	..	3 7 4	Pref.	6½	6½	34/-	+9d.	3 16 4
1974-94	3½	3½	100½	..	3 4 8	Ord.	17½	17½	98/-	..	3 11 6
London Elec. Trans.	2½	2½	98½	..	2 10 9	General Cable (5/-)	15	15	17/-xd	+3d.	4 8 3
London & Home Counties 1955-75	4½	4½	112	..	4 0 4	Greenwood & Batley	15	15	48/9	..	6 3 0
Lond. Pass. Trans. Bd.						Hall Telephone (10/-)	12½	12½	31/6	..	3 19 4
A	4½	4½	121½	..	3 14 1	Henley's (5/-) ..	20	20	27/6	..	3 12 9
B	5	5	122½	..	4 1 8	4½% Pref. ..	4½	4½	24/-	..	3 15 0
C	3	3	69	..	4 14 2	Hopkinsons ..	15	17½	73/9	..	4 12 9
West Midlands						India Rubber Pref.	5½	5½	23/-	..	4 14 9
J.E.A. 1948-68	5	5	106½	..	4 14 0	Intl. Combustion	30	30	62/-	..	4 12 4
Overseas Electricity Companies						Johnson & Phillips	15	15	79/-	..	3 15 9
Atlas Elec. .. Nil	Nil	7/-	..	..	..	Lancashire Dynamo	22½	22½	100/-	..	4 10 0
Calcutta Elec. ..	6*	46/6	..	2 11 9	..	Laurence, Scott (5/-)	12½	12½	14/-	..	4 9 3
Cawnpore Elec. ..	10	7	41/3	..	3 7 9	London Elec. Wire	7½	7½	38/-	..	3 19 0
East African Power	7	7	35/-	..	4 0 0	Mather & Platt ..	10	10	55/-	..	3 12 9
Jerusalem Elec. ..	7	5	29/-	..	3 9 0	Metal Industries (B)	8	8½	49/-	..	3 9 6
Kalgoorlie (10/-)	5	5	10/6	..	4 15 3	Met. Elec. Cable Pref.	5½	5½	21/3	..	5 3 6
Madras Elec. .. Nil	4	30/6	..	2 12 4	..	Mkt. Elec. Mfg. ..	25	25	7½	..	3 9 10
Montreal Power ..	1½	25	..	..	..	Murex	20	20	5½	..	3 19 0
Nigerian Elec. ..	8	10	37/-	+2/-	5 8 1	Newman Ind. (7½/-)	20	20	7/3	..	5 10 0
Palestine Elec. "A"	5*	5*	38/6	..	2 12 0	Philco (2/-) ..	..	..	15/-	+6d.	..
Perak Hydro. elec.	6	7	12/6	-6d.	..	Power Securities	6	6	29/6	..	4 1 4
Tokyo Elec. 6%	6	6	24	-1	..	Pye Deferred (5/-)	25	25	33/9	..	2 14 0
Victoria Falls Power	15	15	90/-	..	3 7 7	Ransome & Marks	20	20	87/6	..	4 11 4
Whitehall Inv. Pref.	—	6	26/-	..	4 12 4	Revo (10/-) ..	17½	17½	44/-	..	3 19 7
						Reynolds	12½	12½	72/6	..	3 9 0

(Continued on next page)

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend		Middle Price Jan. 2	Rise or Fall	Yield p.c.
	Previous	Last			
Equipment and Manufacturing (Continued)					
Siemens Ord. . .	7½	7½	36/-	-3d.	4 3 4
Strand Elec. (5/-)	10	12½	11/6		5 8 8
Switchgear & Cows (5/-)	20	20	20/9		4 16 7
T.C.C. (10/-) . .	5	7½	25/-		3 0 0
T.O. & M. . . .	10	10	56/-		3 11 6
Telephone Mfg. (5/-)	9	9	12/-		3 15 0
Thorn Elec. (5/-)	20	20	28/9		3 9 6
Tube Investments	20	22½	5½		4 6 9
Vactric (5/-)	Nil	22½	17/6		6 8 6
Veritys (5/-)	7½	7½	9/-		4 3 4
Walsall Conduits (4/-)	55	55	52/6		4 3 10
Ward & Goldstone (5/-) . .	20	20	30/-		3 6 8
Westinghouse Brake	12½	14	75/-		3 14 8
West, Allen (5/-)	7½	7½	8/9		4 5 9

Traction and Transport

Anglo-Arg. Trams :					
First Pref. (£5)	Nil	Nil	2/6	..	—
4% Inc.	Nil	Nil	6½	..	—
Brit. Elec. Traction :					
Def. Ord. ..	45	45	1200	..	3 15 0
Prof. Ord. ..	8	8	190	..	4 4 3
Bristol Trams ..	10	10	57/-	..	3 10 2
Brazil Traction ..	1½	2	26½	..	7 12 4
Calcutta Trams	6½	7½	61/6	-7/-	2 8 9

* Dividends are paid free of Income Tax.

Company	Dividend		Middle Price Jan. 2	Rise or Fall	Yield p.c.
	Pre- vious	Last			
Cape Elec. Trams	5	6	26/-	..	£ s. d. 1 12 4
Lanca. Transport	10	10	47/6	..	4 4 3
Southern Rly. :					
5% Prefd. ..	5	5	78	+½	6 8 2
5% Prof. ..	5	5	119	..	4 4 0
T. Tilling ..	10	10	62/-	..	3 4 6
West Riding ..	10	10	47/6	..	4 4 2
Telegraph and Telephone					
Anglo-Am. Tel. :					
Prof. ..	6	6	124	..	4 10 7
Def. ..	1½	1½	30	..	5 0 0
Anglo-Portuguese	8	8	29/6	..	5 8 6
Cable & Wireless :					
5½% Pref. ..	5½	5½	118	+1	4 13 3
Ord. ..	4	4	85	+½	3 14 2
Canadian Marconi	1 Nil	4cts.	9/6	..	—
Globe Tel. & Tel. :					
Ord. ..	8½	6	41/-	..	2 8 9
Prof. ..	6	6	31/-	..	3 17 6
Great Northern Tel.					
(£10) ..	Nil	Nil	28	..	—
Inter. Tel. & Tel.	Nil	Nil	23	+3	..
Marconi-Marine ..	7½	7½	35/6	..	4 4 6
Oriental Tel. Ord.	16	10	48/-	..	—
Telephone Props.	Nil	6	20/-	..	6 0 0
Tele. Rentals (5/-)	10	10	12/6	..	4 0 0

Stocks and Shares (Continued from page 32)

group. In last week's selection, it was shown that every case provided a rise in price on the year. The following list carries on the same story. As already mentioned, various reasons account for the consistent advance in prices, nor can it be said that there is any present indication of material setback from quotations already attained, high though these are.

Taking a selection of representative electrical companies, the following comparisons make interesting comment upon the result of wartime conditions:—

Ordinary shares	Dec. 31st, 1943	Now	Rise
	s. d.	s. d.	s. d.
Automatic Tel. & El.	56 3	67 6	11 3
Cranbrook (10s.)	36 3	44 0	7 7
Elec. & Musical (10s.)	27 9	35 6	7 7
Elec. Construction	50 6	61 3	10 7
Enfield Cable ord.	59 0	64 0	5 0
Ericsson Tel. (5s.)	51 3	53 9	2 6
Johnson & Phillips	66 6	79 0	12 6
Lancs Dynamo	92 0	100 0	8 0
Mather & Platt	52 0	55 0	3 0
Reynolds	70 0	72 6	2 6
Siemens	33 6	36 0	2 6
Telegraph Construction	49 6	56 0	6 6
Westinghouse Brake	65 0	75 0	10 0

Overseas

Examples have already been given of the movements over the twelve-month period in prices of Home electricity supply shares. A short table, dealing with representative

shares in overseas companies, shows variations as follows:—

Stock or Share	Dec. 31st, 1943	Now	Rise or Fall
	s. d.	s. d.	s. d.
Calcutta ..	35 0	46 6	+11 6
Palestine ..	40 3	38 6	-1 9
Victoria Falls	86 3	90 0	+3 9
Whitehall pref.	24 0	26 0	+2 0

Tokyo 6 per cent. rose from 19 to 24 during 1944. Calcutta Trams started the year at 36s., doubled in price, and left off at 61s. 6d., a net rise of 25s. 6d.

Telegraph and Telephone

Cable & Wireless ordinary stock was amongst the active spots of 1944 and the price shows an improvement of 7½ points. The 5½ per cent. preference has also improved, being included, as it is, in a good many lists of investments placed before their clients by Stock Exchange brokers. The progress of the war is indirectly illustrated by a rise of 5½ in Great Northern (Denmark) Telegraph. A gain of 9 points in International Telephone & Telegraph shares is deserving of notice:—

Stock or Share	Dec. 31st, 1943	Now	Rise
	s. d.	s. d.	s. d.
Anglo-American pf. ..	114½	124	9½
Cable & Wireless pf. ..	113	118	5
Cable & Wireless ord.	77½	85	7½
Great Northern	22½	28	5½
Inter. Tel. & Tel.	14	23	9
Marconi Marine	32/3	35/6	3/3

NEW PATENTS

Electrical Specifications Recently Published

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

ALLMANNA Svenska Elektriska Aktiebolaget.—Means for regulating electrically one or other of two related quantities." 17259 42. December 13th. 1941. (566060.)

Automatic Telephone & Electric Co., Ltd., and P. N. Roseby.—Electrical signalling systems." 8902. June 3rd. 1943. (566122.)

British Thomson-Houston Co., Ltd.—Roasting racks for electric ovens." 11015 43. July 7th. 1942. (566103.) "Manufacture of electrodes for glow discharge devices." 10269 43. June 29th. 1942. (566132.)

British Thomson-Houston Co., Ltd., and J. Moir.—Reproduction of sound from film sound records." 4180. March 15th. 1943. (566112.)

R. Calvert, G. G. Gouriet and E. Davies.—Electrical frequency-dividing and counting circuits." 10159. June 23rd. 1943. (566102.)

Crompton Parkinson, Ltd., and A. W. Angold.—Prepayment mechanism for meters and the like." 16880. November 27th. 1942. (Addition to 515223.) (566173.)

Ericsson Telephones, Ltd., B. O. Anson and S. H. D. Ward.—Microphones." 11479. July 14th. 1943. (566162.)

D. C. Gall.—Electrical measuring instruments of the moving coil type." 14668. September 7th. 1943. (566106.)

General Electric Co., Ltd., and E. Friedlander.—Protective devices for high-power transmission lines." 8015. May 20th. 1943. (566181.)

Holophane, Ltd. (Holophane Co., Inc.).—Luminaires." 9269. June 9th. 1943. (566189.)

M. A. Horsford.—Electric illuminating and audible warning system." 3830. March 9th. 1943. (566145.)

Macfarlane Engineering Co., Ltd., J. W. Macfarlane and W. L. Macfarlane.—Electric generators." (Cognate applications 3973 43 and 19599 43.) April 14th. 1943. (566168.)

J. C. Macfarlane and W. L. Macfarlane.—Synchronous electric motors." 5787. April 10th. 1943. (566147.)

Marconi's Wireless Telegraph Co., Ltd., and H. Haywood.—Electrical converting arrangements." 9206. June 8th. 1943. (566100.)

Marconi's Wireless Telegraph Co., Ltd., and J. H. Moon.—Lighting of the scales of indicating instruments." 4809. March 24th. 1943. (566114.)

Mullard Radio Valve Co., Ltd., and C. F. M. Hayes.—Devices for feeding rod-like bodies." 3426. March 2nd. 1943. (566069.) "Glass-moulding machines." 3427. March 2nd. 1943. (566070.)

J. E. Oram, G. H. S. Grene and Wild-Barfield Electric Furnaces, Ltd.—Electric heating of moulds, press tools and the like." 9478. June 11th. 1943. (566128.)

L. H. Paddle and M. E. Borth.—Control of alternating current supply voltages." 3638. March 5th. 1943. (566071.)

Partridge, Wilson & Co., Ltd., and F. A. Loach.—Automatic contactors or switches of the change-over and simple on-off types." 8920. June 3rd. 1943. (566075.)

Philips Lamps, Ltd. (Naamlouze Vennootschap Philips' Gloeilampenfabrieken).—Radio receivers adapted to be automatically tuned to a number of predetermined stations." 8125. May 6th. 1940. (Convention date not granted.) (566135.)

Pressed Steel Co., Ltd., E. G. Rowledge and W. G. Nolcken.—Compression type refrigerating systems." 10262. June 25th. 1943. (566131.)

Radio Gramophone Development Co., Ltd., C. F. Marriott and D. H. J. Taylor.—Apparatus for testing resistors." 13725. August 23rd. 1943. (566105.)

Simmonds Development Corporation, Ltd.—Electrical indicating or recording systems." 9430 43. June 12th. 1942. (566101.)

Standard Telephones & Cables, Ltd., and L. J. Heaton-Armstrong.—Antenna systems for defining a blind approach path." 15892. November 10th. 1942. (Addition to 562853.) (566172.)

Standard Telephones & Cables, Ltd., and A. J. Maddock.—Radio navigational systems." 9263. July 3rd. 1942. (566169.)

Standard Telephones & Cables, Ltd., F. H. Bray and L. R. Brown.—Circuits for counting electrical impulses." June 11th. 1943. (566156.)

H. E. Yarrow.—Superheater for use in connection with steam boilers." 8220. May 24th. 1943. (566184.)

Amended Specification

548441. Telephone Manufacturing Co., Ltd., and others.—Frequency converters."

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within one month from December 27th:—

EUTALLOY. No. 629,135, Class 6. Welding metals, being common metal alloys. Design No. 630,334. Common metals and alloys thereof, for welding.—Eutalloy & Welding Processes, Ltd., 10, Parkway, Welwyn Garden City, Herts.

CHROMOTRON. No. 630,907, Class 8. Television apparatus and parts thereof not included in other classes.—J. L. Baird, 3, Crescent Wood Road, London, S.E.26.

LECTRALOT. No. 630,759, Class 11. Electric lamps.—Thames Technical Co., Ltd., 83, High Street, Brentford.

USKON (design). No. 626,966, Class 17. Electrically-conductive rubber composition in sheet form.—United States Rubber Co., New York. Address for service: c/o T. A. Clayton, 39-51, Highgate Road, London, N.W.5.

CABOLINE. No. 630,267, Class 17. Insulating varnish and insulating materials.—Sternol, Ltd., 16, Finsbury Square, London, E.C.2.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

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

Australia.—January 10th. N.S.W. Railways. Electrical equipment for 50 suburban electric motor cars and 50 trailer cars.

QUEENSLAND.—January 10th. 33-kV switchgear, Spec. 380. City Electric Light Co., Ltd., Boundary Street, Brisbane (£2 2s.).

VICTORIA.—April 26th. Melbourne City Council. Electrostatic flue gas dust collecting equipment. Spec. 419. City Electrical Engineer's Office (£1 1s.).

March 1st. Western Australian Government Tender Board. Two 25,000-kW turbo-alternators and condensing plant; boiler-house equipment (boilers, pulverised coal equipment, economisers, feed pumps, air heaters, mechanical draught plant, pipework, buildings, etc.); and 25,000-kW frequency changer.

Batley.—January 10th. Electricity Department. 750-kVA transformer and e.h.v. ring main unit. (December 29th.)

Dundee.—January 10th. Corporation Housing Department. Various works, including electric light installations in 31 blocks (162 houses) at Magdalene's Kirkton housing scheme. City quantity surveyor, 21, City Square.

Fife.—January 10th. County Council Catering Committee. Work, including electrical, for central kitchen at High Street, Strathmiglo. Specifications and schedules from C. R. Douglas & Son, F.S.I., 15, East Port, Dunfermline (£1 1s.).

Orders Placed

Darlington.—Town Council. Accepted. Overhead line (£284).—F. Reid Ferens & Co. Equipment for waterworks substation (£264).—W. Lucy & Co.

Hull.—Assistance Committee. Accepted. X-ray unit (£455).—Philips Lamps.

Wallasey.—Electricity Committee. Accepted. Rectifying equipment (£340).—English Electric Co., Ltd. Replating battery (£207).—Edison Swan Electric Co., Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Argyllshire.—New harbour at Carradale (post-war) to cost £80,000; clerk, County Council, Lochgilphead.

Burnley.—X-ray department at Infirmary (£5,000); clerk to Victoria Infirmary Board, Briercliffe Road.

Bury.—Works additions, Benson's Confectionery Co., Ltd., Huntley Mount Road.

Chesterfield.—Schools, Newbold estate; W. S. Wilson, borough surveyor, Town Hall.

Coventry.—Rebuilding Barker Butts School on Whitley Abbey site; D. E. E. Gibson, city architect, 1a, Warwick Row.

Croydon.—Extensions, Ruskin Grammar School (£4,140); borough engineer.

Falkirk.—New water distribution scheme (post-war) to cost £362,850, for Stirlingshire and Falkirk Water Board; Eric W. Denholm, engineer to the Board.

Fife.—Central kitchen at Rosyth for school meals (£5,400); clerk, County Council, Cupar, Fife.

Keighley.—School at Ingrow; E. G. Felgate, borough architect, College Street.

Leeds.—Additions, Sweet Street; H. R. Marsden, Ltd., machinery manufacturers, Soho Foundry.

Manchester.—Schools, Wythenshawe; G. H. Gawler, chief building surveyor, Education Offices, Deansgate, Manchester 3.

Mansfield.—Extensions for school meals at King Edward and Rainworth Schools; R. F. B. Grundy, borough surveyor, Town Hall.

Matlock.—Civic centre, for U.D.C.; J. Turner, surveyor, Town Hall, Matlock.

Middleton (Lancs.)—Extensions, works and offices; Yorkshire Dyeing & Proofing Co., Ltd., Spring Vale Mills.

Newbiggin (Northumberland).—Ten homes for the Aged Miners' Homes Association; J. Kailofer, architect, Council Offices, Newbiggin.

Newton Heath.—Works extensions; G. C. Baines, architect, 12/24, Guildhall Street, Preston.

Openshaw.—Works canteen; H. F. V. Newsome, architect, 42, Tatton Road South, Heaton Moor, Stockport.

Preston.—Dining hall and kitchen, Grammar School; secretary, Board of Governors.

Reading.—Additions (£3,473), Pangbourne Waterworks; George Stow & Co., Ltd., engineers, Mill Street, Slough.

Rochdale.—Additions, Larkfield Mills; Empress Shoe & Slipper Works, Ltd., Boundary Street.

Additions, Eagle Oil Works; E. S. Lord., Ltd., Bury Road.

Rotherham.—Additions, Thames Street; Yates, Haywood & Co., Ltd., Effingham Works.

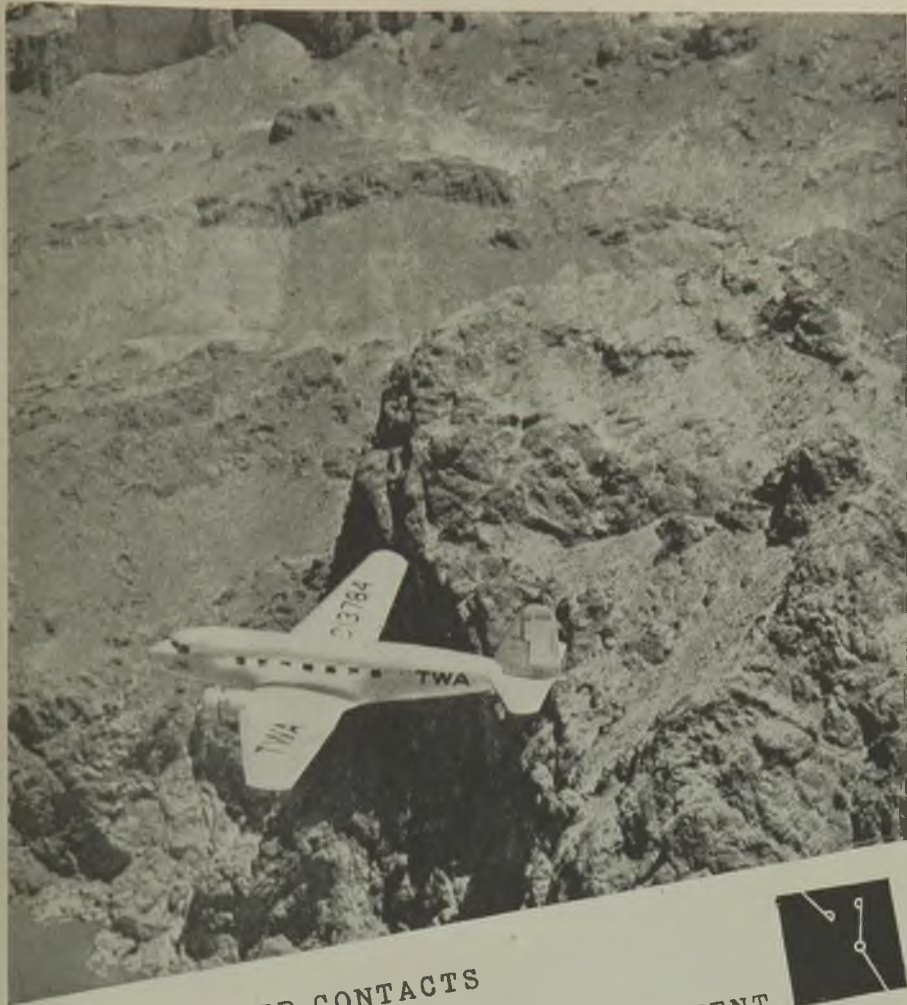
Spilsby.—Houses (22), for R.D.C.; surveyor, Council Offices, Boston Road, Spilsby, Lincs.

Stretford.—Transport depot, Chester Road; Whatton's Transport, Ltd., Meadowgate, Bourne, Lincs.

Swansea.—Secondary school, Derwyn Fawr Road, for R.C. authorities; W. J. Rees & Partners.

Tyldesley.—Houses (50), Mosley Common site; N. Chamberlain, surveyor, Town Hall.

Warrington.—Additions, Knutsford Road; Daniel Johnson, basket manufacturers, 486, Knutsford Road.



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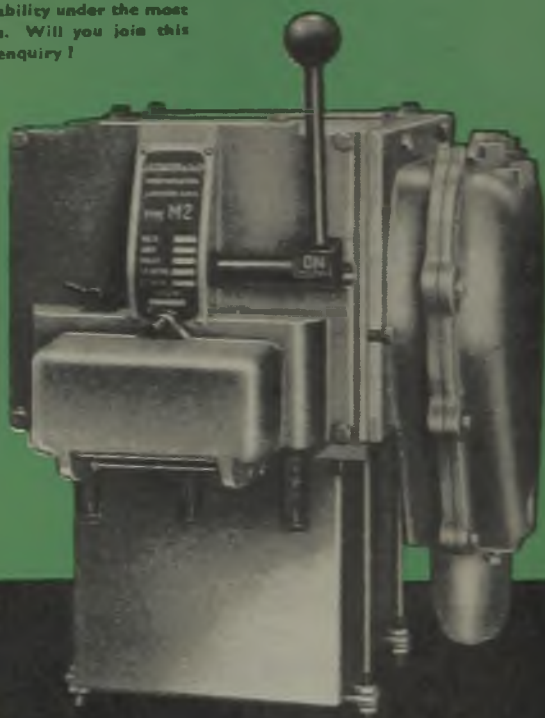


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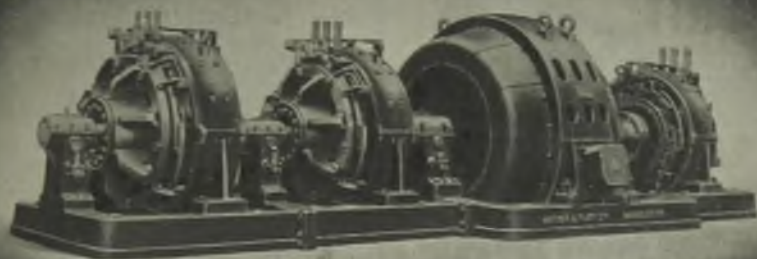


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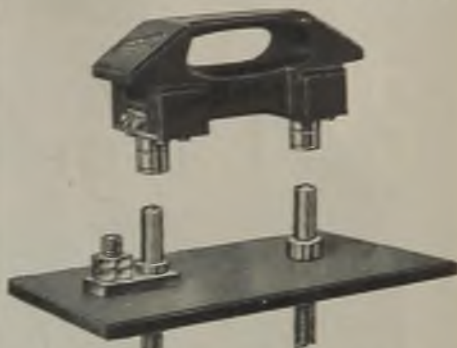


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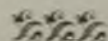
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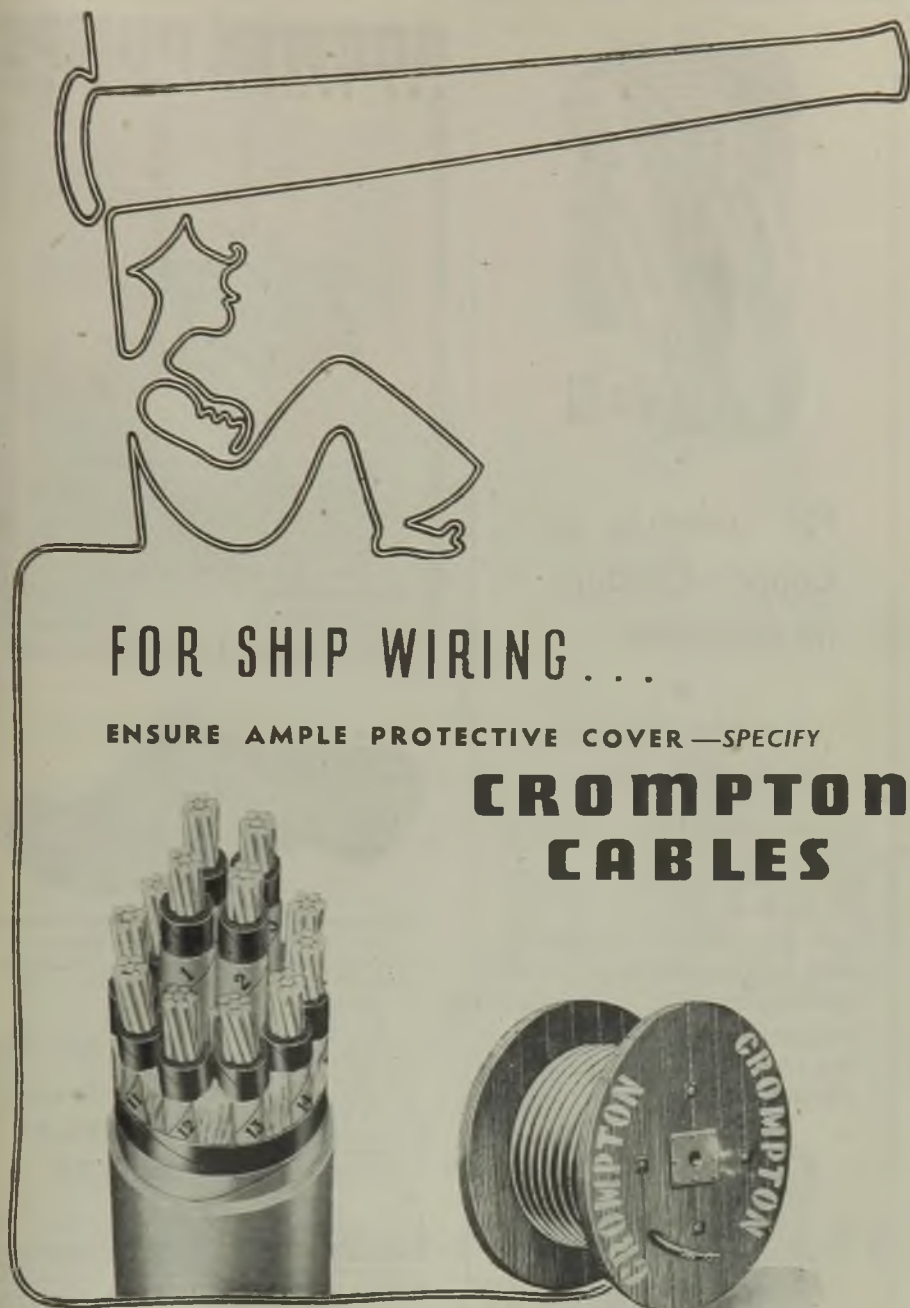
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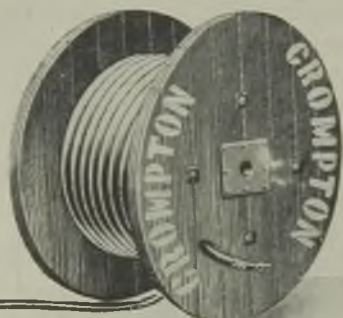
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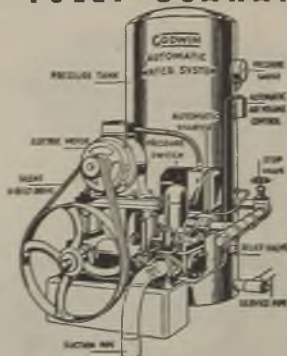
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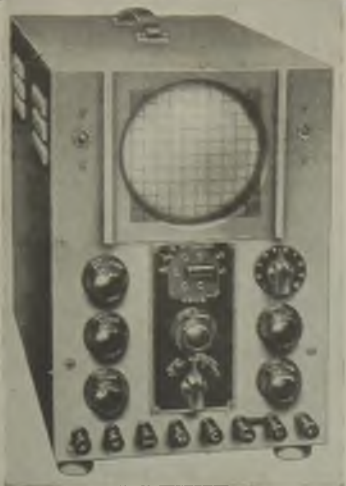
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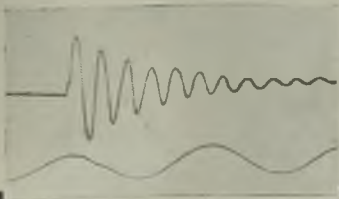
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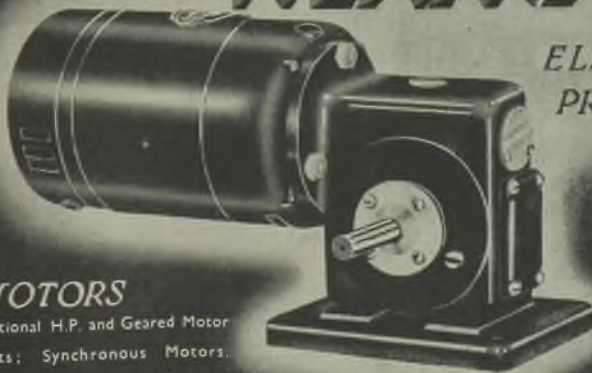


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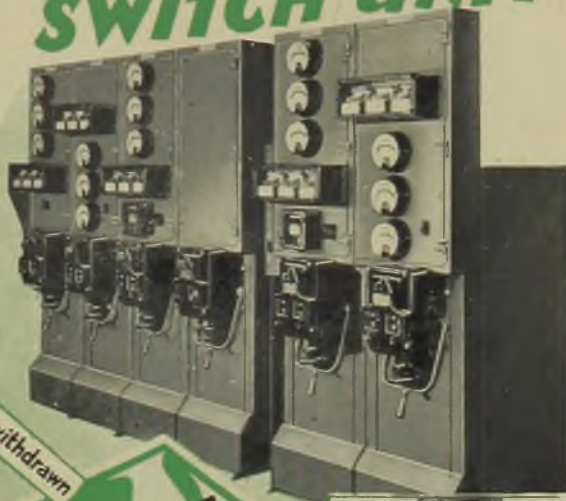
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A space saving SWITCH UNIT



Showing Trunnion blocks withdrawn



Circuit Breaker being racked down for isolation



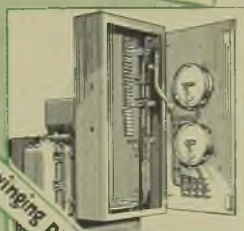
Circuit Breaker Truck withdrawn from cubicle



Circuit Breaker lifted for contact inspection



Front view showing easy access to cable box



Panel wiring accessible—swinging panel

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Extensive experience in the design, manufacture and installation of all types of Power and Traction Equipment, has given B.I. an unrivalled position in this field of electrical development.

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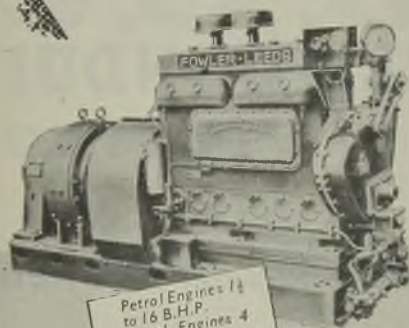
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CLASSIFIED ADVERTISEMENTS

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

THE CHARGE for advertisements in this section is 2/- per line (approx. 8 words) per insertion, minimum 2 lines 4/-, or for display advertisements 30/- per inch, with a minimum of one inch. Where the advertisement includes a Box Number there is an additional charge of 6d. for postage of replies. **SITUATIONS WANTED.**—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Original testimonials should not be sent with applications for employment.

SITUATIONS VACANT

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

COUNTY BOROUGH OF GREAT YARMOUTH ELECTRICITY DEPARTMENT

Appointment of Charge Engineer and Junior
Shift Engineer

APPLICATIONS are invited from suitable candidates for the following positions:

Shift Charge Engineer

Candidates must have had a good practical and technical training in mechanical and electrical engineering and experience in the operation of modern boiler and turbo-alternator plants.

Applicants should be up to Graduate level standard of the I.E.E. or possess a first-class B.O.T. Marine Engineer's Certificate of Competency. Salary in accordance with E.P.E.A. Schedule, Class 1, Grade 8.

Junior Shift Engineer

Applicants must have experience in the control of large electric supply systems and paralleling turbo-alternator plant. They must be technically qualified up to at least Ordinary National Certificate in Electrical Engineering and have had good general engineering experience. Salary in accordance with E.P.E.A. Schedule, Class F, Grade 9.

The appointments will be subject to the provisions of the Local Government and Other Officers' Superannuation Act, 1937, and the successful candidates will be required to pass a medical examination.

Forms of application may be obtained from the undersigned, and should be returned in the official envelope provided not later than the first post January 16th, 1944.

GERARD T. ALI COCK,
Engineer and General Manager.

Electric House,

Regent Road,
Great Yarmouth.

1181

NORTHAMPTON BOROUGH EDUCATION COMMITTEE

College of Technology

REQUIRED in February next, a full-time Teacher of Engineering Subjects for Senior and Junior students. Candidates should possess a good University Degree or an equivalent qualification. Salary in accordance with the Burnham Award for Graduate Assistant Teachers in Technical Schools.

Further particulars and forms of application may be obtained from the undersigned, by whom the completed forms must be received by the 20th January, 1945.

H. C. PERRIN,
Secretary for Education.

Borough Education Office,

"Spring" Rd.,
Cliftonville, Northampton.

1193

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

ROYAL TECHNICAL COLLEGE, SALFORD

(Principal: J. E. Richardson, Ph.D., B.Eng.,
M.I.E.E., A.M.I.Mech.E.)

APPLICATIONS are invited for the post of full-time Lecturer in Electrical Engineering, to commence duties as soon as possible after Easter, 1945. Applicants must have had industrial experience and be capable of teaching Design of Electrical Machinery up to the Higher National and London University Final B.Sc. degree standard, together with at least one other advanced electrical subject.

Salary in accordance with the Burnham Technical Scale, plus war bonus, with allowance for approved industrial experience.

Application forms and further particulars may be obtained from the Principal, Royal Technical College, Peel Park, Salford 5, Lancashire, to whom applications should be returned not later than 22nd January, 1945.

H. H. TOMSON,

Clerk to the Governors.

1182

ADVERTISING Assistant, age about 30 years, required to prepare technical pamphlets, descriptions of mechanical and electrical equipment, catalogues, etc. Some previous experience would be essential and it is desirable that this should include experience in the electrical engineering industry. The post would offer excellent prospects to a first-class man with the right experience. Apply—Brookhirst Switchgear Ltd., Chester. 1185

AFTER restrictions on the engagement of labour are removed a well-established firm of electrical power switchgear and domestic appliance manufacturers in the London area desire to engage men for the following permanent positions: (a) Draughtsman to take charge of small drawing office; (b) Draughtsman for development of new electrical equipment; (c) Works Engineer with knowledge of tool design and production, and able to supervise plant maintenance. Applicants should write as soon as possible, giving fullest details of previous experience, employers and salaries earned. This information will be dealt with in strictest confidence. Only men of initiative and with sound experience need apply to—Box 1215, c/o The Electrical Review.

APPLICATIONS are invited for the post of Shift Charge Engineer. The salary paid and conditions generally are in accordance with the National Joint Board Schedule, Grade 8, Class F, at present £387 per annum. Applicants must have sound theoretical knowledge and practical experience in the operation of H.P. boilers, turbo alternators, E.H.T. and L.T. switchboards and usual auxiliary plant. Applications, stating age, and giving full particulars as to training and subsequent experience, with copies of any testimonials, to be addressed to—The Chief Engineer, Slough Estates Ltd., Trading Estate, Slough, Bucks. 1185

ASSISTANT Production Manager to control female labour required by firm of Radio Valve manufacturers in North London. Candidates should possess experience in production of radio valves, or lamps, or assembly of small electrical components, or mass production. Salary £420 to £500 p.a. according to qualifications, plus production bonus. Applications in writing (no interviews), stating date of birth, full details of qualifications and experience (including a list in chronological order of posts held), and quoting reference No. Q.4006XS, should be addressed to the Ministry of Labour and National Service Appointments Department, Sardinia Street, Kingsway, London, W.C.2. 1198

APPPLICATIONS are invited for the position of Shift Charge Engineer at 2 large North-West industrial power station working in conjunction with the "Grid." Candidates must have had a good practical and technical training in electrical and mechanical engineering, and experience in the operation of water tube boiler and turbo-alternator plants. Applications, stating age and giving full particulars of experience and training, accompanied by not more than three testimonials, to be sent to—Box 1201, c/o The Electrical Review.

ASSISTANT Chief Electrical Engineer required in the near future by leading electrical porcelain manufacturers. Experience in high voltage insulation work essential, and applicant should be capable of dealing with research and design problems associated with tenders and manufacture of the company's products. Age 35/40 years. Applications should give full details of training and experience, also salary expected, but will not be considered if not complying with above requirements.—Box 1195, c/o The Electrical Review.

CHIEF Maintenance Engineer required by N.W. London firm. Previous supervisory experience in maintenance of machine tools, boilers, presses and electrical plant essential. Post-war prospects. Salary £500 p.a. plus 40 per cent. bonus. Applications in writing (no interviews), stating date of birth, full details of qualifications and experience (including a list in chronological order of posts held), and quoting reference No. Q.S.489, should be addressed to the Ministry of Labour and National Service Appointments Department, Sardinia Street, Kingsway, London, W.C.2. 1196

CONTROL Engineer required to operate modern E.H.T. board and D.C. switchboard at generating station in Home Counties, N.J.I.C. rate 2s. 44d. per hour. State experience, age, married or single, to—Box 1216, c/o The Electrical Review.

CROMPTON Parkinson Limited have completed their plans for the maximum production and distribution of an extensive range of electrical products both at home and overseas in the post-war period. They wish to have available for consideration a comprehensive list of potential Sales Managers and Sales Engineers. The list will include employees at present serving with H.M. Forces, men still in the organisation, and suitably qualified men not previously employed by the company. These last may at present be employed elsewhere or in the Forces, but applications would be welcomed setting out fully details of qualifications, experience and outlook. Some of the products to be dealt with are electric motors of all types, switchgear, transformers, cable, lamps, electric vehicles, electric trucks and accumulators. All correspondence, which will be treated in the strictest confidence, should be addressed to—The Chief Personnel Officer, Crompton Parkinson Ltd., Electra House, Victoria Embankment, London, W.C.2. 941

LECTURER in Radio, to assist in the training of Naval Radio Mechanics. The candidate must have had a good education in electricity or physics and have a satisfactory knowledge of radio theory and practice. Salary £350 p.a.—Electrical Department, Robert Gordon's Technical College, Aberdeen. 1187

OVERSEAS Employment. Temporary Technical Advisers (Electrical) (Foreign Service) required by the Admiralty for three years or duration of hostilities in the Far East, whichever is the shorter. Commencing salary £250-£400 per annum, according to age, qualifications and experience (plus Civil Service war bonus), and in addition foreign service allowance appropriate to station is payable from date of taking up duty overseas. Qualifications: Good education, with knowledge of electricity and ability to direct work from drawings and diagrams of electro-mechanical assemblies, relays, radio apparatus, etc. Selected applicants will undergo a short period of training in this country, during which officers necessarily maintaining dependants other than at the duty station will be granted billeting terms or subsistence allowance. Written applications, quoting reference No. O.S.390 (no interviews), giving the following essential details: (1) Full name; (2) Date of birth; (3) National Service registration number; (4) Local office shown on address side of Registration Card, N.S.2; (5) Medical grade, if known; (6) If discharged from the Forces, particulars of service number, rank, unit and reasons for discharge; (7) Industrial training and experience; (8) Name and address of present employers; (9) Details of present work, should be sent to the Ministry of Labour and National Service Appointments Department, Sardinia Street, Kingsway, London, W.C.2. Applications will not be acknowledged. 1204

SALES Manager with technical background required for electronics and electrical equipment section of well-known radio and electrical manufacturing concern. Good salary and prospects for the man with the right experience and ability. Write full details in confidence to—Box 1199, c/o The Electrical Review.

REPRESENTATIVE. Well-known London paint and varnish manufacturers require experienced Representative with some technical knowledge of manufacturing methods of electrical industry. Reside Greater London but be prepared travel as required in U.K. Salary and expenses with life insurance, pension and bonus schemes. Write fully, stating education, experience and remuneration required, etc., to—"C. C.", c/o Streets, 110, Old Broad Street, E.C.2. 1183

SECOND Distribution Technical Assistant, West Midlands Joint Electricity Authority. Candidates should preferably possess a university degree and/or be graduates of the I.E.E. They should have had a good works training with an electrical engineering firm of repute. Salary £383 p.a., in accordance with Class G, Grade 8a, of the N.J.B. Schedule. The appointment will be subject to the Local Government Superannuation Act, 1937, and a satisfactory medical report. Applicants should write, quoting D.1021XA, to the Ministry of Labour and National Service, Central Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary form, which should be returned completed on or before 13th January, 1945. 1197

STORES Clerk required by electrical wholesalers. Good knowledge of electrical material essential. Apply—London Electrical Company, 92, Blackfriars Rd., S.E.1. 25

TEMPORARY Junior Mains Engineer, County Borough of Ipswich. Candidates should have had recent experience in overhead and underground mains distribution. Salary in accordance with the N.J.B. Schedule, Grade 10a, Class G, rising on merit to Grade 9, Class G, commencing salary to be agreed on the basis of age and experience of applicant. Applicants should write, quoting D.1029XA, to the Ministry of Labour and National Service, Central Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 18th January, 1945. 1203

WANTED, three Electrical Representatives (2 for Midlands and 1 for Lancashire and Northern territory). Young, keen men with fair technical knowledge and with good connections among electric supply authorities, large industrial users, factors and the trade generally. Products are wires and cables principally, but other lines would be added. Excellent prospects for real workers. Apply, giving experience in detail, with references, to—Box 1192, c/o The Electrical Review.

APPOINTMENTS FILLED

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

SITUATIONS WANTED

AM.I.E.E., A.M.I.Mech.E., seeks interesting spare time work, Central or West London area.—Box 6605, c/o The Electrical Review.

AM.I.E.E., with hydro generation, distrib., installation and contract engineering experience, works trained, free shortly, seeks progressive post with supply authorities, consultants or mfrs.—Box 6590, c/o The Electrical Review.

CABLE Makers, home or colonies. Have you a Scientific Control Centre in your works? If not, your sales, design, production, inspection, research and installation organisations lack cohesion. Your firm depends on being up to date, so employ me to correct this deficiency, as I have had years of experience, technical and practical, in the cable industry, dealing with paper, cambric, rubber and thermoplastic insulated cables.—Box 6597, c/o The Electrical Review.

COMPANY Director of electrical wholesale firm seeks change in London district. Good organising abilities.—Box 6607, c/o The Electrical Review.

ELECTRIC Cable Works Executive desires change (post-control), management, engineering, production, existing or projected plant, home or abroad.—Box 6598, c/o The Electrical Review.

ELECTRICAL Engineer, A.M.I.E.E., desires post as Works Engineer, 25 years' experience, maintenance, construction, electrical and mechanical, age 44, exempt.—Box 6603, c/o The Electrical Review.

ELECTRICAL/Mechanical Engineer, sound commercial background, experienced on rural and similar development, H.T. and L.T. distribution, electrical installation and factory maintenance, desires position with scope in post-war period. Preferably with rural supply authority where initiative and experience will be utilised and appreciated.—Box 6601, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer desires to contact small manufacturer with view to producing his designs (domestic apparatus), which should have large demand in post-war period.—Box 6602, c/o The Electrical Review.

LAMPS, Electric Fittings, Technical Sales Engineer, with strong connection electrical trade, industrial, commercial, etc., high sales record, Warwickshire, desires to represent leading manufacturers, possibly with view to opening branch depot in Coventry, now or post-war.—Box 6579, c/o The Electrical Review.

SUPERVISING Electrical Engineer (33), last 8 years as executive, planning, installation and maintenance large industrial plants, heavy current A.C. and D.C. equipment, electro-chemical and metallurgical, pyrometry, automatic controls. B.Sc., A.M.I.E.E. Available month's notice.—Box 6600, c/o The Electrical Review.

WIRE Mill Foreman requires situation. Thorough knowledge resistance wires of all descriptions, including Ni-Cr, Ni-Cu, Ni, Al, phosphor bronzes, etc., in down to .002", also strip; all types of annealing; experienced in upkeep of diamond and synthetic dies; free shortly, highest references available. Write—Box 544, c/o Pool's, Aldwych House, London, W.C.2. 1208

YOUNG Electrical Engineer, Higher National Certificate, exempt military service, with 6 years' varied experience, requires progressive position, preferably with consultant.—Atkinson, 35 Marcus Rd., Balham, S.W.17. 6604

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

GEORGE COHEN, SONS & CO. LTD.

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One	12,000 lbs. ..	175 lbs. ..
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One	12,000 lbs. ..	160 lbs. ..
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GUARANTEED HEAT GENERATORS.

OLDHAM WORKS, OLDHAM TERRACE,

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LEC. APPARATUS. DULL EMITTER SYSTEM.

59

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G-POWER UNITS

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3-kVA

Self-cont., Semi-portable Petrol Alternating Sets.

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Semi-portable Petrol Welding Sets, A.C. or D.C.

30-kVA

Petr./Paraff. Alternat. Set, dir. coupl., lightweight.

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Petr./Paraff. Altern. Set, rad. cool., semi-port.

Several others.

Any "Special Duty" Machinery supplied to your requirements at short notice.

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REBUILT MOTORS AND GENERATORS

LONG deliveries can often be avoided by purchasing rebuilt secondhand plant. We can redesign or replace surplus plant of any size.

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ELECTRIC MOTORS AND DYNAMOS

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

For Sale or Hire. Send your enquiries to:—

BRITANNIA MANUFACTURING CO. LTD.,

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CITY ROAD, LONDON, N.1.

Telephone: 5512-3 Clerkenwell.

13

ARC WELDING MACHINES FROM STOCK

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

MAX-ARC WELDERS LTD.,

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35

ECONOMISERS IN STOCK

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

BURFORD, TAYLOR & CO. LTD.,

7, Commercial Street, Middlesbrough. Telephone 2622.

65

A.C. Motors, 1/50th h.p. to 3 h.p., from stock, for essential work only.—The Johnson Engineering Co., 5, Spencer Street, Leamington Spa.

57

MAN POWER IS MULTIPLIED

by the installation of

MORGAN ELECTRIC LIFTING BLOCKS.

All capacities A.C. and D.C. Supply.
Delivery from 2-3 days.

MORGAN LIFTWAYS & POWERWAYS,
50, WILKIN STREET, N.W.5.
Gul. 1147.

47

A Booster Set by Metropolitan Vickers, comprising shunt-wound Motor, 4.5 b.h.p., 220 volts, 1,250 r.p.m., 18.2 amps., direct coupled to shunt-wound D.C. Generator, 100 volts, 1,250 r.p.m., 26 amps. The above are mounted on a heavy cast iron base. Starter for motor by Brookhirst. Shunt regulator by Metropolitan Vickers. May be inspected by appointment.—The National Institute for Research in Dairying, Shinfield, nr. Reading. 1214

A large stock of surplus Fibre, Carbon Rods, Ebonite, A.I.D. Turnbuckles, etc., also Searchlights (sale or hire), Mirrors, Lenses; also Winches of our well-known self-sustaining types. Hundreds of thousands supplied during the last 40 years to Govt. depts., corporations and traders.—London Electric Firm, Croydon. 42

A lead Storage Battery. Number of cells 115, in glass boxes. Rated at 18 amps. for 10 hours, complete with conductors and insulators. Radial end cell switch, automatic cut-in and cut-out. By Record Electric Co. May be inspected by appointment.—The National Institute for Research in Dairying, Shinfield, nr. Reading. 1213

A.C. and D.C. House Service Meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one year. Repairs and recalibrations.—The Victoria Electrical Co., 47, Battersea High Street, S.W.11. Tel. Battersea 0780. 19

ALTERNATOR, 500 kVA, 3-p., 50 c., 400/440 v., 750 revs., direct coupled exciter, 2 brgs., on bedplate.—Stewart Thomson & Sons, Fort Road, Seaford, Liverpool, 21. 58

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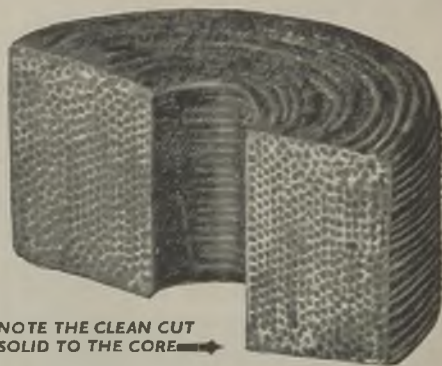
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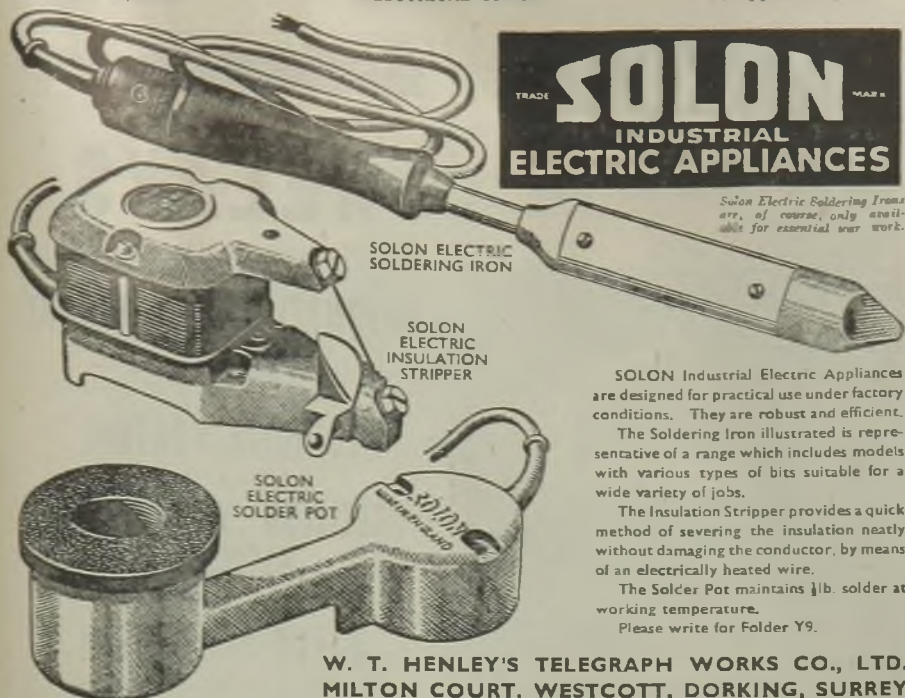
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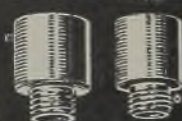


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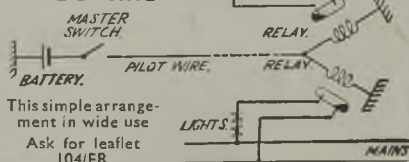
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