

# ELECTRICAL REVIEW

OL. CXXXIX.

NOVEMBER 15, 1946

NO. 3599



Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2



"BIG BEN" is always up to the minute, never falling a step behind or getting one in front. Unlike Big Ben, we at SANDERS-WEDNESBURY endeavour to be always a step in front. but the abnormal conditions of today unfortunately will not permit us to keep pace with the demand for our products. Shortage of supplies, restrictions, etc., are gradually being overcome—meantime, modifications to existing ranges and entirely new designs are being planned to keep Sanders switchgear, fusegear, sockets, plugs, etc., "up to the minute."

WM. SANDERS & CO. (WEDNESBURY) LTD., WEDNESBURY, STAFFS.

# WHO'S *been looking through my eyes?*



As a Builder of homes for the people it's my job to ensure efficient equipment for the occupants—for example, an ever-ready supply of hot water. The Heatrae people must have "looked through my eyes" when they produced their 1½ gal. automatically-controlled Electric Water Heater for kitchen sinks.

It is the ideal type to ensure "Bouquets for Builders" from grateful housewives.

## HEATRAE

**leaders in electric water heaters**

HEATRAE LTD., NORWICH

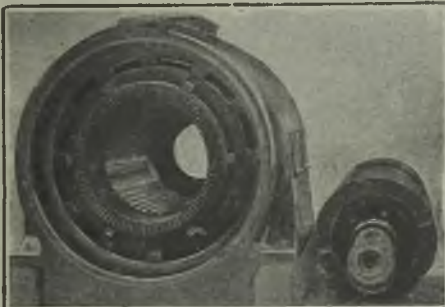
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**The WESTMINSTER ENG. Co. Ltd.**

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**1500 kVA Turbo Generator Stator and Rotor Entirely Rewound**

**Makers of Electric Welding Machines  
Photo Printing and Process Arc Lamps  
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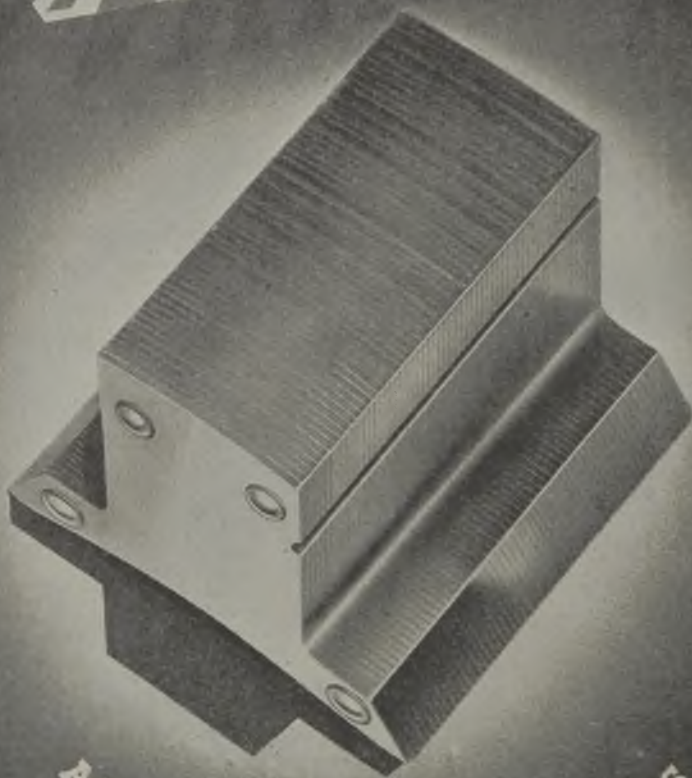
Makers of all types of repetition products from the bar in all metals



**M-C-L AND REPETITION LTD**  
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AND ELECTRICAL SHEETS

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# *'English Electric'*

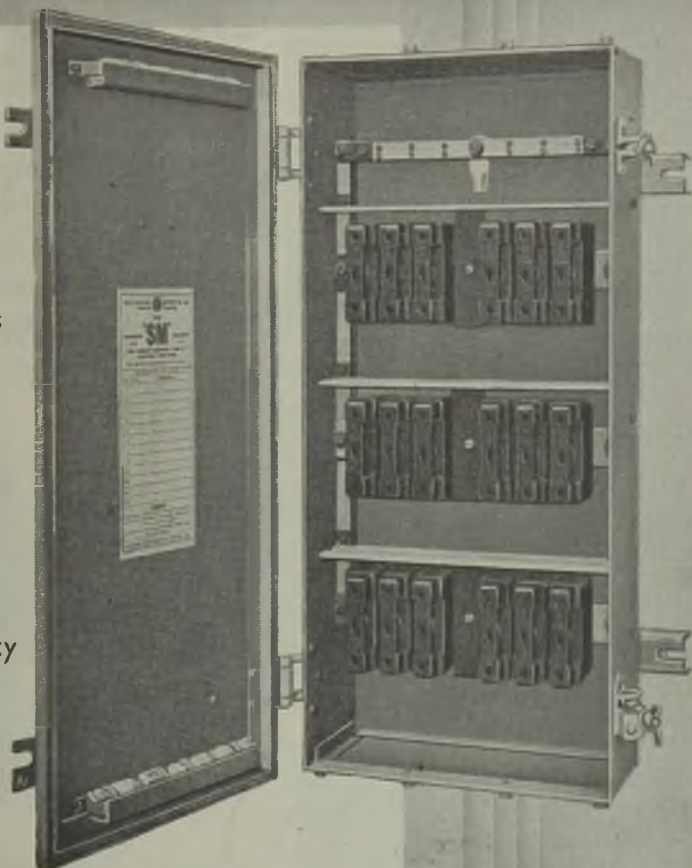
## DISTRIBUTION FUSEBOARDS TYPE 'SM'



30 and 60  
Amps Rating  
Available  
up to 12 Ways

Rapid cabling  
facilities

Incorporating  
H.R.C. Fuses  
Category of duty  
440 A.C. 4



WRITE FOR PUBLICATION No. FG. 112

**THE ENGLISH ELECTRIC COMPANY LIMITED**

London Office : QUEEN'S HOUSE, KINGSWAY, LONDON, W.C.2

**FUSEGEAR WORKS - - - STAFFORD**



***NO* damage  
IN TRANSIT-**

of Cables travelling through "Walsall" Conduit. They arrive at the other end in the same condition as when they start — unruffled and not frayed.

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**Walsall**

**WALSALL CONDUITS LTD · WEST BROMWICH · STAFFS**

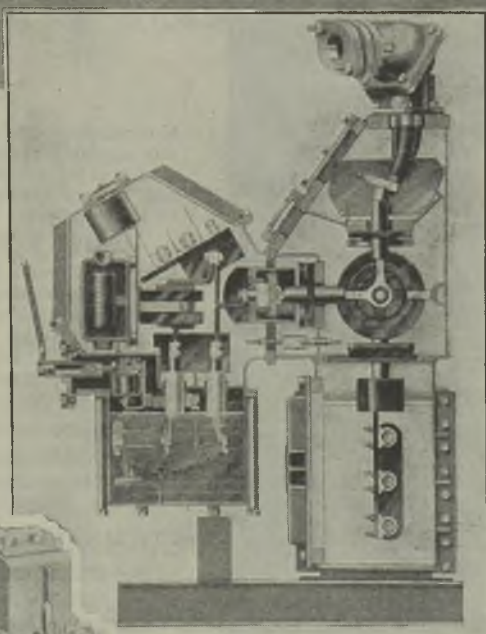
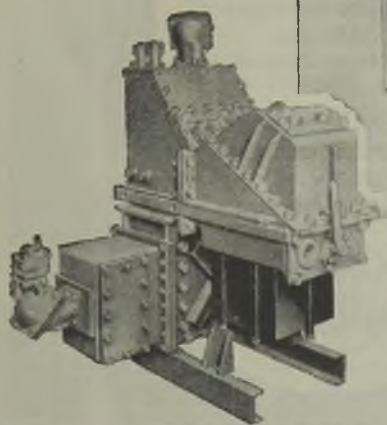




# FLAMEPROOF SWITCHGEAR

**CLASS  
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**25 MVA.  
3.3 kV.**



*Complies fully  
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Groups 1 and 2

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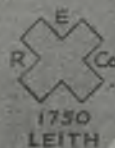
## BRITISH ROPES LIMITED

Head Office: Doncaster.

Offices, Works and Stores throughout Great Britain.



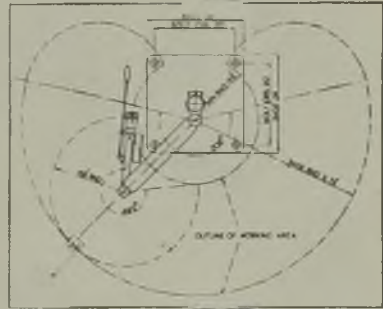
**AJAX**  
(RCD)  
BRAND







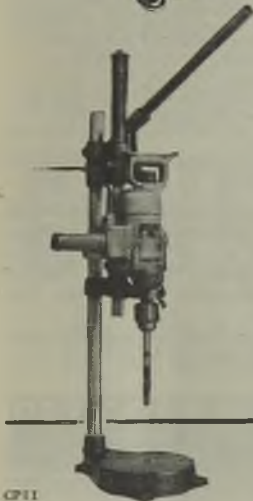
WHAT  
LONG ARMS  
YOU'VE GOT...



All the better, if we may paraphrase, to do your drilling with! The  $\Phi$  Jack-Knife Radial Arm shows yet another application of the unique day-in, day-out reliability of  $\Phi$  Universal Electric Tools as applied to work normally requiring an expensive radial drill. And the arm does more than reach out to the useful range of 42 inches . . . it resists the torque of the tool . . . carries all radial and thrust loads on enclosed type tape-roller bearings . . . is adjustable for height . . . and is extremely sensitive in operation. A  $\Phi$  Bench Drill Stand as illustrated will widen the scope of usefulness of any Universal Drill but whether "hand-held," stand, or radial-arm mounted,  $\Phi$  Universal Electric Tools meet efficiently and economically the needs of modern industry.



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ROCK DRILLS    DIAMOND DRILLS    OIL WELL TOOLS



# THE BEST WORK DEMANDS THE BEST LIGHT



## THE D & G GIRDER FITTINGS

- Gives Concentration of Light on the JOB.
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ONE—450 H.P. RECONDITIONED PROTECTED TYPE SLIP RING MOTOR, by "B.T.H.", 400 volts, 3 phase, 50 cycles, 480 r.p.m., fitted with three pedestal type bearings; motor mounted on cast iron baseplate. Complete with Liquid Rotor Starter and Switch Cubicle containing triple-pole oil circuit breaker.

ONE—200 H.P. RECONDITIONED TOTALLY ENCLOSED FAN COOLED SLIP RING MOTOR, by E.E.C., 400/440 volts, 3 phase, 50 cycles, 725 r.p.m.; fitted with ball bearings and having third outer pedestal roller bearing; motor mounted on fabricated baseplate. Complete with "Ellison" Oil Immersed Rotor Starter and "Ferguson Pailin" Oil Immersed Circuit breaker.

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ONE—200 H.P. RECONDITIONED OPEN TYPE SHUNT INTERPOLE MOTOR, by "Bruce Peebles," 440 volts D.C., 635 r.p.m.; fitted with three pedestal type ring oil bearings; motor mounted on cast iron baseplate.

ONE—114 H.P. RECONDITIONED PROTECTED TYPE SHUNT INTERPOLE MOTOR, by "Mavor & Coulson," 500 volts D.C., 750 r.p.m.; fitted with two end shield ring oil bearings.

ONE—110 H.P. RECONDITIONED DRIP PROOF WOUND MOTOR, by "B.T.H.," 500 volts D.C., 740 r.p.m.; fitted with two endshield ring oil bearings.

## Diesel Alternator Sets

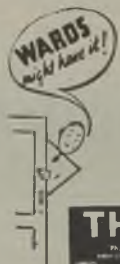
ONE—200 k.w. DIRECT-COUPLED DIESEL DRIVEN ALTERNATING SET, comprising 300 b.h.p. "Williams & Robinson" 4-cylinder Vertical Blast-Injection Diesel Engine direct coupled to 250 k.v.a. "Brush" 0.8 p.f. Alternator, 3,300 volts, 3 phase, 50 cycles; together with Step-down Transformer, 3,300 volts/440 volts, 3 phase, 50 cycles. Engine rebuilt by makers in 1945.

ONE—35 kVA DIRECT-COUPLED DIESEL DRIVEN ALTERNATING SET, comprising 45 b.h.p. 4-cylinder Vertical Cold-Starting Diesel Engine, by "Ruston & Hornsby," direct coupled to 35 kVA Alternator by "W. H. Allen," 440 volts, 3 phase, 50 cycles.

## Welding Equipment

ONE—MODERN 60 kVA "Metro-Vick" Flash Butt Welder, suitable for welding solid steel sections from 2 to 3.5 sq. in. Input 400/440 volts, 3 phase, 50 cycles.

Further particulars and prices on application



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**THOS W. WARD LTD**  
ALBION WORKS - SHEFFIELD  
The Symbol of **TWW** Reliability

# ADAPTABILITY

Adaptability and ease of fitting are two of the outstanding features of the Consumer's Service Unit. The supply intake, main switch and consumer's fuse chambers are in one compact assembly and can be arranged to suit all conditions; this also makes the work of supply authorities and contractors much easier by eliminating a diversity of apparatus and tortuous wiring. Full details are contained in our publication No. 204B.



## CONSUMER'S *Service Unit*



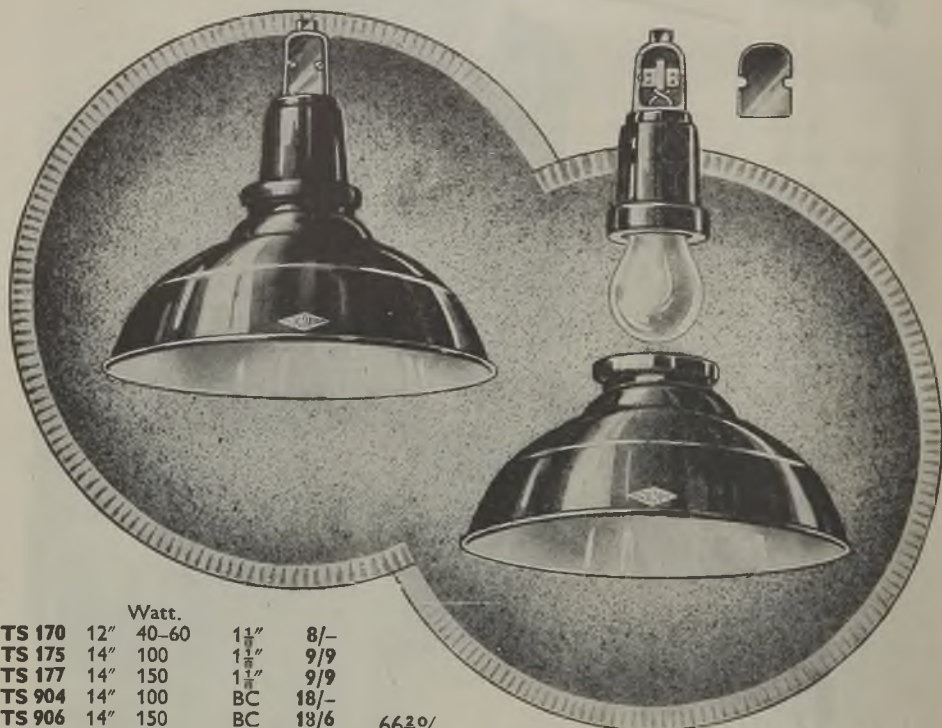
**BRITISH INSULATED CALLENDER'S CABLES LIMITED**

NORFOLK HOUSE, NORFOLK STREET, LONDON W.C.2



# THORLUX OVERLAMP REFLECTORS FOR GAS FILLED LAMPS

FOR EASY MAINTENANCE—THE BEST.



		Watt.		
TS 170	12"	40-60	11 <sup>1</sup> / <sub>8</sub> "	8/-
TS 175	14"	100	11 <sup>1</sup> / <sub>8</sub> "	9/9
TS 177	14"	150	11 <sup>1</sup> / <sub>8</sub> "	9/9
TS 904	14"	100	BC	18/-
TS 906	14"	150	BC	18/6
TS 908	14"	150	ES	19/9
TS 910	16"	200	ES	21/6
TS 912	18"	300	G	30/6
TS 914	18"	500	G	33/-
TS 916	20"	750/1000	G	38/6

66<sup>2</sup>/<sub>3</sub>%  
Advance.

**SLIP-IT-ON.  
SLIP-IT-OFF.  
OVER THE LAMP  
FOR CLEANING.**

## Thorlux Overlamp Maintenance Scheme.

Have one spare clean reflector. Remove dirty one (lift, turn, and it's off). Replace with clean one. Repeat over whole installation.

## Thorlux Wiring Box.

Remove Lid, connect Mains and Earth,  
Replace Lid—**Job's done** (The Wireman's Friend).

**A SUCCESSFUL & MOST POPULAR HIGH QUALITY REFLECTOR, IN LARGE DEMAND BY GOVERNMENT DEPTS., LARGE & SMALL INDUSTRIAL PLANTS.**

SAMPLES—With Pleasure.

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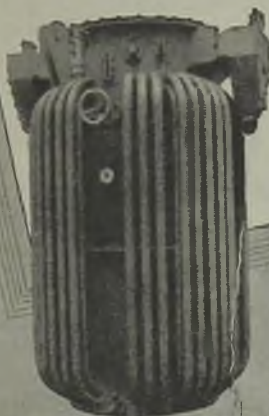
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**FERRANTI** Moving Coil Voltage Regulators will simplify the control of your industrial processes. Is your problem in this list or is it new?

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in its black moulded plastic cabinet. The design of the cabinet, the design and manufacture of the moulds and the production of the mouldings were all entrusted to . . . . .

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Manufactured under the strictest laboratory supervision throughout and finished to perfection, they are of the finest quality obtainable.

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"EDISWAN"  
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### ELECTRIC SOLDERING IRONS (4 MODELS)

INSTRUMENT • WIRELESS • UNIVERSAL  
GENERAL PURPOSE

FOR VOLTAGES FROM 6—250

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HIGH QUALITY

3 MODELS  
FROM STOCK  
FOR  
ANY VOLTAGE  
OVER  
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**JOHNSON & PHILLIPS**

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Shakespeare's voice and Nelson's hand.

Milton's faith and Wordsworth's trust, in this  
our chosen, chainless land.

Bear us witness: come the world  
against her,

England yet shall stand.

*Swinburne.*



## R · E · A · L

*Issued by Rowlands Electrical Accessories Ltd.  
Birmingham England*





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A NEW LINE  
*by*



**CIRCUIT-BREAKERS  
FOR  
RANGE 5 SWITCHGEAR  
UP TO 250 MVA AT 11kV**

**HEBBURN-ON-TYNE ENGLAND**

*Personally presented by Mr. Hawkins***Hawkins***Electric Products*

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Here are examples of what quantity production and new manufacturing methods achieve for the famous Hawkins Supreme Products.

**New Aluminium Kettle**, 4 pint—1250 watt immersion element. Cat. No. LGH 700.

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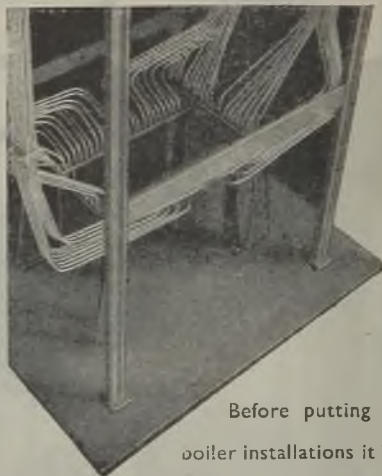
**New Electric Fan**, adjustable for desk, table or wall bracket—guard and blades beautifully finished in cream with the stand in either red or green. Cat. No. LGH 920.

Prices on application

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## Power pre-view



Before putting in large boiler installations it is a good thing to be able to see the job 'in the round' so that site problems can be smoothed out at the start and construction speeded up. That is why, in addition to good design, good fabrication and adequate construction drawings, International Combustion Ltd. frequently provide scale models of their boiler installations. It is an extra service which is much appreciated.

The Technical Staff of International Combustion are always ready to bring their exceptional experience to any steam-raising problem.



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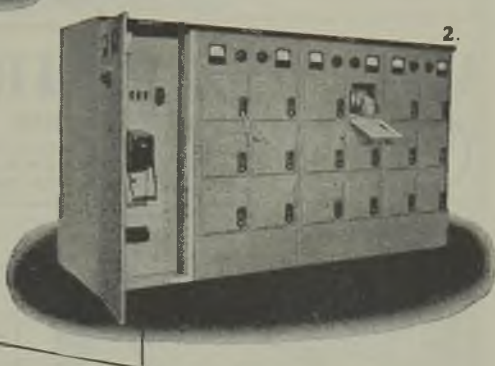
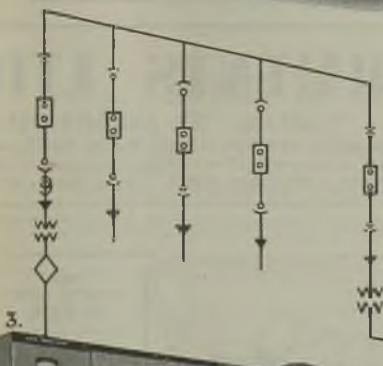
NINETEEN WOBURN PLACE W.C.1 WORKS: DERBY

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1. Vertical Draw-out Switchgear  
6.6 kV, 250 MVA for Intake.



WORKS Engineers facing the problem of Electrical Extensions or modernization of Switchgear should write for PUB. NO. B. 285.



2. 400 Volt A.C. Distributor board with 18 Fuse-Switch Circuits.

3. 440/220 Volts D.C. Distribution board supplied from rectifier fitted with 15 Fuse-Switch Circuits.

**SPECIFY**

**BRUSH**

8/89

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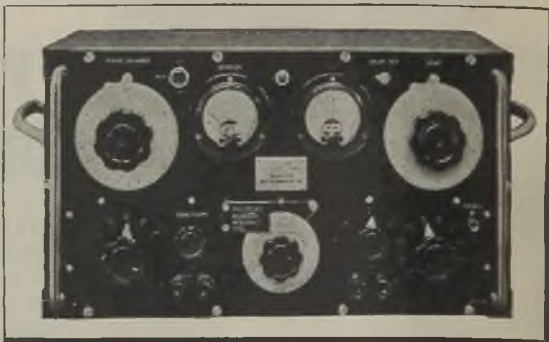


From its unique range of Communications Test Gear  
**MARCONI INSTRUMENTS LTD** can now offer the  
**UNIVERSAL IMPEDANCE BRIDGE**  
**TYPE TF 373D**

**FOR IMMEDIATE DELIVERY**

Designed for the direct measurement of inductance, capacitance and resistance over exceptionally wide ranges, the instrument is a product of Marconi pioneer experience in radio engineering.

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WORKS: ENFIELD, MIDDLESEX  E.R.44



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"Why does this happen to me?  
 This iron has gone cold on me, see!  
 Stuck fast, good and tight!  
 Fixed hard with FLUXITE  
 I'll be sunk if we don't get it free."

For all **SOLDERING** work—you need **FLUXITE**—the paste flux—with which even dirty metals are soldered and "tinned." For the jointing of lead—without solder and the "running" of white metal bearings—without "tinning" the bearing. It is suitable for **ALL METALS**—excepting **ALUMINIUM**—and can be used with safety on **ELECTRICAL** and other sensitive apparatus.

With **FLUXITE** joints can be "wiped" successfully that are impossible by any other method.

Used for over 30 years in Government works and by leading Engineers and Manufacturers. OF **ALL IRONMONGERS** in tins—10d., 1/6 and 3/-. The "FLUXITE GUN" puts **FLUXITE** where you want it by a simple pressure. Price 1/6 or filled 2/6

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## SIMPLIFIES ALL SOLDERING

Write for Leaflets on Case-Hardening Steel and Tempering Tools with **FLUXITE**, also on "Wiped" Joints. Price 1d. each. **FLUXITE LTD.** (Dept. R.E.), Barmsey 24, S.E.1



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In the late eighteenth century the physicists of the world were pursuing a new quarry — applied electricity. The science was emerging from the laboratory and approaching the factory. These years saw the foundation of a firm which has played a great part in the history of the electrical industry—Thomas Bolton. They have co-operated with manufacturers from the days of teething troubles until the present moment. They will continue to co-operate with this as with other great industries.

ESTABLISHED 1783

THOMAS

**BOLTON**

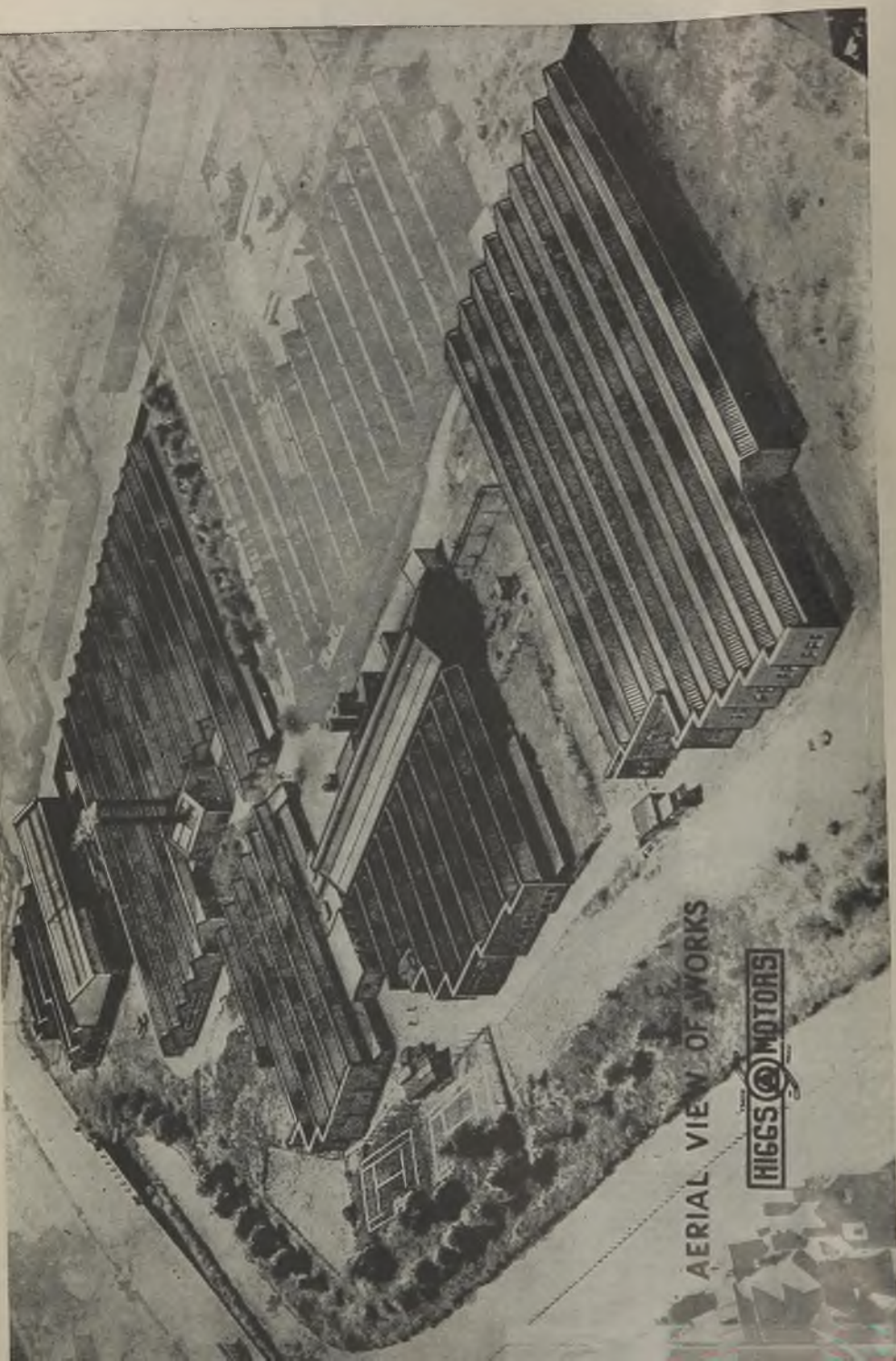
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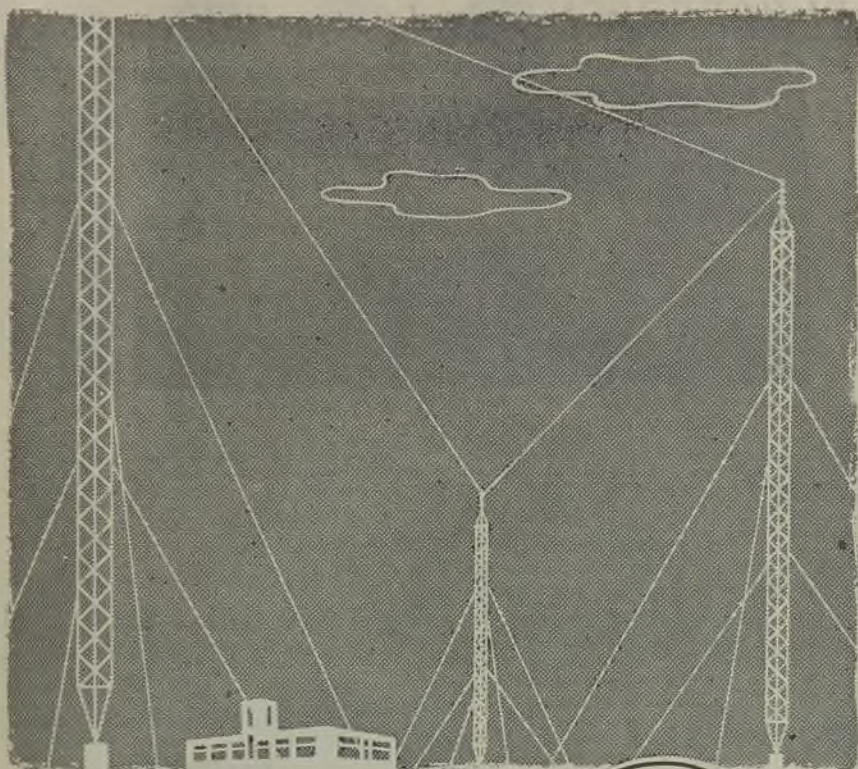
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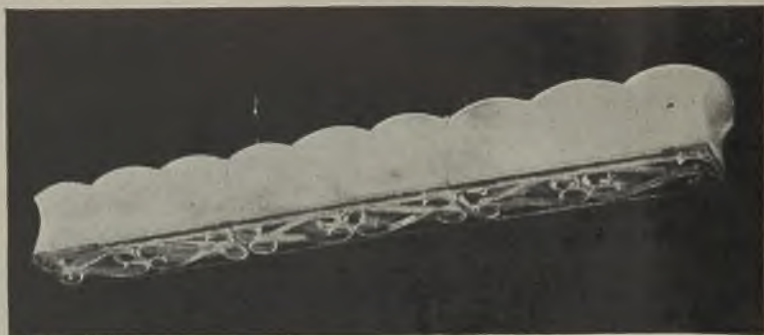
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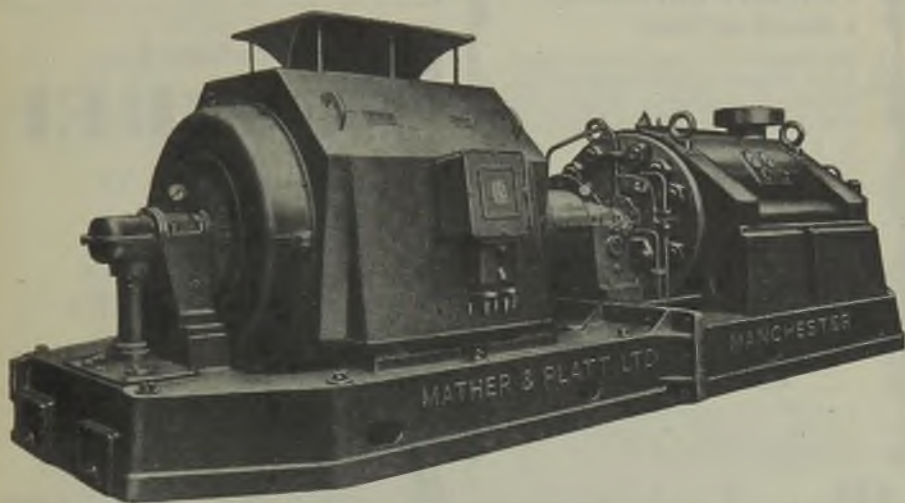
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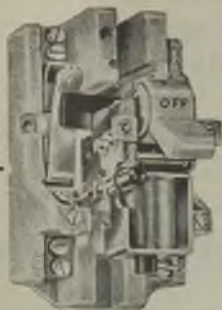
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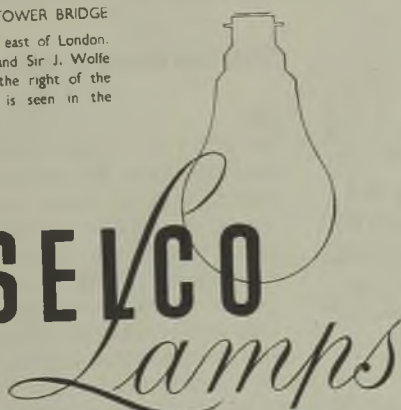


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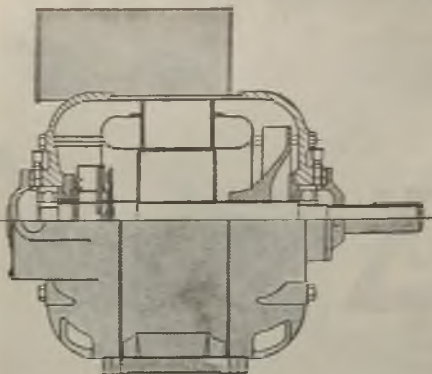
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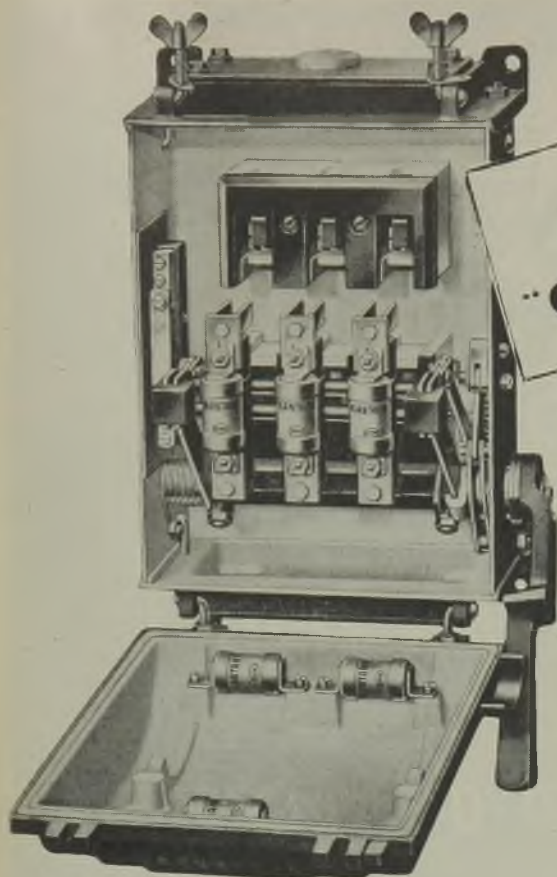
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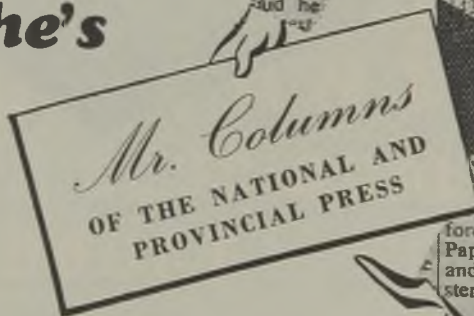


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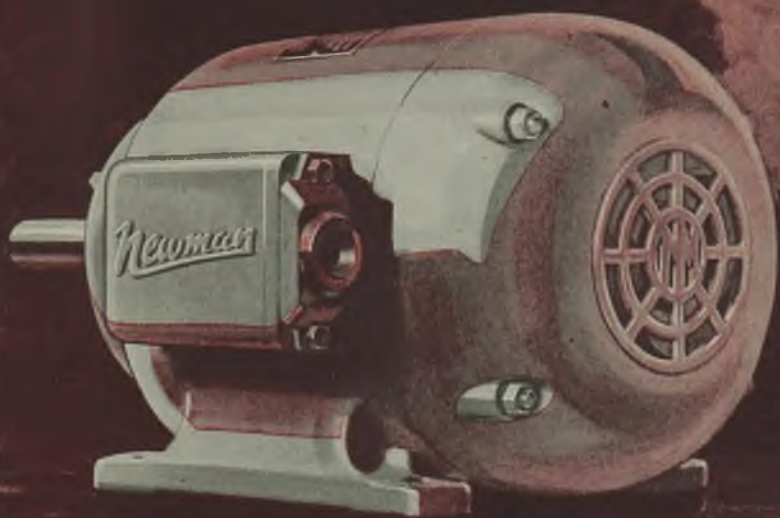
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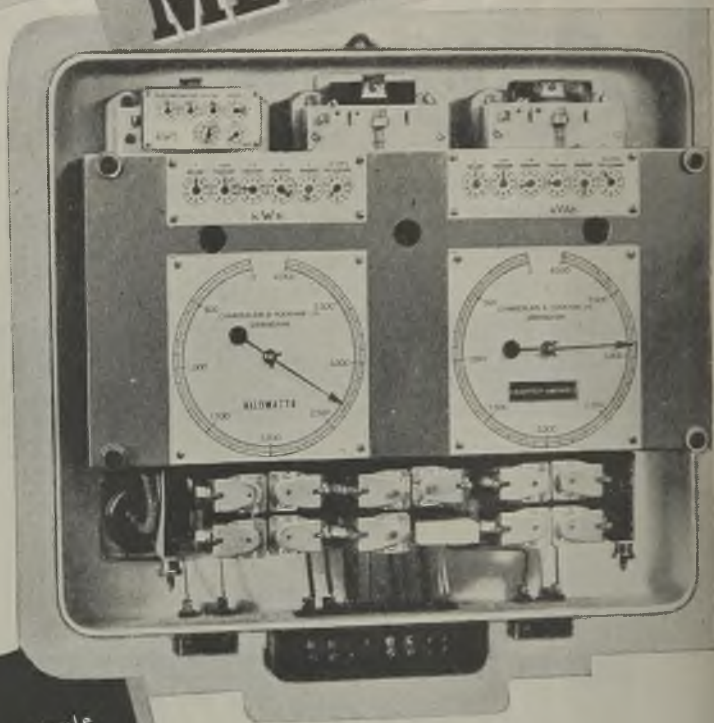
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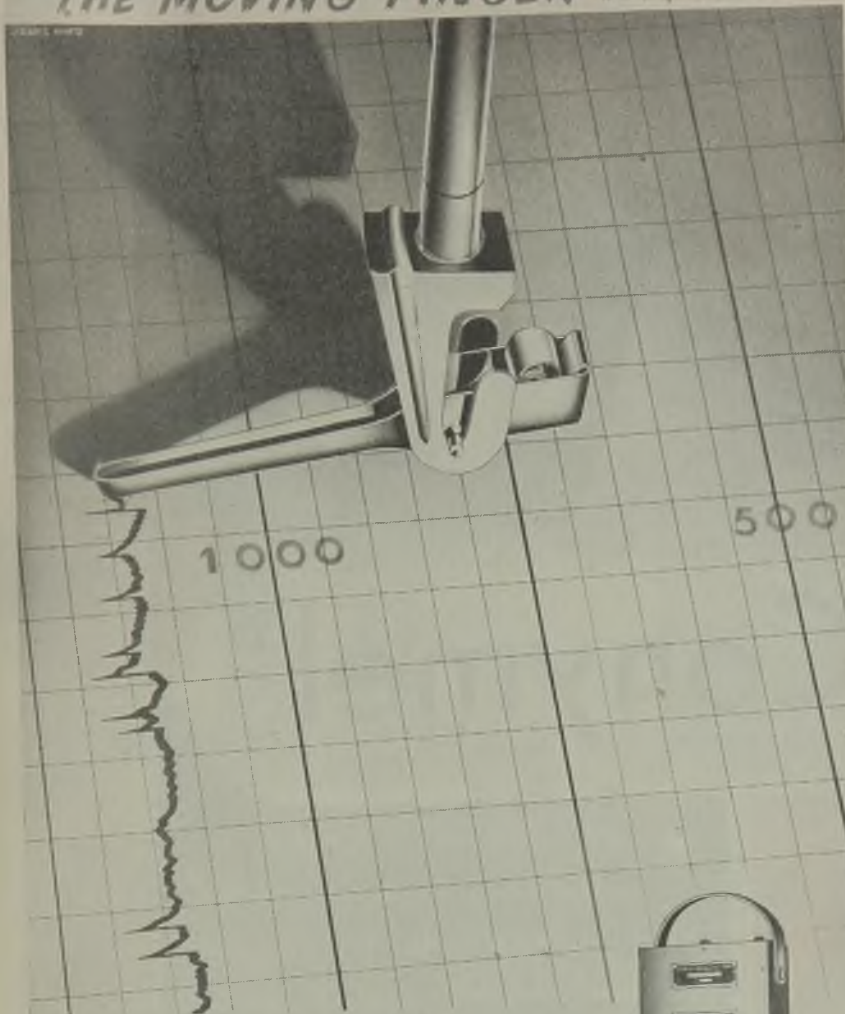
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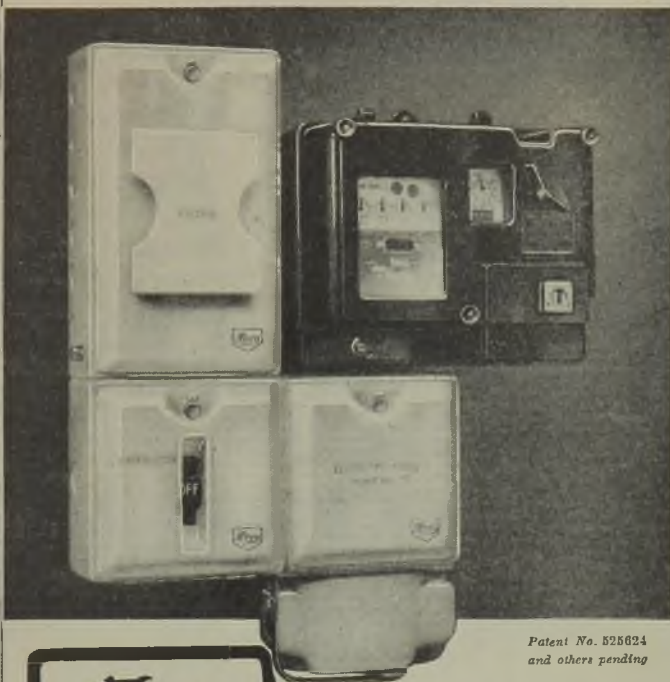
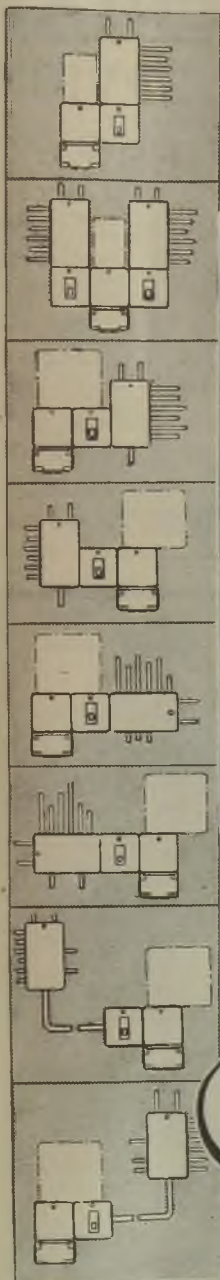
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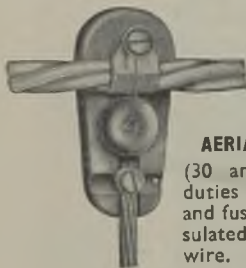
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# ELECTRICAL REVIEW

November 15, 1946

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C. O. Brettelle, M.I.E.E. J. H. Cosens

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**EDITORIAL, ADVERTISING & PUBLISHING OFFICES :** Dorset House, Stamford St., London, S.E.1

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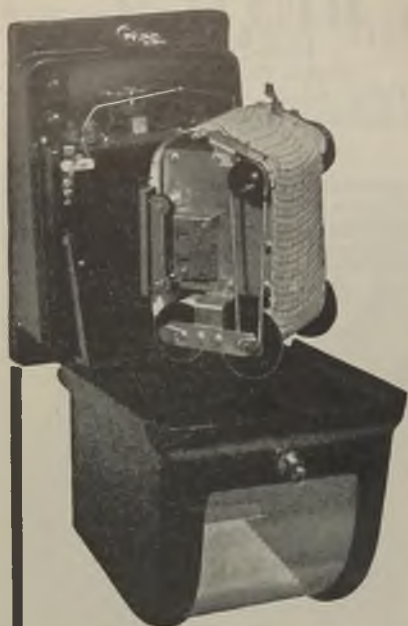
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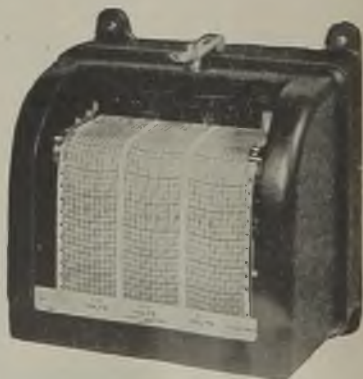
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# ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIX. No. 3599.

NOVEMBER 15, 1946

9d. WEEKLY

## Circuit Breaking

Views of British Switchgear Makers

**L**AST week's well attended meeting at the Institution of Electrical Engineers testified to the interest taken in the development of high-voltage switchgear since papers on the subject were presented in a double bill two and a half years ago. Investigations into the application of resistance switching to air-blast breakers then described by Messrs. H. E. Cox and T. W. Wilcox have been transferred to oil breakers in their present paper. In the other paper Messrs. A. Allan and D. F. Amer are chiefly concerned with aerodynamic problems linked with successful air-blast operation at 66 and 132 kV; it was in effect a follow-up of the earlier paper by authors on the staff of the same manufacturing concern, who dealt with the influence of rate of rise of restriking voltage on both oil and air-blast designs, with especial reference to MVA rating. All the authors are members of manufacturing concerns which have long established international reputations in regard to the first type and are among the five which are now producing air-blast breakers as the result of many years of intensive research.

### Non-Odious Comparisons

There was, therefore, no question of any intent to provide a ground for debate on the relative merits of the two systems, as the President pointed out. Nevertheless, it was almost inevitable that the subsequent discussion should turn very much on a by no means odious comparison. There was nothing to complain of in this, as it enabled users and their consultants to

make pertinent criticisms based on operating experience and conveyed an idea of the extent to which progress has been healthily stimulated as a result of technical competition between the two types.

Making full allowance for conservatism, the continued faith shown in the technical merits of oil as an arc quencher can be regarded as warranted by the reliability record of British switchgear. The expression "bogey" was freely used during the discussion in regard to risks of explosion and fires—reasonably so since, on any statistical basis, the risk has proved to be very small—again with British designs.

### Air-Blast Auxiliaries

No doubt the scales are weighted against the air-blast system by some lingering mistrust (due to caution rather than to prejudice) regarding the dependability of extraneous and relatively complicated non-electrical auxiliaries required for supplying compressed air. Any difficulties of this nature, however, are from the evidence offered merely teething troubles. A point of some importance that emerged was that unit testing of breakers of all kinds furnishes a quite satisfactory method of assessing performance, thus adding appreciably to the effective range of the A.S.T.A. proving stations.

As regards performance under operating conditions there appears to be little to choose between oil and air-break switchgear. Economics at present favour the former, although with the wiping off of development charges for the newer method, improvements in air-compression technique



and a reduction of current-transformer costs, capital expenditure may be expected to tend towards equality. Growth of electrical load will probably raise breaking capacities on the grid well above present maximum figures, in some cases in association with 264 kV, when the advantages may well lie with air-blast breakers. In any case it is clear that whatever design is required to suit future conditions, it can be produced of a quality that will easily maintain the high traditions of switchgear makers in this country.

**Nationaliza-  
tion  
Imminent** As was generally expected, the King's Speech at the opening of Parliament on Tuesday contained a reference to the

Government's proposal to bring the electricity supply industry under public ownership. We may therefore anticipate a Bill in the course of the next few months which will at last reveal the form which nationalization will take. While the necessity for such a measure may still be questionable, the fact remains that in the face of the Government's intention to proceed with it the industry must accept the principle and exercise what influence it can to ensure that the public will secure the best possible service and that existing undertakings shall be fairly treated.

**Frankenstein** NUMEROUS works of fiction have portrayed machines that developed life-like personalities not intended by their inventors. Such imagined monsters do not appeal to the sense of wonder more than do many modern automatic engineering devices. Indeed their powers appear primitive before those of the electronic automatic computing engine, developed in the mathematics division on the National Physical Laboratory, which can give answers to the most complex calculations and co-ordinate the results at a speed and with an accuracy that are far beyond what is humanly possible. The number of unknown quantities that can be tackled by this machine is said to be nearly a hundred.

**Misleading  
Metaphor** ATTRIBUTION of human qualities to mechanical devices may lead the unsuspecting astray. In a letter to *The Times*, Professor D. R. Hartree (who took "mechanical integra-

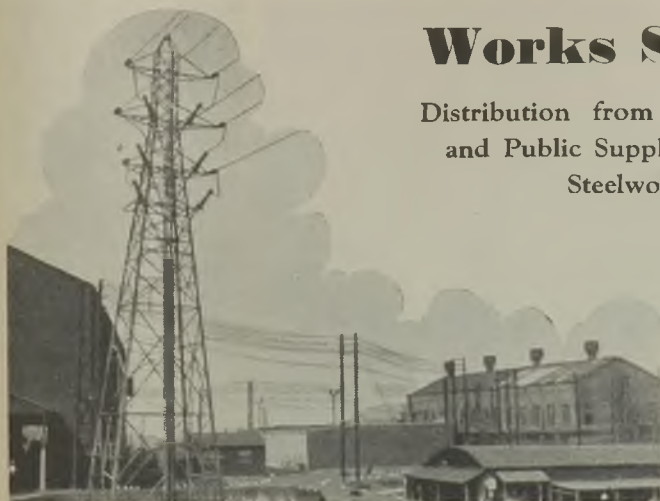
tion" as the subject of his Kelvin Lecture in 1943) deprecates the use of such expressions as "electronic brain" because they ascribe to the A.C.E. capabilities it does not possess. Professor G. W. O. Howe has spoken in similar vein. The use of the A.C.E. is, of course, no substitute for the thought entailed in organizing the computations. It eliminates brain-wearying tasks somewhat in the way that automatic machines in factories may call for a higher grade of labour in setting up, supervision and adjustment than in carrying out purely manual work of a physically tiring kind.

**Financial  
Assistance** SCARCITY of labour and materials is a common handicap to industry but the obtaining of the necessary finance or credit on reasonable terms is sometimes even more difficult. It was for this reason that the Industrial & Commercial Finance Corporation, Ltd., was established last year by the Bank of England and joint stock banks. Its object is to make advances, ranging from £5,000 to £200,000 to encourage the commencement or expansion of suitable business enterprises. During its first year it provided assistance in 133 cases to the extent of over £5 million. It is a sign of the continuing expansion of electrical engineering that it was the chief individual branch of industry to benefit from the Corporation's operations. It took 7 per cent of the total advances, i.e., £357,200.

**Coal  
Supplies** THIS week Mr. Shinwell, Minister of Fuel and Power, said that in September the weekly consumption of coal by electricity undertakings went up by 59,000 tons as compared with September, 1945. He was satisfied that users could be more economical; a further appeal would be made to them, but it might be necessary to have a more rigid system of allocation. Stocks held by electricity undertakings at the end of September were equivalent to 3.4 weeks' supply; a year earlier they represented 5.8 weeks' supply. Mr. Shinwell said that the deterioration in the quality of coal was due partly to the non-discriminatory flat-rate increases in prices which provided no incentive for washing and cleaning. The National Coal Board was looking into the matter.

# Works Supply

## Distribution from Private Plant and Public Supply in a Large Steelworks



The main source of supply is from the grid at 66 kV and transformed to 6.6 kV in the sub-station on site; supplementary supplies are available from private generating plant (power station on right)

**T**HE three articles "Steel Slab Production," "Hot Strip Rolling" and "Cold Strip Rolling" published in the *Electrical Review* of August 2nd, September 20th and October 18th, describing the production at the steelworks and rolling mills at Shotton, Chester, of John Summers & Sons, Ltd., contained so much of interest with regard to loadings and demands for special purposes over this very large factory area that readers would be left unsatisfied without some knowledge of how these demands are met. We therefore propose to outline in this article the works supply and distribution system.

The scheme is unique, not so much because of special features called for by the production as it now exists, but because of its evolutionary development over many years to meet both the

the availability of exhaust steam from mill driving engines for the generation of electricity. This has resulted progressively in a good deal of dovetailing of new plant and system components with older equipment and components where the latter has still been serviceable and efficient. Much of the interest in the present system therefore lies in why the present form has been adopted, and it may be useful to review the principal stages in the development of the works which dates back to about 1900 when the supply system was 220 V d.c. From 1898



The principal works power station has a generating plant capacity of 7,750 kW in four mixed-pressure turbo-alternator sets

growth of the works and changing conditions brought about by schemes of modernization relating to both the production plant and the system itself, and in consequence of

to 1904 the No. 1 steelworks and the first group of hand sheet mills were built. In 1910 2.2-kV generating plant was installed, and a year later further hand sheet mills were



added. In 1917 the No. 2 steelworks and No. 2 power station were put into commission, and this power station is now the

pressure Fraser & Chalmers turbines were installed to replace the gas engines. As the works expanded the 200/220-V d.c. system became inadequate and it was decided to change over to a.c. for both the generation and the primary distribution.

From 1910 to 1937 all the works supply was privately generated in the works power stations at 2,200 V, three phase, 50 cycles by mixed-pressure turbo-generators of sizes ranging from 500 kW to 3,750

The 22-kV overhead ring main is fed from No. 2 power station; 7,500 kVA transformer on left with A.R.P. protection



principal one at the works. Electrification of the principal sheet-mill drives took place in 1926 and 1927. In 1937 a public supply was inaugurated from the North Wales Power Company. In 1939-1940 slab mill and hot- and cold-strip mills were installed, and this year a reversing cold-strip mill, skin-pass mills, and annealing plant have been added.

Up to 1904 the 200/220-V d.c. supply was provided first by two small Parsons steam turbo-generator sets and two small vertical steam-engine sets operating with steam at 100 lb per sq in. These sets were later superseded by four Crossley gas engines coupled to

kW. The turbines ran mainly on the low-pressure steam exhausted from the two (and later four) reversing-mill engines which drove the sheet-bar mills. The turbines changed over automatically to high-pressure steam when low-pressure steam was not available. The total generating plant capacity



Control of the 6.6-kV nine-panel switchgear is centralized on boards in No. 2 power station

Sandycroft generators and supplied from a gas producer. When the first steelworks was built and exhaust steam was made available from the bar-mill drive, two 500-kW mixed-

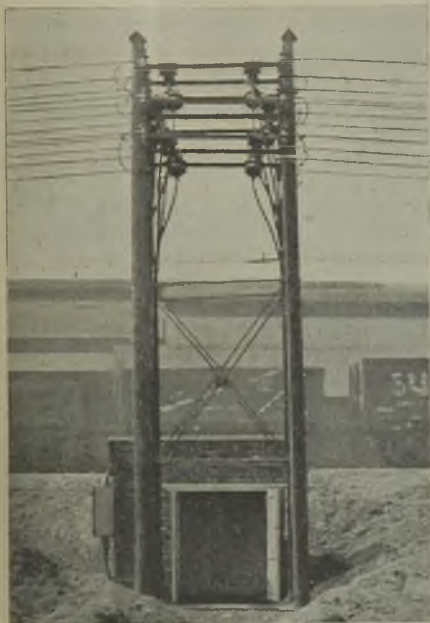
was about 10,500 kW, and part of this plant is still in operation. The reduction in the private generation supply was brought about as the result of a change of rolling-

mill practice made in 1939 when three of the reversing-mill engines were taken out of commission, so that the available supplies of low-pressure steam were reduced.

The principal supply for the works is now taken from the North Wales Power Company, although the incoming twin overhead



The strip mill has a seventeen-panel 6.6-kV switchboard (above) for its main drive motors, m.g. sets, and transformers  
The 2.2-kV ring main has nine section switches for isolation purposes (left)



commission shortly afterwards. The public supply is taken through two 30,000-kVA 66/6.6-kV Hackbridge transformers, with on-load tap-changing gear, situated in a sub-station adjacent to No. 2 power station. The supply is taken to a nine-panel B.T.H. metal-clad switchboard with circuit-breakers of 500-MVA rupturing capacity. Connection with the older 2.2-kV systems is made through a 7,500-kVA and two 2,500-kVA transformers, which enables the generating plant to run in parallel with the public supply. The section of the recording wattmeter chart (p. 770) indicates the nature of the demand made on the public supply system.

Two feeders, each 2 by 1.0-sq in. per phase, are taken from the 6.6-kV nine-panel switchboard to the strip-mill plant, via a seventeen-panel English Electric metalclad

Space problems have been solved by careful planning; 440-V oil circuit-breakers and air-break switch-gear in a steelworks substation

lines introduce a supply direct at 66 kV from the Central Electricity Board's sub-station at Mollington, about three miles north of Chester. When this supply was installed about eight years ago a 6.6-kV distribution system was created to meet the concentration loads of the hot- and cold-strip mill plants which were put into



switchboard which is also equipped with circuit-breakers of 500-MVA rupturing capacity. This board supplies the slab mill and strip mill main driving motors, motor-generator sets, and the transformers. There are nine large synchronous motors connected at this point, all designed for operation at unity power factor, and these correct the overall power factor of the system to near unity. An interesting system of reactor starting is used for these synchronous motors. A single reactor, with a second equipment installed as standby, is connected to a common starting busbar from which any synchronous motor may be started by means of its "start" oil circuit-breaker. Interlocks on the control prevent more than one motor being started at the same time.

The older parts of the works and the slab-mill and strip-mill plants are served by an extensive 2.2-kV distribution scheme. In general, and with certain exceptions arising out of special circumstances, motors down to about 50 H.P. are connected to this system, whilst the largest motor connected to it is of 2,000-H.P. The older parts of the works,

great importance. The steel furnaces, rolling mills, annealing furnaces and other plants are operated 24 hours per day, and the loss of supply, even for a short period, might have

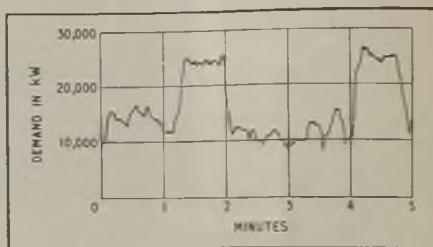


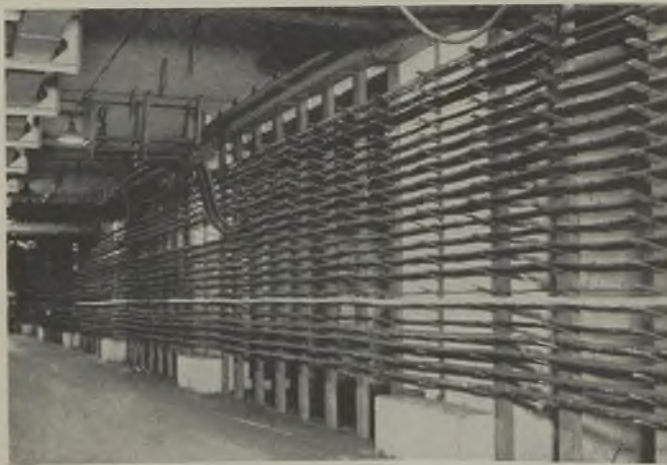
Chart indicating the nature of the demand on the public supply system

disastrous consequences. The extent of the 2.2-kV distribution scheme may be judged by the fact that the average load on it is around 10,000 kVA.

Other systems used in the works are 440 V, 3 phase, for general power, 400/230 V for lighting, and 220/230 V d.c. Suitable substations fed from the

2.2-kV systems serve the low-voltage networks, and we were particularly impressed to see how space problems have been met by careful planning in equipping these substations in which considerable use is made of both low-voltage oil circuit-breakers and air-break switchgear. The d.c. scheme serves practically all the cranes, and the steelworks and mill auxiliaries. The experience of the maintenance staff over many years has resulted in great confidence in the steelworks mill-type d.c. motor, which has therefore been standardized for service on the cranes and the mill auxiliaries. There is a total of 6,000 kW of a.c. to d.c. converting plant for supplying the 230-V d.c. system, both motor-generator sets and rotary converters being used.

In common with the systems previously described, the d.c. system is extensively inter-



All heavy cables are carried on steel racks in the hot-strip mill basement

being somewhat scattered, are served by an overhead ring-main distributor with four 0.25 sq in. conductors per phase. This 2.2-kV ring main is run through nine section switches, which prove very useful for isolation purposes because, as is inevitable in a plant of this nature, considerable sectionalizing of the distribution network is called for to permit the duplication of supplies—a matter of very



linked throughout the works for security of supply. For example, No. 2 steelworks has two 500-kW rotary converters, linked to the hot-strip mill by means of two 0.5-sq in. twin cables. The hot-strip mill and cold-strip mill each have a 1,500-kW motor-generator set linked by means of copper busbars with two 4 in. by  $\frac{1}{2}$  in. conductors per pole, and these are carried through an underground cable tunnel.

For general distribution multi-core p.i.l.c. and armoured cables are used, because overhead lines have been very troublesome and short-lived as the result of corrosion con-

sequent on the sulphurous atmosphere in which they operated. For the latest installations cable manufacturers have supplied special braiding and compounding over the wire armouring, to give improved protection against corrosion, and this has proved very valuable.

We are indebted to Mr. Reith Gray, director and general manager, John Summers & Sons, Ltd., for permission to visit the works and to publish this and the foregoing articles, and to Mr. S. A. Lewitt, chief electrical engineer, and Mr. T. D. Martin, assistant electrical engineer, for their assistance.

## Cargo Ships

### Standard Vessels Built During the War

**D**ETAILED information about the design and equipment of fast "standard" cargo liners and tankers constructed to Government order is contained in a paper compiled by MESSRS. W. T. BUTTERWICK and W. MACARTHUR MORISON (who were associated during the war period with the department of Merchant Shipbuilding and Repairs, Admiralty) for the North-East Coast Institution of Engineers and Shipbuilders.

The Furness Shipbuilding Co., Ltd., developed the outline design to comply with a very large number of requirements of the Ministry of War Transport, specially for the carriage of bulky military cargoes, in which respect two of the standard ships were the equivalent of three peace-time vessels. Normal drilling and riveting construction was employed, though welding was utilized by some builders who possessed appropriate facilities.

The ships were about 500 ft long and 64 ft broad, of 10,875 to 12,070 tons deadweight and 15 knots with margin. Most were propelled by geared turbines with oil-fired water tube boilers; but some had Barclay Curle-Doxford and Harland Kincaid Diesel engines of 6,800 to 7,500 S.H.P. in which cases there was a loss of some 300 tons of deadweight due to the heavier machinery and seatings.

The turbines were designed on an "austerity" basis by the Parsons Marine Steam Turbine Co., Ltd. Those built by Richardsons, Westgarth & Co., Ltd., had a rotor of a welded hollow cone design, which reduced the weight by 3.5 tons. The turbines built by the Metropolitan-Vickers Electrical Co., Ltd., were of fabricated steel construction and integral to withstand the effects of underwater explosions.

Apart from the turbine feed pumps for the boilers and the steam air ejectors for the condensers, all the auxiliaries were electrically driven; each ship had three Diesel d.c. generators of 175 kW at 220 V and one 10-kW set (also driving a small compressor) for lighting when in port. The tanker auxiliaries were

similar, except that two additional 30-kW steam driven sets were provided. On the Diesel propelled ships each auxiliary set was of 210 kW.

Cargo derricks were of 5, 10, 30, 50 and 80 tons; all the 19 electric winches were of 30 H.P. each and so arranged that they could be operated singly by means of a special selector switch, or coupled electrically and mechanically for operation from either of the normal positions. Each controller had a watertight double pole isolating switch with removable key handle. The wiring formed four ring mains with not more than six winches on any one circuit. A double pole fuse box and four removable links of the handle type enabled any winch damaged by enemy action to be completely isolated from the deck without going down below, so that all remaining winches on the affected circuit could continue to function normally.

In view of the special service of these ships and their cargoes, their protective equipment exceeded the normal provision. Special de-gaussing gear was fitted, of the low-voltage kind, energized from three motor-generator sets with voltage regulators varying their fields, actuated remotely from the chart room. Radar and merchant aircraft beacon gear were fitted amidships and "Asdic" equipment in a specially constructed compartment in the bottom of the first hold. The master gyro compass had several repeaters, a recording echometer was fitted and there were extensive telephone and alarm control systems.

### Schools for Signal Linemen

**T**HE G.W.R. is opening new technical schools at Bristol and Birmingham this month for training candidates to fill a large number of vacancies for key maintenance staff in the company's Signal Department. A three months' intensive course will be given in the installation and upkeep of mechanical and electrical signalling apparatus, block telegraphs, electrically operated points, track circuits and telephones.

# Views on the News

## Reflections on Current Topics

ONE good custom which fell into desuetude during the war was the penny collection in aid of the funds of the Electrical Industries Benevolent Association instituted some years ago by the late Mr. J. Y. Fletcher. I was therefore pleased to hear Mr. L. C. Penwill, chairman of the E.I.B.A. Committee, announce at last Friday's Electrical Industries Ball the Association's determination to resuscitate the penny collection. Mr. Fletcher, it will be remembered, provided a supply of special plastic plates for the purpose. Those who still have them should polish them up and put them into active use again; those who have not should write to the Secretary.

\* \* \*

It is reported in the October *Electrical Power Engineer* that a member appeared before the National Executive Council of the Electrical Power Engineers' Association at a recent meeting to explain why he had accepted a chief engineer's position which had been "banned" by the Association. With great regret the N.E.C. found itself unable to accept the member's explanation and his expulsion was confirmed. Subsequently the N.E.C. decided that any member applying for or accepting a "banned" appointment should be "summoned to defend himself before the National Executive Committee."

\* \* \*

At the same meeting, I see, the *Electrical Power Engineer* was said to have shown a tendency to depart from its "non-political tradition." The editor, Mr. A. M. F. Palmer, M.P., explained how difficult it was to avoid references to political matters, but he repudiated any suggestion that he had shown political bias. But why should Mr. Palmer have had to defend himself? After all the E.P.E.A. is a trade union, which inevitably puts it into the political arena and, moreover, it is committed to certain policies which if not essentially political have been made so.

\* \* \*

Accusations of "snooping" have been made against the Southport Electricity Department because of an endeavour which is being made by the Department (engineer, Mr. W. T. Gann) to ascertain exactly what

apparatus is in use. Lack of knowledge of connected load is a handicap from which most undertakings suffer, although according to the strict letter of the law (Section 24, Electric Lighting Act, 1882) "any officer appointed by the undertakers may at all reasonable times enter any premises to which electricity is or has been supplied by the undertakers . . . for the purpose of ascertaining the quantity of electricity consumed or supplied" and for other purposes. In actual practice most undertakings hesitate to involve themselves in a thorough investigation of perhaps thousands of premises or to risk upsetting good relations with consumers. At Southport, Mr. Gann treats it as "a matter of kindness and courtesy if the required information is given."

\* \* \*

A short time ago I referred to a note by "Pilgrim Three" in the *Electrical Contractor* regarding a 7-gallon tank containing two 10-kW immersion heaters. I suggested that the tank was somewhat small or the heaters somewhat large. In the November *Electrical Contractor* "Pilgrim Three" admits that he made a slip—the total loading is 10 kW (two 5-kW heaters). He says there is space for a third but it was found unnecessary.

\* \* \*

Poultry farmers are perturbed about the cuts which are having to be made in electricity supply for they say that interruptions may have serious effects upon hatching eggs and newly-hatched chickens. The hope has been expressed that any necessary cuts will be spread over as wide an area as possible to minimize the stoppage in any particular district. The daily press makes a great deal of play with the term "spoilt dinners" in connection with electricity cuts, but this is less serious than the total destruction of dinners *ab ovo*, as it were.

\* \* \*

Dr. Martin Ruhemann (according to the *Crewe Guardian*) expressed the view at a recent discussion organized by the Crewe Co-operative Educational Committee that "atomic energy would soon be so cheap and harmless that children would be able to play with it in the garden." A nice prospect for future Guy Fawkes' Days!—REFLECTOR.

# Synthesizing Cooking Load

## Theory Confirmed by Practical Test

**W**ITH the present stringency in supplies of

By G. O. McLean, M.Eng.

synthesis, in contrast to analysing the bulk to arrive

materials and long delivery dates for electrical machinery, forecasting of load becomes more and more important and, because of the narrowness of margin between revenue and costs due to the heavy increases in the latter (principally coal and wages), accuracy is most essential.

In an article on "Load Forecasting" which appeared in the *Electrical Review* of July 27th, 1945, the author outlined the theory of applying statistical methods to synthesizing loads. On the assumptions that the individual cooker demand was 4 kW and that 3 kWh was used between 10 a.m. and 1 p.m. on Sunday for cooking, the theoretical demand to be expected from 900 cookers connected was then given as 1,341 kW or 1.49 kW each.

It was suggested that these assumptions might not be valid for all undertakings, but that engineers could check characteristics of their own cooker consumers by installing recording ammeters in a few circuits selected at random, and constructing frequency distribution curves from the results.

The result of one such practical test confirmed the theory outlined in the earlier article and also points of statistical theory dealt with by P. Schiller in the *Electrical Review* of December 29th, 1944. The raw material data

was collected from recording-ammeter charts for two week-ends and the intervening weekdays from the cooker circuits of ten consumers chosen quasi-randomly from a West Country area. The sample was made as representative as possible in regard to both occupation and family size, so that the sample cannot be considered strictly random, but that is an advantage rather than a disadvantage, as has been demonstrated in other sampling work (e.g. E.R.A. Report K/T. 113). The size of the sample was restricted by the availability of suitable instruments, and in any event it was hoped to demonstrate how individual consumer characteristics can be used to forecast the load of the bulk or "population" by

the individual's characteristics.

As already indicated, the principal characteristics we want to know are the demand, the "peakiness" of the demand (load factor is the usual measure of this) and the times during which the peaks occur in individual cases. The ten ammeter charts were examined for these facts, and the individual results tabulated in groups so as to give frequency distributions from which the average and the measure of dispersion known as "standard deviation" could be calculated. For instance, the peak loads recorded were divided into twelve groups, the interval between each group being  $\frac{1}{2}$  A\* (secondary current) and the numbers in each group totalled and expressed as a percentage of the total.

Whereas the cooking load is known to be highest on Sunday (between 12 and 1 p.m.), most undertakings have, for the past six years at any rate, experienced their system peak at 8.30 a.m., and breakfast and dinner cooking loads are, therefore, usually considered separately.

Fig. 1 shows how peak loads were distributed over the hours of the day. Where two or three equal demands were recorded in the day, all the times were included in the frequency tabulation. Individual peaks occurred over a surprisingly wide range of times,

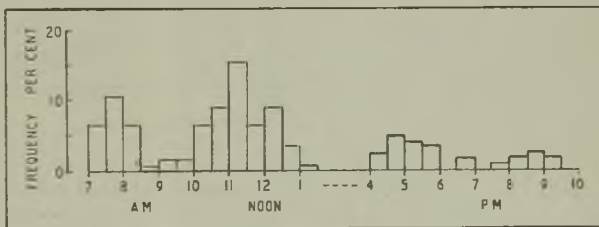


Fig. 1.—Peak time frequency

namely, from 7 a.m. to 9.30 p.m. Another unusual feature is that the 11 to 11.30 a.m. frequency predominates, although there are three times as many weekday recordings as Sundays in this particular survey. This

\* Current readings were made by means of current transformers and a 5-A recorder, calculations made with original recordings and conversion factors being applied later.



indicates that in the area concerned a cooked mid-day meal was general.

Fig. 2 is a graphical representation of the

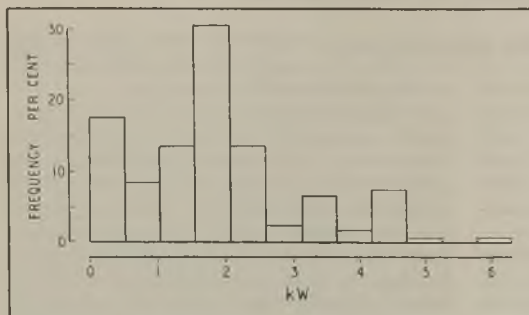


Fig. 2.—Frequency of breakfast peak severity

severity of the cooking load between 8 a.m. and 9 a.m. for the sample concerned. The average demand was 2.0 kW, though the range was from 0 to 6 kW. Space does not permit tabulation of all the figures recorded, or the calculations involved in expressing mathematically the average and the spread of the other results about the average. Statistically, these two facts tell the investigator all he wants to know about the distribution of the results, if he can assume that the graphical picture is a fairly symmetrical bell-shaped curve

(known as the normal or Gaussian curve). The dispersion factor is often expressed as a percentage of the average and is then called the coefficient of variation. It is the ratio of the statistical unit, known as the standard deviation, to the average. In this case the coefficient is 66 per cent, which means that there is a good chance (roughly odds of 3 to 2 on) that any single cooker load at breakfast time is 2.0 kW  $\pm$  66 per cent — or between 0.66 and 3.32 kW.

Similarly, the results for Sunday demands between 11.30 a.m. and 1 p.m. were 4.25 kW average with a coefficient of variation of 36 per cent.

The difference in the characteristics of the two cooking periods is very marked; i.e., the Sunday cooking demand (average individual)

is more than double the breakfast average demand and is also twice as consistent (variation coefficient about half). It is necessary to

emphasize at this point that the figures given are instantaneous demands and not half-hour demands, as the ammeter charts were actually divided into 5-min intervals and the spot readings at those intervals tabulated.

The "peakiness" of the peak is indicated by the Fig. 3 histogram, as it shows the frequency with which the daily load factors occurred. The outline is bell-shape, with the exception of one portion between 12 and 14 per cent, which was due, it is suspected, to a sticking ammeter on one consumer's premises. Nearly 50 per cent of the load factors recorded

were between 5 and 8 per cent, the average being 7.84, with a coefficient of variation of 45 per cent.

If, instead of taking the whole twenty-four hours, shorter periods were considered and

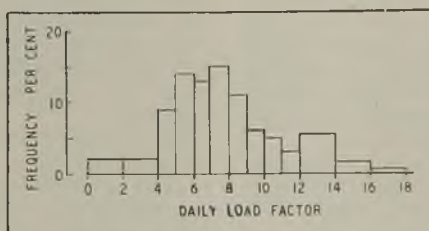


Fig. 3.—Frequency of load factors

load factors calculated, the average load factor during the breakfast hour 8 a.m. to 9 a.m. would be as high as 50 per cent, showing that there was either a steady load for 30 minutes out of the 60, or, if there were sharp peaks, then they were recurring at frequent intervals. Examination

of the charts showed that the former was the case.

Fig. 4 illustrates this point, as it shows the frequency of the minutes in use between the

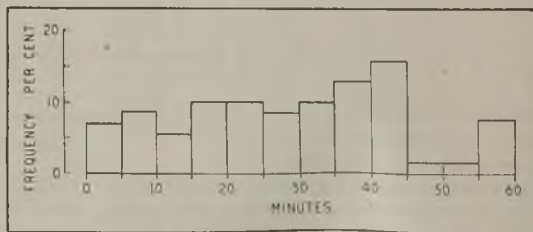


Fig. 4.—Usage period frequency

hours of 8 and 9 a.m. There are nine 5-min periods, each with about 10 per cent of the total, the average being about 30 minutes,

giving the 50 per cent load factor noted above. (Actually the number of times the cooker circuit was switched on and off during the whole day averaged about ten). The high percentage shown for 55 to 60 min in Fig. 4 is abnormal owing to the sticking ammeter.

Before comparing the practical with the theoretical results, the question of diversity has to be considered. Fig. 5 shows the actual diversity existing amongst the ten consumers during the Sunday cooking period (11.30 a.m. to 1 p.m.) The records (two Sundays

regarding the shape of such curves.\* The value to which the curves converge will be fixed by the average load factor of the application being considered, e.g. breakfast cooking or water heating.

The result indicated by the dotted extensions, 2.6 kW, is not the half-hourly demand per consumer after all possible diversity has been taken into account, as the figures used were instantaneous demands and for the summation of the twenty records, there still remained a load factor of 70 per cent, giving

the true after-diversity demand on the half-hourly basis of 1.82 kW. Criticism of the use of the second Sunday's results, on the ground that greater diversity would be shown by 20 different consumers and probably more still by 200 consumers, is no doubt justifiable, but the figure does demonstrate how rapid the approach of the two boundary curves is with short-period load factors of even 50 per cent. (In the same company's area, the Sunday cooking demand at a major substation to which 1,100

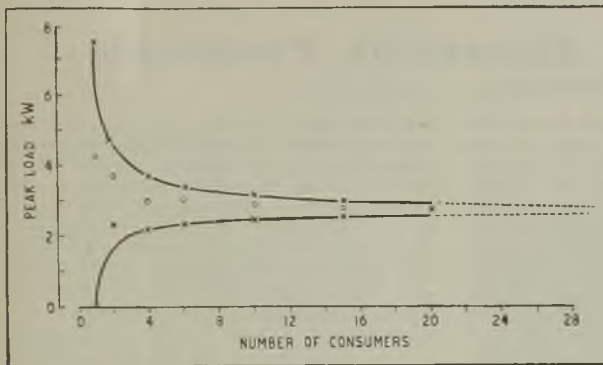


Fig. 5.—Range of peak loads/number of consumers

for each consumer) were considered in the following way. The records were taken at random and labelled:

$A_1 B_1 C_1 \dots I_1 J_1 A_2 B_2 \dots J_2$   
The  $A_1$  and  $B_1$  loads were then added, and the nine other consecutive pairs similarly treated. Thus  $A_1$  and  $B_1$  gave a combined instantaneous demand of 8.2 kW;  $C_1$  and  $D_1$ , 9.4 kW; and  $E_1$  and  $F_1$ , 5.8 kW. Dividing by two to get the demand per consumer, the ten results were:

4.1; 4.7; 2.9; 2.8; 4.2; 4.1; 4.02; 3.45; 2.3; 4.2 kW.

The highest is 4.7 kW, the lowest 2.3 and the average 3.68 kW. These three figures are plotted on the chart on a vertical line through the point on the base line for two consumers. Next, the  $A_1 B_1$  pair were added to the  $C_1 D_1$  pair, and the  $C_1 D_1$  pair to the  $D_1 E_1$  pair to get ten groups of four. Groups of six were obtained by adding three pairs together; and finally groups of fifteen by adding fifteen consecutive individual results beginning with  $A_1 B_1 C_1 D_1$  and  $E_1$ . Smooth curves have been drawn through the points indicating the range limits, and these show quite clearly the justification for the theory

cookers were connected was 2,000 kW, which after making allowances for other loads gave a residue of 1.36 kW per cooker.)

In conclusion, an attempt must be made to relate the actual results to the theoretical forecast. The theory outlined in the earlier article was to the effect that if there were evenly distributed in a certain period of time, called the peak-concentration period, an infinite number of equal loads, then a diversified demand would tend to be the average of a single load over the whole period multiplied by the number of loads involved. This simple statement had to be modified, because in practice we do not deal with infinitely large numbers but with definite figures, generally in hundreds or possibly thousands, fed from a single distribution substation.

The adjustment consisted of adding to the concentration-period load factor an amount inversely proportional to the square root of the number of consumers concerned. This particular sample gave us sixty weekday

\* C. Bary (U.S.A.) has pointed out that plotting coincidence factors against number of consumers gives rectangular hyperbolas.

breakfast cooking results and twenty Sunday dinner cooking results, and we have seen above that the mean demands of these results were 2.0 kW for breakfast and 4.25 kW for Sunday dinner on an instantaneous basis and 1.0 kW and 2.73 kW respectively on a half-hour demand basis. The mean individual load factor for both periods was 50 per cent. Theoretically then, the after-diversity demand (½-hour basis) should be 0.56 kW per consumer for the breakfast load and 1.65 kW per consumer for the Sunday-dinner load. The summated results actually experienced

were 0.62 kW in the former case and 1.82 kW in the latter.

Local conditions, such as diversity of occupation, times of starting and stopping work and distances between homes and workplaces, can all seriously affect the characteristics of the load. Fortunately, the habits of a locality change very slowly, and therefore when the characteristics (average demand, concentration period and load factor) have been determined, the theoretical forecasts can be used with confidence for a period of three to five years before a fresh check is needed.

## Bombay Electrical Proposals

### Establishment of Grid System

**F**OLLOWING the lead given by the Government of India in regard to the rationalization and development of electric power—by introducing, during the Budget Session of the Assembly, its Electricity Supply Bill, 1946—the Government of Bombay has proposed the establishment of a grid system in regions which lend themselves to such development economically under quasi-State control. As soon as the Central Legislature passes the Electricity Supply Bill, the Bombay Government will be setting up an Electricity Board to “rationalize” the generation of electricity by using a few selected stations having natural advantages; to make available progressively large amounts of power at low rates; and to bring the energy within reach of a progressively increasing number of the population—urban and rural.

### Inefficient Stations to be Closed

New hydro-electric and thermal stations will be established. These and the existing efficient generating stations of licensees, wherever practicable, will be interconnected. Inefficient stations will be closed down and the licensees concerned supplied with bulk power. Wherever possible, rural areas within the grid regions will be supplied power from the system; small Diesel stations will be established in isolated townships. It is also proposed to give financial assistance to small-scale industrialists in rural areas in acquiring electrical machinery and equipment by hire purchase.

Two 15,000-kW steam turbo-generators are being installed at Ahmedabad. While according to the present programme, grid power will be available in Ahmedabad, Kaira, Mattar, Nadiad, Umreth, Anand and Borsad early in 1948, it is proposed to undertake the preliminary investigation of the Koyana hydro project, which will supply electricity to the Deccan, including the industrial areas of Sholapur, Satars, and Poona Districts, as early as possible.

Pending the establishment of the Bombay

Electricity Board, a special grid department has been organized. The development programme under execution at present consists of the following:—The North Gujarat Scheme: Two 15,000-kW steam turbo sets are being installed by the Ahmedabad Electricity Company to supplement the existing 37,500-kW station. Bulk power from the company will be received at a Government-owned station, whence it will be transmitted to Baroda and Kalol. The South Gujarat Scheme: A new steam station is to be established in the Surat Region, comprising, initially, two 7,500-kW turbo sets. It is proposed to construct an e.h.v. line from Surat to Bulsar with main stations at Navasari, Billimora, and Bulsar. Rural electrification schemes have been sanctioned for a number of districts.

The Government of Bombay has made an agreement with the Government of Mysore for the purchase of up to 3,730 kW from the Jog hydro-electric station. This power can be obtained some time in 1947. Other electrical projects which are likely to be taken up by the Government within the next ten years are the Kona hydro project, the Kalinadi and Bhatgar schemes, and the Bhandardara-Randha scheme. —*Reuter's Trade Service* (Calcutta.)

### Bengal Project

**A**CCORDING to the *Indian Textile Journal*, effect is shortly to be given to a project for the electrification of nearly 2,200 square miles of the rural area of Bengal at a cost of approximately Rs350,00,000. The scheme, which has been approved by the Provincial Development Board, was drawn up by the Central Technical Power Board of the Government of India in order to promote industrial development to the north and north-west of Calcutta. A bulk supply will be taken from the Gourepore Electric Supply Co. and transmitted by 120 miles of 33-kV lines in the form of a ring circuit to Krishnagar, Burdwan and other towns.



# PERSONAL and SOCIAL

## News of Men and Women of the Industry

**THE B.E.M.** has been awarded to **Mr. B. Wainwright**, an employee at Blackburn Meadows power station of the Sheffield Corporation, for gallant conduct. In January last an explosion at the station caused fatal injuries to two men. Mr. Wainwright, at great risk to himself, worked his way to the back of some boilers in a steam-filled boiler-house and shut off the escaping steam.

On November 8th the staff of the North-Eastern Electric Supply Co., Ltd., presented **Col. S. E. Monkhouse** with an inscribed antique table, a salver made of old Newcastle silver and a cut-glass decanter to mark the termination of his executive activities with the company. Col. Monkhouse remains on the board of directors. The presentation was made by Lt. Col. E. H. E. Woodward (general manager and a director of the company), and in expressing his thanks Col. Monkhouse paid warm tribute to all departments for the support he had received from them during the time he held chief executive office on the management.

**Mr. C. S. Agate**, E.M.I. Engineering Development, Ltd., is the new chairman of the Radio Industry Council. He succeeds **Mr. T. E. Goldup** (Mullard Wireless Valve Co., Ltd.).

**Mr. F. S. Mitman** has resigned the position of managing director of the Brush Electrical Engineering Co., Ltd., and is succeeded by **Mr. Alan P. Good**.

**Mr. W. S. Thomas**, works manager of the Splendor Lamp Co., Ltd., has been elected Deputy Mayor for the Borough of Malden and Coombe for the municipal year 1946-47.

**Captain H. S. Hayes**, of Bristol, has been appointed to the Colonial Service as an electrical and mechanical engineer in the Public Works Department, Nigeria.

"The Gothics" (the football club of the Norwich works of Laurence, Scott & Electromotors) have made further progress in the F.A. Cup and are now due to meet a professional team, Colchester, on November 16th. It is many years since a works club team from the Eastern Counties has gone so far in the competition.

York Corporation Electricity Committee reports the resignation of **Mr. A. G. Forgan**, power station superintendent.

The Music Society of Central London Electricity, Ltd., is giving a symphony concert at the Kingsway Hall, Kingsway, London, W.C.2, on December 2nd, when **Mr. John Steele** will conduct. The standard of previous concerts given by this society has been high and the programme, which includes Beethoven's No. 1 symphony in C major and Schumann's piano-

forte concerto in A minor, is an attractive one. The solo pianist is **Guy Jonson** of the Royal Academy of Music, but the whole of the remainder of the programme is given by members of the staff of Central London Electricity, Ltd. Tickets (5s., 3s. 6d. and 2s.) can be obtained from **Mr. R. A. Brown**, box office manager, 19, Carnaby Street, W.1.

On his retirement after over forty years' service **Mr. G. W. Steward**, general manager and engineer of the Lowestoft Corporation Electricity and Transport Department, was presented with a barometer and a cigarette case from the staff. The presentation was made by the Mayor of Lowestoft, Councillor **J. W. Woodrow**.

At a farewell gathering recently the staff of **A. Reyrolle & Co.'s** Leeds office presented **Mr. W. Hanna**, their erection superintendent for the Midlands area, with cuff-links and a cheque to mark his retirement. Mr. Hanna has been with the company for twenty-nine years, twenty-one of which were spent in the Midlands.



Mr. W. Hanna

**Mr. F. Fowweather**, B.Sc., of Bolton, who has been appointed assistant lecturer in physics at Manchester College of Technology and Manchester University (Faculty of Technology), was concerned during the war with the design and development of radar equipment as research engineer and physicist with Ferranti, Ltd.

The committee of the Electrical Industries Benevolent Association for the counties of Wiltshire, Somerset and Gloucester have appointed **Mr. W. J. Murphy**, of Foster Electrical Supplies, Ltd., 200, North Street, Bedminster, Bristol 3, as secretary in succession to **Mr. W. J. Woodcock**.

**Sir James Swinburne**, Bt., F.R.S., has resigned the presidency of the Old Cromptonians' Association and he is succeeded by the **Earl of Mount Edgcumb**. The name of the organization has been altered to "Cromptonians' Association."

## Obituary

**Dr. K. H. Gyr**.—We regret to record the death of **Dr. Karl Heinrich Gyr** which occurred on November 3rd in his sixty-eighth year. A native of Zürich, Dr. Gyr was educated there and at Lausanne and Gresden; graduating at Zürich with the degree of Ph.D. On return-

ing from a stay in the United States and in England he joined the firm of H. Landis, a fellow student and an old friend of his, and in 1905 the firm of Landis & Gyr was founded.

In 1912 a company under the name of Landis & Gyr, Ltd., was registered in England and in 1928 the workshops were transferred from Hampton Hill to North Acton. Under the leadership of Dr. Gyr the business developed until it became one of the leading electricity meter manufacturing concerns, with factories in Switzerland, England, France and Germany. Dr. Gyr was chairman of Landis & Gyr, Ltd., and was on the boards of a number of other companies. In 1945 the Federal Technical University in Zürich conferred on him the honorary degree of Doctor of Technical Science in recognition of his outstanding technical achievements and the services he had rendered to Swiss industry. Although Dr. Gyr had been ill since 1939 he was at his office regularly until a few weeks ago.

The funeral service at Fraumunsterkirche, Zürich, on November 6th was attended by representatives from Swiss industry and from his company.

**Mr. C. Rodgers, O.B.E.**—We deeply regret to record the death, which occurred at Watford on November 5th, of Mr. Charles Rodgers, deputy director of the British Electrical and Allied

Manufacturers' Association. Mr. Rodgers had served B.E.A.M.A. for a long period, and was to have retired at the end of next month. He was appointed secretary in 1921 and deputy director in 1935, continuing to act as secretary also for a further three years until the appointment of the Hon. J. R. Rea.

A native of Wath-on-Dearne, Yorks, Mr.



The late  
Mr. C. Rodgers

Rodgers was educated at Sheffield University, the City and Guilds Engineering College and Zürich Polytechnic, gaining the degrees of B.Sc. (Lond.) and B.Eng. (Sheffield). Subsequently he joined the staff of Siemens Bros. Dynamo Works, Ltd., with whom he served as chief a.c. designer at Woolwich and Stafford until 1904 and later was transferred to London to deal with administration and publicity matters. He was a member of the Institutions of Electrical and Mechanical Engineers and at various times served on the Councils of the I.E.E., the British Standards Institution, the Electrical Research Association, the Electrical Development Association and the Science Museum: he was also hon. secretary of the British National Committee of the World Power Conference. Mr. Rodgers leaves a

widow, two daughters and one son, Mr. A. Rodgers, who is with the Metropolitan-Vickers Electrical Co., Ltd. The funeral was held on Saturday preceded by a service at the Watford Parish Church.

**Mr. F. B. Leonard.**—The death has occurred of Mr. F. B. Leonard, former deputy chief electrical engineer with St. Marylebone Borough Council, who retired in 1944.

**Mr. James McIntosh, A.M.I.E.E.**, telephone manager in Edinburgh, died on November 5th, at the age of sixty.

**Wills.**—**Mr. Charles James Beaver, M.I.E.E.**, a director of W. T. Glover & Co., Ltd., who died on March 20th last, left £14,846 gross, with net personality £13,287.

**Mr. William James Trotwood Thomas, A.M.I.E.E.**, who died on January 12th last, intestate, left £2,834 gross, with net personality £380.

**Mr. Hubert Grainge Treadwell**, of Wisteria House, Middleton Cheney, Northants, electrical engineer, who died on September 11th last, left £1,357 gross, with net personality £34.

## Electricity in Glasgow

**T**ABLES included in the accounts of the Glasgow Electricity Department (general manager, Mr. G. Morgan) for the year ended May 31st last show that the net capital expenditure to that date was £10,497,071, of which £7,951,058 had been repaid. Interest on loans for the year amounted to £80,667 compared with £134,866 in 1939-40. Gross revenue increased during the year by £34,085 to £2,171,104 but there was a much greater rise in working expenditure—£218,019—making the total £1,903,697. After meeting loan charges and income tax the net result was a loss of £98,924 compared with a surplus of £62,158 in the preceding year. This is the first deficit recorded in the table which covers seventeen years. In addition a sum of £108,167 (against £11,540) was required for capital and special expenditure and, together with the deficit, this reduced the balance carried forward from £337,731 to £130,640.

The Department generated 665.9 million kWh during the year (against 672.7 million in 1944-45) of which 37.5 million (35.9 million) was used at the works; in addition 4.3 million kWh (4.5 million) was purchased. Sales totalled 658.4 million kWh (668.4 million), the proportion expended in distribution and not accounted for rising from 6.03 to 7.83 per cent. From a statement of costs per kWh sold it is seen that last year's purchase cost figure of 0.6229d. compares with 0.5439d. in 1944-45 and 0.3148d. ten years ago; the corresponding total expenditure figures were 0.8274d., 0.7450d. and 0.7901d. Revenue per kWh sold last year averaged 0.7913d. against 0.7673d. in 1944-45 and 0.8289d. a decade ago.

# Electrical Industries Ball

## Substantial Aid for E.I.B.A. Funds

**N**EARLY six hundred people gathered at Grosvenor House, Park Lane, London, W., last Friday for the second post-war Electrical Industries Ball. Although full freedom from austerity and restrictions has not yet been achieved there was quite a pre-war spirit which made the function a thorough success. Dancers would have welcomed a little more freedom of movement, but it is

hoped that by this time next year the Grosvenor's large ballroom, which was in American occupation during the war years, will again be available. As it was the number of guests had to be limited and many of those who wished to be present were disappointed.

The guests, who included many well-known

Right: Dancing in progress at last Friday's E.I.B.A. Ball. Below: The President (Mr. Walter Riggs), Chairman (Mr. L. C. Penwill) and friend



Above: Mr. W. J. Jones (E.L.M.A.) and Mr. J. W. Simpson (I.M.E.A.) and their party. Left: Mr. L. C. Sharp's table.

people representing 'all branches of the industry, were received by Mr. Walter Riggs, the president



of the Electrical Industries Benevolent Association, and Mrs. Riggs. During the



Messrs. A. L. Lunn (L.P.T.B.), J. Hacking (C.E.B.) and W. N. C. Clinch (Northmet Co.)

supper interval the president gave a brief address in which he commended the objects of the Association.

At a later juncture Mr. H Senior Fothergill, the E.I.B.A. secretary, announced the numbers of programmes which entitled the fortunate holders to prizes presented by electrical manufacturers. These comprised fires from Berry's Electric, Ltd., the English Electric Co., Ltd., and Ferranti, Ltd.;

announced that it amounted to £53; in addition £104 had been realised from the sale of programmes. He said that the Association aimed at restoring the custom of penny collections at all electrical functions



Mr. V. Z. de Ferranti, President I.E.E., and Mrs. de Ferranti in conversation

and those who were willing to help were asked to communicate with the secretary.

The dance programme was of a very varied character, ranging from the most modern back to the waltz and polka, and Debroy



Mr. P. V. Hunter's party including Sir Noel and Lady Curtis Bennett and Mr. H. Nimmo (Electricity Commissioner)

vacuum cleaners from the British Vacuum Cleaner & Engineering Co., Ltd., and the Hotpoint Electric Appliance Co., Ltd.; a radio receiver from the General Electric Co., Ltd.; and an electric blanket from H. J. Baldwin & Co., Ltd. The respective prize winners were Mr. E. J. Vidler, Mr. M. Stone, Major A. Young, Mr. F. C. Lucas, Mrs. J. G. Briggs, Mr. S. Ferguson and Mr. E. J. Jarvis.

An excellent cabaret show was given by the Dehl Trio, Charlie Chester and Helen Hill (with Frank Wilcock at the piano). A "penny collection" was taken up and Mr. L. C. Penwill, chairman of the Court,

Somers and his band added greatly to the success of the occasion. The organizers had reason to be gratified at the results of the ball; the guests certainly enjoyed themselves while augmenting the Association's funds.

**I.E.E. Chesters Estate.**—At the meeting of the I.E.E. on November 7th, Mr. E. Leete gave a brief outline of the scheme for building the Chesters Estate by the Committee of the I.E.E. Benevolent Fund—a brochure concerning which has already been sent out to all members—and an appeal was made for the £50,000 Fund, which is the amount estimated to be required.

# Network Design

## "Retail Delivery Service"

**T**HE development of electricity distribution was the subject of the inaugural address of MR. W. H. HOWARD (Dundee Corporation) as chairman of the enlarged and re-named I.E.E. North-East Scotland Sub-Centre (including Aberdeenshire and Kincardineshire with Dundee). Distribution was described as a "retail delivery service," the successful management of which demanded a wide knowledge of local requirements; the existing state of affairs needed some revision.

Generation and distribution were becoming more elaborate and remote from each other and new entrants to the industry were finding it increasingly difficult to become proficient in both branches, so were obliged to specialize in one or the other. Would the two branches eventually be entirely separated?

Such an event might in some respects be beneficial, for distribution problems had received too little attention in the past; to some extent they had been overshadowed by the more vital problems of generation, resulting in a good deal of needless expenditure owing to lack of sufficiently well worked-out policies of dealing with progressive load increases.

Most supply engineers considered that network design was either relatively simple, not calling for a high order of technical skill, or that it was extraordinarily difficult, the number of imponderable factors to be taken into account rendering a theoretical approach impossible, so that intelligent guesswork must be used to a large extent.

Mr. Howard did not subscribe to either of those contradictory opinions. In view of the capital involved (more than half the expenditure of the industry being sunk in distribution) he considered the systematic study of network design to be overdue, pointing out that voltage control and protective gear policies profoundly influenced network costs.

At present the network designer had to be taken on trust; he could save or waste much money without the fact being realized one way or the other. It did not seem possible to devise a reasonably simple set of standards by which to judge the success of network design, so there appeared to be a good case for a central research and training establishment for working out sound general policy and training specialists for this responsible work. Better planning was one of most promising means of further improving efficiency.

## Edmundsons' Engineers

### Retirement to Set Up as Consultants

**W**E are informed by Edmundsons Electricity Corporation, Ltd., that Mr. Charles H. P. Ewbank, their chief engineer and four of the departmental heads who have served under him at Edmundsons have retired from their positions to set up in business on their own account as Ewbank & Partners, Ltd., engineering consultants. Their registered offices are at 109, Jermyn Street, London, W., but pending the acquisition of suitable premises, they will operate from 24, Gillingham Street, S.W.1. This arrangement has not only enabled them to solve the otherwise almost insuperable problem of adequate accommodation, but is particularly convenient in the fulfilment of their first contract, which is with Edmundsons.

Ewbank & Partners, Ltd., have signed an agreement with Edmundsons to do for them all that they have done in the past as officials of the Corporation. The continuity of service thus secured is important in view of the extensive developments planned by Edmundsons.

Mr. Thomas E. Boothby, formerly Edmundsons' deputy chief engineer, Mr. Donald E. Bird, electrical engineer, Mr. Samuel N. Chew, project engineer and Mr. William Kitson, generation engineer, are Mr. Ewbank's fellow directors in the new company. They have each been responsible in their own departments at Edmundsons, and under the general supervision of Mr. Ewbank, for the great developments in the Edmundson areas in the past two decades.

Mr. Ewbank and his colleagues were responsible for the design and erection of the Little Barford and Llynfi power stations. The latter was built in the record time of nineteen months.

In an interview Mr. Ewbank said, "My fellow directors and I have always worked as a team and we hope by the formation of this company to continue as a team. In view of the uncertainties of the future we felt it was the one way of ensuring that we kept together. Moreover, we believe that as a team we can do far better work than if we were separated."

## Fuel Economy Abroad

THREE reports on fuel economy since 1939 have been published by the Central Office of the World Power Conference, London. These have been prepared by the National Committees of the Netherlands (6d. net), Denmark (6d.) and Sweden (1s.). The first relates to the production and consumption of fuel and the plight of the inhabitants of Holland under enemy occupation.

In the report dealing with Danish conditions, references to the use of alternative fuels indicate that one ton of good pit coal is equivalent to  $2\frac{1}{2}$  tons of peat and slightly more of brown coal; methods of adapting existing boiler house practice to such fuels are briefly described. In many small power stations windmills up to 60-kW are used as supplementary sources of energy and Diesel engines have been converted to natural-gas operation.

In Sweden the capacity of hydro-electric stations was increased from 1.78 million kW in 1939 to 2.54 million kW in 1945 and the figure, including plant under construction, is now over 3 million kW. The hydro-electric output rose from 8,125 million pre-war, to 13,100 million kWh last year—an increase that has reduced the annual consumption of coal by the equivalent of 750,000 tons. During the same period the output of thermal power stations fell from 924 million to 400 million kWh.

The four 200-kV lines which transmit hydro-electric power from the north to the central and southern parts are insufficient and two more will be completed in the near future. Attention is being paid to the use of higher voltages, either a.c. or preferably d.c. Consumption of electricity in households has been increasing rapidly. Railway electrification is said to have solved fuel transport problems. Trolley-buses have been introduced in the bigger cities. More use has been made of peat, one ton of which is stated to correspond to half a ton of coal, and other fuels, brief particulars of which are given.

## High-Voltage Gas-Cushion Cables

GAS-CUSHION cables for the highest voltages are the subject of a paper presented by Mr. T. R. P. HARRISON (W. T. Henley's Telegraph Works Co., Ltd.) before the Transmission Section of the Institution of Electrical Engineers.

The author reviews their performance under tests, which have been formulated to furnish design data, in comparison with normal cables. Tests were conducted at power frequency in the Henley Research Laboratory while impulse tests were made at the National Physical Laboratory.

The special requirements pertaining to the

impulse testing of cables are enunciated, the present dearth of data on this aspect being revealed, which necessitated special investigations in two respects. First, by inference, the presence of nitrogen gas at a pressure of 200 lb per sq in. does not seem to cause any reduction of the impulse breakdown voltage. Secondly, the impulse breakdown stress of a gas-cushion cable is of the order of 950 kV per cm, which confirms the values for a fully impregnated cable cited by R. Davis in the *I.E.E. Journal*, Vol. 89, Part II, p. 52, 1942.

The breakdown under impulse differs from that at 50 c/s, there usually being much less blackening and charring, but more bursting and splitting of the papers. The splitting of the dielectric, which is usually longitudinal, is not necessarily associated with the charring and (so far as experience has been gained) the puncture is not wholly radial. When true cable puncture takes place the oscillograph records immediate voltage fall to zero, whereas it has not yet been established why impulse breakdown may follow a long path from conductor to sheath, in which case the voltage may remain quite high.

Present investigations have stabilized the position at 132 kV and the author does not see any reason why 264-kV cables should not be of the gas-cushion type, using impregnated paper as the dielectric. It is evident, however, that the present construction of oil-impregnated paper under gas pressure is essentially heterogeneous and there are obvious reasons why it would be advantageous to apply a homodielectric uniformly.

Polythene and polystyrene are admirable in respect of power factor at high temperature, so it now remains to show how such materials may be applied to cables for very high voltage operation.

## Resistance Welding

A PAPER prepared by Mr. S. HUNTER GORDON for the Institute of Marine Engineers in London deals with resistance welding in its several forms. The author's intention is to define what is meant by the terms spot, seam, projection and flash-butt welding, to illustrate the principles involved and indicate the kinds of work done by each method. Data and information are included about the flash-butt welding of marine engine crankshafts for the Admiralty; about the forging of locomotive pistons to their rods and about the use of alloy steel pressings to form aeroplane propeller hubs by the automatic preheating reciprocating method of flash-butt welding.

Graphical and tabulated data are included on tests made at the Admiralty Engineering Laboratory, West Drayton, of seven alloy steels generally used in industry and on the welding of five grades of valve steel to carbon steel.



## CORRESPONDENCE

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

### D.C. Motor Starters

**I**N an article under the heading "Can You Send A Man Out?" in your issue of November 1st, mention was made of a "starter-regulator" in connection with a d.c. motor. A problem was set and clearly answered by the author.

It is not practicable, however, to use a starter of the usual face-plate type for speed variation, since moving the starting arm would render useless the no-volt and overload coils. These are only operative when the arm is in the full-on position, a spring being incorporated so that the arm is returned to the off position when, owing to the de-energizing of the no-volt coil, the supply is cut off or when short-circuited, as a result of the attraction of the armature of the overload coil, if the current exceeds a certain value.

In any mid-position, such as would be required for varying speed by inserting resistance in the armature, this protection would be ineffective. Also the resistance would have an indefinite rating which is not usual with face-plate starters. Rheostats wired in series with the shunt field provide the usual method of speed variation. Drum-type controllers are not under consideration.

Bath.

K. GILES.

### Electricity Restrictions

**T**HE comment by "Reflector" on page 685 of the *Electrical Review* of November 1st with regard to electricity rationing has been based on an article which appeared in the local press some little time ago in which I was somewhat misquoted.

I am certainly not in favour of the drastic method which was outlined, that is, cutting off the consumer permanently if he exceeds a certain quota, but I am inclined to think that the ordinary voluntary response to calls by the radio, press and posters will not have much effect upon the situation. Up to the present time, Sheffield has had no cuts which affect the domestic supply, and all reductions which have been called for by the Central Electricity Board have been made by agreement with the large works, and I propose to continue this method of reducing supply when called on.

The cuts which have been made up to the present have been in respect of plant shortage only, but when the time comes when cuts have to be made for fuel reasons then a different situation will arise. Even then I still intend (subject to no national direction being imposed as to how the cuts shall be made) to make cuts industrially as it is obvious that not much would be saved in suburban and domestic areas having only 400 to 1,000 kW demand per square mile with probably no greater load factor than the industrial areas.

The industrial areas of Sheffield have a demand per square mile varying from 30,000 kW to around 55,000 kW. In other words we could get from the industrial areas a reduction in units in a day which would take very many days to get from the suburban areas. In any case cutting off the suburban areas as a matter of deference to industrial exports would very nearly cause a political revolution.

I apologize for taking up your space but felt that the implication in "Reflector's" comment, for which I do not blame him, required correction.

Sheffield.

JOHN R. STRUTHERS,  
General Manager,  
Corporation Electricity Dept.

**W**ITH regard to "Reflector's" remarks mentioning the rationing of electricity in Rome, as one of the two technical advisers to the Rome Area Allied Command I was called upon, with Capt. W. Neff, C.E., U.S.A., to evolve a rationing plan. This with the assistance of the two supply companies we did, and although no doubt some of the measures seemed severe they certainly did the trick.

We reduced the 1943 peak from 150,000 kW to 36,000 kW. Approximately 250,000 consumers were involved and the rationing varied over a wide range from 10 kWh per month for an ordinary lighting consumer to 25 per cent of the corresponding 1943 consumption for places of amusement. Whilst the curfew was in force street lighting was banned and transport curtailed. Meters were read monthly and penalties varied from a fine of 1,000 lire to disconnection for six months.

In general, areas only received a supply

every third day with one continuous supply for seven days per month, with the exception of certain preferential circuits which were kept going for twenty-four hours per day. Load shedding when called for by the Italian Electricity Grid (headed by Col. Lapper, C.E.B.) was carried out on a strict priority basis.

Hounslow.

R. F. FLACK,  
Major, R.E.

### Razors in Bathrooms

**I**N your issue of November 8th, Mr. John Bland raises an interesting point in connection with electric razors—or perhaps “shavers” is a better word. A possible solution of his problem is to use a properly connected three-core flexible cord with a three-pin plug and socket of the flat-pin type, of which several reputable makes are available, thus securing non-interchangeability with other household appliances.

My own solution is to use a 1:1 double wound transformer of about 10-VA rating, with the centre point of the secondary (and the core of course) earthed; the secondary feeds a two-pin 2-A socket and there is no need to earth any part of the shaver.

Sutton Coldfield. E. H. NORGROVE.

**R**EGARDING the inquiry by Mr. J. Bland, the following details may be of interest. A client of mine had obtained an electric razor which he required to be used in his bathroom. The razor, in common with the majority of its type, was wound for operation on 110 V, a.c./d.c., a resistance box being supplied for use when connected to 230 or similar voltage. To obtain a reasonably safe installation the following method was adopted. A flat-pin socket was installed in the bathroom, connected to the secondary of a 230/110-V transformer. The latter was double-wound, fused on both primary and secondary, enclosed in an earthed metal case and installed in a position outside the bathroom. A ceiling switch controlled the primary circuit of the transformer.

The advantages gained by this method of installation were: (1) The 110-V supply was isolated from the mains, thereby eliminating shocks to earth; (2) the resistance box was not required and the power loss associated with this item was avoided; (3) by the use of a flat-pin socket, the only one in the house, other electrical accessories could not be used in the bathroom; and (4) the razor could still be operated elsewhere without modification by inserting the flat-pin plug

top into the resistance box and connecting the latter to a 230-V outlet.

The installation has given many trouble-free years of service and is considered to be a satisfactory solution to what is usually a difficult problem.

P. A. ROWLAND.

South Harrow.

**Power-Factor Correction.**—Referring to his letter in the *Electrical Review* of November 1st, Mr. Z. M. Raht says that the passage “could be corrected to the same power factor at different loads” should read: “could correct to the same power factor the different loads of the motor.”

### The King's Speech

#### Nationalization Bill Foreshadowed

**L**AST Tuesday His Majesty the King opened the new session of Parliament and in the course of his speech said:—

“A measure will be laid before you to bring inland transport services under national ownership and control. A Bill will also be submitted to you to bring into national ownership the electricity supply industry as a further part of a concerted plan for the co-ordination of the fuel and power industries.”

In a later passage his Majesty said:—

“Valuable reports have already been received from working parties appointed to make recommendations for the better organization of a number of important industries and you will be asked to approve legislation to enable effect to be given to their recommendations.”

### Argentine Fuel Position

**T**HE problem of fuel supplies is referred to in the report of the Société d'Electricité de Rosario for the years 1940-45. Owing to the disturbed political outlook in the pre-war years, the directors took the precaution of adding to their fuel stocks and at the end of 1940 had on hand no less than 110,000 tons of coal and 9,500 tons of fuel oil, sufficient for seventeen months. This fell at the end of 1945 to 17,400 tons of coal and 700 tons of fuel oil. Large quantities of substitute fuels were brought into use during the war including, in 1945, 7,700 tons of native fuel oil, 18,700 tons of charcoal, 114,500 tons of agricultural products and 4,100 tons of linseed oil. It was found that two tons of most of the substitutes were necessary to replace one ton of coal and even then the steam output of the boilers was reduced by one-third. The ash of the substitute fuels badly affected the refractory linings of the boiler furnaces while sticky deposits formed on the boiler tubes. Early in the present year the position was eased by the arrival of three consignments of fuel oil each of 5,000 tons, and contracts have been placed which will secure a monthly supply of between 5,000 and 6,000 tons.

# Modern Circuit-Breakers

## Discussion on Oil and Air-Blast Types

**A**T a meeting of the Institution of Electrical Engineers on Thursday last week, the papers by Messrs. A. Allan and D. F. Amer and by Messrs. H. E. Cox and T. W. Wilcox (summarized in our last issue) were read and discussed. The President (Mr. V. Z. de Ferranti) explained that it was quite fortuitous that these two papers were read on the same evening. It had not been found possible to have them presented at separate meetings but there was no desire that there should be a debate on the relative merits of the two types of circuit-breakers dealt with in the two papers.

MR. J. HACKING (C.E.B.) discussed the two papers from the point of view of the buyer and user. He thought Messrs. Cox and Wilcox had put forward a convincing justification for the use of resistors with oil circuit-breakers. There were five manufacturers in this country who were able to supply 2,500-MVA air-blast breakers and all five had them in operation or manufacture. There was not much difference in performance, but if one took into account the housing for the current transformer, the air-blast breaker was inherently more expensive although it was necessary to have regard for the probable development of each type. The air-blast breaker seemed to have certain advantages which might ultimately render it superior to the oil breaker and it was by no means unlikely that later developments would result in economies in cost, so that the disadvantage as against the oil breaker in that respect would disappear.

### Negligible Fire Risk

MR. F. C. WINFIELD (Merz & McLellan) thought the bogey of fire risk with the oil breaker had been much over-played; in twenty years he did not think there had been a single failure due to fire in 132-kV circuits in this country and yet that, in his view, was the only present objection to the tank type breaker. It was simpler, it required smaller accommodation and it cost less than the air-blast breaker. The latter could be designed to do everything the oil breaker could do, but the difficulty was in the designing of the auxiliary equipment. Air at from 250 to 1,000 lb was needed and it was a fact that there had been trouble with air

at 250 lb pressure. It was difficult to keep the air lines and valves tight, which reacted on the compressors and increased maintenance costs.

MR. C. H. FLURSCHEIM (Metropolitan-Vickers) showed lantern slides of two new types of multi-break breakers, both of which were claimed to be capable of providing high-speed reclosure. Both designs had twin interrupters and were said to quadruple the speed of the conventional tank breaker.

### Common Definition Methods Needed

MR. D. P. SAYERS (Birmingham) said it would be useful to have a simple common statement as to the effective duration of arcing and break time for the two types of breaker. At present it rather seemed that the authors were trying to keep engineers guessing by using different methods of definition. The air-blast breaker appealed to the supply engineer, but its simplicity was rather offset by the complexity of the pneumatic system. The three phases of a breaker were not mechanically coupled, so would pneumatic coupling between phases be really reliable? Messrs. Cox and Wilcox stated that cost of construction was overwhelmingly in favour of the dead-tank oil circuit-breaker, but did they mean intrinsic cost or purchase price? The cost of a 2½-MVA air-blast breaker was from £11,000 to £15,000. Shunted pots offered the prospect of increasing the effective rating of many ordinary oil tank breakers now in use comparatively cheaply. Could they be fitted without complete replacement of the tanks or top plates?

MR. H. TRENCHAM (B.T.H. Co.) deprecated the use of the term "severity" of the circuit. He believed it was originally introduced by E.R.A. as a comprehensive term, but he would like it now limited to matters which were likely to lead one adrift instead of embracing all factors involved in circuit interruption. The papers indicated that there was a good deal which was not yet fully comprehended. Unit testing was only justifiable in special cases and Messrs. Allan and Amer had indicated that they did not fully support the contention that unit testing was necessary.

MR. L. GOSLAND (E.R.A.) pointed out that



surge strength was becoming the predominant factor in the design of cables and that switching transients accounted for a great deal of the requirements in that respect. The claim was made that the performance of the air-blast breaker was definitely predictable, but there was some doubt about that having regard to data produced by Brown in America.

#### Research in Sweden

MR. M. HAMMARLAND (Sweden) referred to research work on the air-blast circuit breaker with which he had been associated in Sweden for some years and said that aerodynamics introduced factors of greater importance than the authors had indicated. In the Swedish experiment they had found a definite upper limit of interruption of current for a given rate of rise of the striking voltage, which was not constant as might be inferred from the curve in the paper.

MR. J. A. HARLE (Reyrolles) commented only on the oil breaker and suggested that the side-vented explosion pot with switching resistor shown in Fig. 7 of Messrs. Cox and Wilcox's paper had definite limitations. Any new design of breaker should be definitely proved for its capabilities for breaking low inductive circuits and switching out the capacity current. With careful design of the contact enclosure and careful selection of speed of break, there should be no trouble due to that cause.

DR. W. B. WHITNEY (E.R.A.) said both papers indicated the fruition of ideas put forward fifteen or twenty years ago. For instance, as long ago as 1927 the importance of short gaps in air-blast breakers was stressed by E.R.A.

MR. J. S. CLIFF (G.E.C.) emphasized the importance of maintaining the highest possible pressure in the oil pot to ensure the greatest effectiveness. At the same time there was a limit to the strength of the pot in practical design. He referred to experiments which he had carried out in that connection and said that the curves in Fig. 4 of the Cox and Wilcox paper were generally confirmed.

MR. AMER, replying, said that the actual difficulties with air-blast switchgear were primarily connected with the mechanical complexity of the auxiliaries, but the air-blast breaker would become much simpler as time went on. For instance, he did not think they would see the series break switch in future designs and, furthermore, when a

simplified current transformer was available the air-blast breaker was likely to become competitive with all other forms. As regarded the pneumatic operation of isolators, tests had been carried out and shown them to be ideally suitable. Again, the air-blast breaker was the ideal unit for switching out cables, or any form of capacitance, because the high voltage did not appear across the circuit-breaker until all the ionised gases had been completely scavenged. Thus the breaker was able to withstand the voltage which normally appeared across the contacts after the circuit had once been cleared.

MR. WILCOX, also briefly replying, said that if the economics of the current transformer situation changed, then the whole economics of the problem would change. That, and that alone, was sufficient reason not to drop air-blast breaker development. He agreed that the fire risk with the oil circuit-breaker was a bogey. Multiple-break breakers had been used with considerable success in the United States for some time, but a 264-kV 2,500-MVA breaker could be made with two breaks only in series. In America they had been using eight breaks for 230 kV and the simplification resulting from the reduction from eight to two breaks need not be emphasized.

### American Raw Materials

MR. William Clayton, U.S. Under-Secretary of State for Economic Affairs, said in an interview on October 26th that since it had become essential for the United States to import certain strategic materials in short supply within the States, he believed the United States had reached the point in its economic international relations where it should give greater support to foreign investments by American business men in such materials. While, in general, he did not think the United States was prepared to back up overseas investments of its nationals to the extent of British tradition, an exception might be made in the case of minerals essential to the national security.

Pointing out that the war had either depleted or caused near depletion of many domestic resources, Mr. Clayton said that the development of vital industries was now dependent upon importing raw materials. Therefore, what happened to American investments in foreign sources of supply had become a matter of national welfare. Mr. Clayton listed the following materials as among essential imports: bauxite, manganese, nitrates, chromium, copper, tin and high grade iron ores. He said that uranium, the raw material of atomic energy, might be added.

# Meeting Domestic Demand

## Methods Adopted at Gravesend

**T**HROUGHOUT the country there has been during the past few months a general acceleration in the growth of the demand for electricity for domestic purposes. Several factors have combined to bring this

With a record output last year of 46,258,013 kWh (a 12 per cent increase as compared with the slight national reduction) and a September output this year over 30 per cent higher than last year, the Gravesend Electricity Department is in an exceptionally good position to assess the trend, and its experiences and problems encountered in meeting the growing demands for energy are well worth studying.

The 12-sq mile area served by the undertaking has few to equal its record of connections, 15,830 out of a total of 16,814 premises in the area of supply, with new connections going on at the rate of about sixty a month. At the moment therefore 94 per cent of the premises have supplies, but when projected overhead lines to the southern part of the area are completed this figure will be raised to 98 per cent. Electricity has been chosen for all purposes in every one of the 174 prefabricated houses erected or being erected in Gravesend and Northfleet, while all the first 86 (of an eventual 1,517) permanent houses as well as 208 concrete houses and 64 steel houses are being wired to receive cookers, wash-boilers and water heaters, all the traditional houses having 20-gal dual-purpose under-the-draining-board water heaters fitted as standard. Furthermore, the Town Council has decided to have electric water heaters installed in all the 132 houses erected in 1920 under the Chamberlain Scheme without any means for heating water.

Even in cases where it is not proposed to supply electrical appliances immediately, the



Cable laying in Jubilee Crescent

about, principal among them being the difficulty of procuring supplies of coal and coke; a greater appreciation of the merits of electrical service, partly due to wartime experiences; the return of men and women from the Forces; the erection of new and the repair of bomb-damaged houses; the availability of electrical appliances in the shops again; and lack of domestic help. Just recently in particular there has been a tendency to purchase radiators, water heaters, kettles, hot-plates, etc., to guard not only against the shortage of solid fuel but also against the lowering of the gas pressure anticipated during the winter.



Lorton Road substation supplying prefabricated houses

Council shares the views of the borough electrical engineer, Mr. G. V. Harrap, that the cost of providing the necessary wiring in anticipation of future demand is negligible when consideration is taken of the difficulty and damage to property resulting from adding the installation later. For all premises, prefabricated and permanent, the E.D.A. house-service unit has been adopted.

In common with other undertakings, Gravesend is finding considerable difficulty in keeping abreast of demand for new apparatus, the limiting factors being both shortage of labour and materials. However, in September 71 cookers were installed compared with 21 a year earlier, 42 of them being for prefabricated houses. In July the figure was even higher—73, of which 31 were for "prefabs." One water heater was installed in September last year but this September no fewer than 53 consumers were supplied. Similarly 47 wash-boilers were connected (as against one)

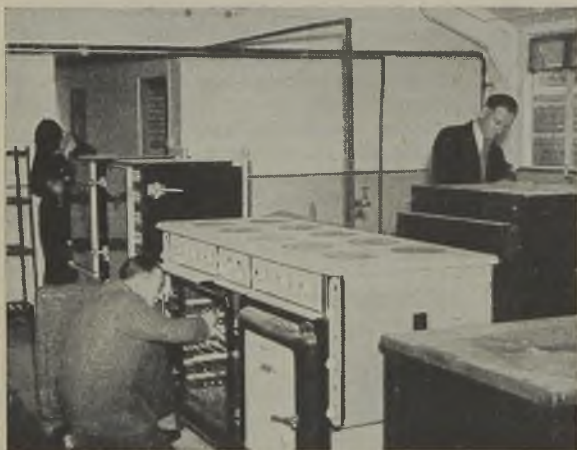
quite a number of the cookers installed have been provided as a result of investigation into



Maximum-demand indicators have been installed in every one of the substations

particulars supplied by the fuel officer, who is also the borough engineer, of 400 premises in which the cooking facilities were considered inadequate or wasteful. Many of these premises have old-fashioned kitcheners which just "eat up" coal and have an efficiency of about 7 per cent. Much fuel has been saved by changing over to electricity, the fuel officer reducing the extra ration of coal allowed.

Facilities are provided both for hire and hire-purchase (spread over seven years) of most of the more expensive appliances. Two-plate cookers can be hired for 12s. 6d. a quarter or hire-purchased for 14s., the corresponding figures for a three-plate model being 16s. and 18s. 6d. The charges for wash-boilers are 3s. 6d. and 4s. 6d. respectively, while water heaters can be hired for 5s. to 10s. and hire-purchased for 6s. 6d. to 14s. 6d. according to size. At present the new 20-gal dual-purpose under-the-draining-board water heater is supplied on hire-purchase only for 13s. 6d. and so are immersion heaters, 4s. 6d. for the 2-kW and 5s. for the 3-kW types. All repairs to consumers' apparatus are undertaken in the Department's own workshops. These are



Installing electrical equipment in a school canteen at Wrotham Road

and 54 immersion heaters (five). The July figures for these two appliances were respectively 38 and 54. The total number of appliances connected at the end of September under hire and hire-purchase schemes were: Cookers 3,754; self-contained water heaters 2,787; immersion heaters 189; wash-boilers 809; and refrigerators 173. Incidentally,



now too small to meet adequately the increasing demands, but Mr. Harrap hopes that larger premises will soon be available.

Apart from carrying on wiring work in Council offices (but not houses), the Electricity Department does not undertake installation work but passes on the orders to local registered contractors. No provision is therefore made at the moment for assisted wiring, installation work being available on a cash basis. The Council also restricts its trading activities to the apparatus mentioned and does not sell any of the smaller appliances. Since, however, all accounts are paid at the showrooms, Mr. Harrap feels that an opportunity is being wasted in this direction and a revision of policy is under consideration.

At the showrooms it is the practice to have as much apparatus as possible in operation and available for immediate demonstration. The Department is also a strong advocate of the merits of exhibitions for publicity purposes and in fact held one from October 7th to 12th, a special feature being the use of films to lead up to a cooking demonstration.

The remarkably large consumption of electricity for domestic purposes (1,724 kWh per consumer last year) is due not only to facilities for hiring and hire-purchase of apparatus but to the somewhat high gas tariff (1s. 5d. a therm) compared with exceptionally low charges for electricity.

Under the domestic two-part tariff the fixed charge is only 7½d. per £ of the net rateable value and the "unit" charge only ½d. in the summer quarter and ¾d. in the winter. Maintenance of this low tariff has been possible only because at present loan charges are diminishing at a faster rate than the loss incurred on domestic supplies. Last year there was a net surplus of £4,898 and £3,122 was contributed towards the relief of the rates. Since developments now in hand will soon cause loan charges to rise again, future results may necessitate a revision of the charges, though it will remain the policy of the Council to keep prices to their lowest level consistent with sound finance.

One result of the development of the domestic load is a load factor well above the average—40·4 per cent last year. This would have been higher still but for the transition from war to peacetime production and was in fact 46·5 in the previous year and 60 per cent in September this year. In view of the heavy cooking load, too, the weekday and Sunday demand is almost the same, the maximum weekday load recorded being 13,090 kW and the Sunday load 12,500 kW.

Close watch on the growth of load throughout the area is facilitated by the installation of maximum demand indicators in every one of the undertaking's 44 substations. This provides a most helpful guide as to which districts need their supplies strengthened.

## Municipal Reports

**Chichester.**—There was again a heavy increase in the demand during 1945-46, which the city electrical engineer and manager (Mr. E. H. Skinner) attributes not only to general development but also to the shortage of solid fuel causing a greater use of electric radiators. Fortunately the demands made on the system by this apparatus did not appear to be of a "snap" nature, for the output was correspondingly increased and the load factor remained high at 38 per cent. In the undertaking's area (excluding bulk supply to Bognor) 21·6 million kWh was sold, an increase of 11 per cent. During the year 159 cookers and 40 water heaters were installed by the Department and approximately one consumer in three now has an electric cooker.

Revenue from the sale of electricity amounted to £190,408 (£174,817), the average price obtained falling from 1·53d. to 1·47d. Total income rose by £15,999 while working expenditure was up by £21,636, and after providing for loan charges and taxation there was a net

loss on the year of £5,127 (against a profit of £363). Revised charges came into force at the end of the financial year.

**Hackney.**—Compared with 1944-45 there was an increase of 10·4 million kWh (14·1 per cent) in sales last year, the total, excluding bulk supply, amounting to 83·8 million kWh. Revenue from the sale of electricity in the Hackney area, £513,347 (against £462,530), averaged 1·470d. per kWh, a reduction of 0·042d. On the expenditure side, while the quantity of electricity purchased from the C.E.B. was 16·6 per cent greater, the cost rose by 27·3 per cent. The report on the undertaking (borough electrical engineer, Mr. E. A. Mills) states that a contributory cause of this was the accelerated depreciation of the generating plant due to the poor quality of coal and onerous working conditions. Total income was £605,654 (£542,043), working expenses were £492,524 (£398,745), and after providing for loan and other charges there was a net profit of £15,281 (£30,549).

# Employment and Wages

## Improvements in the Electrical Industry

**D**URING August there were increases in the number of people employed in the various branches of the electrical industry of Great Britain as compared with July, although in the cases of electrical engineering and electrical apparatus, cable, etc., manufacture, the level was still below that of mid-1945. The figures, which have been extracted from the October issue of the *Ministry of Labour Gazette* are shown in the accompanying table :—

In the electrical wiring and contracting industry the number of recruits in 1945-46 was 5,786 of whom 317 were girls; this compares with 3,020 (303 girls) in 1937-38. On the other hand there were fewer recruits to electrical apparatus, cable, lamps, etc., manufacture, the total being 7,452 (3,095 girls) compared with 10,082 (4,455 girls) in 1937-38.

The returns do not include separate figures for the electrical engineering industry, but it is

EMPLOYMENT DURING AUGUST (Thousands)

Branch	Males (14-65)			Females (14-60)			Total		
	Mid-1939	Mid-1945	August, 1946	Mid-1939	Mid-1945	August, 1946	Mid-1939	Mid-1945	August, 1946
Electrical engineering	105.9	106.1	109.0	28.0	69.7	46.7	133.9	175.8	155.7
Electrical wiring and contracting	38.9	32.0	42.6	2.8	5.5	5.2	41.7	37.5	47.8
Electrical apparatus, cables, etc.	116.4	112.2	129.8	79.5	167.7	118.1	195.9	279.9	247.9

Statistics of unemployment in the industry (United Kingdom) at September 16th were as follows:—Electrical engineering, 2,514 (730 females); electrical wiring and contracting, 1,307 (72 females); electrical apparatus, cable, lamps, etc., manufacture, 3,423 (1,488 females). These figures were all lower than those given for August 12th last.

### Changes in Workers' Earnings

Based on returns from 9,800 establishments, statistics in the *Gazette* show the average earnings of manual workers in various industries during noë week in July last, with the percentage increase over October, 1938 (July in the case of most engineering returns). The highest was 116s. 11d. (treatment of non-metalliferous mine and quarry products) and the lowest 69s. 4d. (clothing), the average being 100s. 5d. The greatest proportionate increase in earnings was in miscellaneous manufacturing industries (111 per cent), with an average rise for the whole group of 89 per cent.

Statistics included for the electrical industry show that the average earnings, with percentage increases over 1938 in parentheses, were as follows:—Electrical engineering, 103s. 2d. (103); electrical apparatus, cables, lamps, etc., manufacture, 96s. 6d. (93); electrical contracting, 93s. 10d. (65); and electricity supply, 110s. 2d. (60).

### Juveniles Entering Employment

The number of juvenile entrants to various industries is analysed in another article in the *Gazette*. It deals only with insurable employment and those juveniles whose first job after leaving school was in the particular industry concerned.

shown that for engineering as a whole new entrants numbered 39,707 (8,550 girls) against 34,840 (6,851 girls).

## Plastics Exhibition

**T**HE ever-growing use of plastics in industry and in the home is shown at the first post-war Plastics Exhibition which is now running at Dorland Hall, Lower Regent Street, S.W.1. The exhibition, which is sponsored by the *Daily Graphic* in association with the British Plastics Federation, is not a trade show, but is intended to present the story of plastics in a simple form with the object of placing them in correct perspective to other materials. The exhibition is divided into six main sections and there are also a number of rooms which are treated throughout in plastics.

On entering the exhibition the visitor is first given a brief description of the historical development of plastics and their origin and the various types now in existence, of which there are nearly thirty. From there he proceeds to the "Rainbow" room which has been specially designed to show the wealth of colour which the use of modern plastics can bring. From the electrical point of view chief interest is in the plastics arcade, which is a series of shop displays showing a selection of appliances and utensils for the home, and examples shown include electrical accessories, such as switches, plugs and sockets, lampholders, lampshades, electric irons and iron handles, a hair dryer casing, radio cabinets, table lamps electric clock cases, vacuum cleaners, bell accessories, insulated plier grips and meter cases. The exhibition closes on November 27th.

# COMMERCE and INDUSTRY

## Forty-Hour Week Discussions. Export Conference Arrangements.

**R**EPRESENTATIVES of the employers and trade unions in the engineering industry met in London last week to discuss the unions' claim for a reduction of weekly hours from forty-seven to forty without loss of pay. No decision was reached and the discussion was adjourned until November 26th.

### Electric Clothes-boilers

In the House of Commons last week, Mr. Collins asked the Minister of Supply whether electric clothes-boilers were now in plentiful supply; and why large quantities were advertised for sale by a London retail store, instead of being evenly distributed through normal trade channels.

Mr. Wilmot replied in the affirmative. After meeting essential needs, producers were, he said, free to dispose of their products as they wished.

### Transmitters for Sweden

Long- and short-wave transmitting equipment worth nearly £20,000 has been ordered from Marconi's Wireless Telegraph Co., Ltd., by the Swedish Telegraph Administration. The contract covers the supply of a 40-kW air-cooled long-wave transmitter which will be installed at Karlsborg in Southern Sweden and will be employed on the European telegraph service; and two 7-kW short-wave transmitters which are to be erected at Grimeton on the Swedish west coast and will be used to augment the existing telegraph service with America.

### New Aluminium Cable Company

It is understood that the Aluminium Wire & Cable Co. is being formed as a private company with an authorized capital of £500,000. According to the *Financial Times* the promoters are the British Aluminium Co., Ltd., Hawker Siddeley Aircraft Co., Ltd., and Tube Investments, Ltd. The proposed directors of the new company are:—Hon. G. Cunliffe and Mr. G. J. S. Boex (directors of the British Aluminium Co.), Sir Frank Spriggs and Mr. H. Burroughs (directors of Hawker Siddeley Aircraft Co.), Mr. E. Austyn Reynolds (a director of Tube Investments), and Mr. A. J. S. Aston (a director of Reynolds Rolling Mills, a subsidiary of Tube Investments).

### Radio Industry Council

In a summary of its first year's work the Radio Industry Council refers to the formation of a Technical Directive Board, representing the four constituent associations, to act in an advisory capacity to the Council, and the setting up of a Technical Executive Committee to

carry out the Council's day-to-day technical activities. Meetings between the industry and the Inter-Service Components Technical Committee (later transformed into the Radio Components Standardization Committee) have proved their value.

Standardization of screw threads and of valves was pursued during the year and in conjunction with the British Standards Institution much attention has been paid to the standardization of radio apparatus in matters affecting the user.

### Token Imports

Besides Canada, the United States, Belgium and Switzerland, the token imports scheme has been extended to include France, Holland, Denmark and Sweden. Token imports of the goods covered by the arrangement will accordingly be admitted from individual manufacturers in those countries at the same yearly rate of 20 per cent by value of each manufacturer's pre-war trade with the United Kingdom in the goods in question.

### Overhead Line Charts

Last year Mr. J. S. Forrest, Central Electricity Board, contributed to the *Electrical Review* a series of charts, with examples demonstrating their use, for calculating the load-carrying capacity and voltage drop of overhead lines. These covered various conductor sizes and lengths for a range of voltages from 400 to 264,000. This matter forms the basis of "Overhead-Line Charts" which has just been published by the Electrical Review, Ltd., Dorset House, Stamford Street, London, S.E.1, at 2s. 6d. It takes the form of a 20-page booklet with an attractive cover design and is a convenient reference book for constructors and operators of overhead line systems.

### Apprentices' Hostel

On November 2nd the Mayoress of Chelmsford (Councillor Mrs. H. M. Hodge) officially opened a new hostel for the apprentices of Crompton Parkinson, Ltd., at Phoenix House, Chelmsford, which is prominently situated in the London Road and adjoins the grounds of the social centre. The accommodation consists of spacious dining room, lounge and study rooms, and sleeping quarters for thirty. Games and hobby rooms are being provided in buildings in the gardens. After an inspection of the building, the guests took tea with the Mayor and Mayoress. Mr. T. H. Windibank, M.I.E.E., the works director, who presided, expressed the company's appreciation of the great assistance rendered by the Mayor and Mayoress to obtain much of the



equipment and furnishings, and of the interest they had taken in the project. After the Mayoress had addressed the apprentices, urging them to take every advantage of the study facilities which the house offered, Mr. J. C. P. Anderson, B.Sc., president of the Apprentices' Association, expressed thanks to the company for the generous provision.

### Imperial Preference Assurance

Sir Stafford Cripps, the President of the Board of Trade, in a letter to the National Union of Manufacturers, regarding its recent representations on the subject of imperial preference, reassures manufacturers that these preferences will only be contracted as part of a general settlement advantageous to this country.

### Selling Lighting Ideas

An excellent example is provided by Craven & Co., electrical contractors, 473, Norwood Road, London, S.E.27, of the way an energetic and imaginative retailer can build up his own reputation as a lighting engineer and at the same time educate the light-using public. The main showroom lighting scheme is arranged around the walls, the upper part acting as a shelf for stock such as lampshades, etc. Fluorescent lamps, some "daylight" and some "warm white," have been used with lightly diffused glass both top and bottom. Good lighting is provided for the articles displayed below, while the upward light brightens the ceiling and upper wall area, thus providing a well-diffused light throughout the showroom and illuminating the lampshades

and spread the light on the display material immediately below.

The illumination of a nearby café has been modelled on similar lines as a result of a visit to these showrooms.

### Women's Engineering Society

The Women's Engineering Society is holding its annual conference in Birmingham from November 22nd to 24th. The theme of the conference will be "Education and Training for Engineering," and papers will be read by Mr. C. A. Harrison, B.A., Mr. John Maslin, and Miss Verena Holmes, M.I.Mech.E. On Saturday, November 23rd, at the University, Edmund Street, the president and Council will give a dinner in the evening to engineers and industrialists, at which the speakers will be Miss Jennie Lee, M.P., and Professor M. L. E. Oliphant, F.R.S. Inquiries and applications for tickets should be made to the Secretary, Women's Engineering Society, 35, Grosvenor Place, London, S.W.1.

### Conference on Export

Delegates from all parts of Britain, representing a wide range of industries, will attend the Export Conference to be held by the Federation of British Industries in the Central Hall, Westminster, on Wednesday and Thursday, November 27th and 28th. Means by which Britain's export drive can be further strengthened will be defined and discussed and, in addition to F.B.I. member-firms, the Institute of Export and the British Export Trade Research Organization will be officially represented. The conference will be opened by Sir Clive Baillieu, K.B.E., C.M.G., president of the F.B.I., and Mr. Leslie Gamage, M.C., who is a member of the F.B.I. Grand Council, president of the Institute of Export and chairman of B.E.T.R.O., will preside.

At the first session Sir Stafford Cripps, M.P., President of the Board of Trade, will speak on the significance of exports to the national life and Lord Bennett (former Prime Minister of Canada) on the British export problem from the Dominion point of view. At succeeding sessions the speakers will include Sir John Woods, K.C.B., M.V.O., Permanent Secretary of the Board of Trade; Sir Norman V. Kipping, J.P., Director-General of the F.B.I.; Lt. Col. H. B. Riggall, J.P., president of the British Engineers' Association;



Modern lighting effectively demonstrated

placed on the upper glass and the array of fittings suspended from the ceiling. This arrangement requires only a wood frame and glass panels, the latter, although not absolutely essential for the lower section, helping to soften

Mr. E. W. Goodale, C.B.E., M.C., president of the Silk and Rayon Users' Association; Mr. E. A. Carpenter, J.P., vice-president of the Manchester Chamber of Commerce; and Sir Frederick Bain, M.C., deputy-president of the F.B.I. The addresses at the three final sessions will be followed by open discussion.

### New Plastics Company

Thomas De La Rue & Co., Ltd., announce that negotiations are proceeding for the formation of a new company, to be called National Plastics, Ltd., to acquire and amalgamate the undertakings of De La Rue Plastics, Ltd., and Moulded Products, Ltd. It is intended that Thomas De La Rue & Co., Ltd., shall have a substantial interest in the new company and that the members of the present board of De La Rue Plastics, Ltd., shall join the board of the new company under the chairmanship of Mr. B. C. Westall, with Mr. W. J. Merifield, chairman of Moulded Products, Ltd., as deputy chairman. Mr. H. P. Bridge, managing director of De La Rue Plastics, and Mr. H. W. F. Ireland, managing director of Moulded Products, have agreed to serve as joint managing directors of the new company.

### Reports on German Industry

The latest list of reports by investigating teams on various branches of German industry include the following:—B.I.O.S. 411. "Miscellaneous Electrical Factories in the British and American Zones" (3s. 6d.). B.I.O.S. 767. "Accumulator Manufacture in Germany" (3d. 6d.). B.I.O.S. 826. "Investigation of German Researches on Fine Structure of Metals with especial reference to X-ray Diffraction Techniques" (2s.). F.I.A.T. 617. "The Electrical and Technical Ceramic Industry of Germany" (13s.). F.I.A.T. 706. "Report on Selenium Dry Rectifier Developments" (5s.).

### Submarine Telephone Repeater

In the reference in the *Electrical Review* of October 25th, to the submarine telephone cable recently laid between this country and Germany, it was stated that the Anglo-Irish co-axial cable was air-insulated. We are advised by the General Post Office that owing to a clerical error the information it supplied to us was incorrect in regard to the latter. The Anglo-Irish cable is insulated with paraggutta, air being used for inland cables.

### Smelting Company's Centenary

During October the Sheffield Smelting Co., Ltd., completed 100 years under its present title, although it was established over 180 years ago.

### Synchronous Clock Installations

Judging from contracts for new electric clock installations and conversions from former mechanical timekeepers recently carried out by

Gillett & Johnston, Ltd., the electric clock seems fast becoming predominant. St. Mary's Church, Portsea, Hants, is one of the most important of the conversions from former weight-driven clocks, a large synchronous timepiece being driven by a special high-torque motor. Both St. Marychurch Town Hall, Torquay, and the Treboeth Public Hall, Swansea, have 2 ft 6 in. dials, the latter installation being glazed with opal glass for internal illumination. A motor-driven hour striking unit sounds the hours on a new 1½-cwt bell of Langford Church, near Maldon, Essex.

### Contract Price Adjustment Formulæ

The latest figures for the British Electrical and Allied Manufacturers' Association contract price adjustment formulæ are as follows:—Rate of pay for adult male labour (November 9th) 103s. (no change). Cost of material: The index figure for intermediate products published by the Board of Trade on November 9th was 199.9, which is the figure for October (against 198.8 for September).

### Batti-Wallahs' Luncheon

The next luncheon of the Batti-Wallahs, Society will be held at the Connaught Rooms' Great Queen Street, W.C.2, on November 28th. The principal guest will be Lt. Col. N. Elliott, general manager and chief engineer of the London and Home Counties J.E.A. who will speak on "Electricity in the Service of the 21st Army Group."

### American Rubber Buying

Following the announcement by Mr. Marquand last week that the Board of Trade would cease to purchase rubber by January 1st, it is reported by the *Wall Street Journal* that the United States Government also intends to abandon the bulk purchase of rubber, probably on January 1st but by next Easter at the latest. Measures are being taken to exercise some form of control to guarantee a market for the great synthetic rubber industry.

### "Export Trader" Review

A special issue of the *Export Trader*, one of the Associated Iliffe journals, devoted to the interests of Britain's overseas trade, is now in course of dispatch to readers in sixty-eight countries. The Annual Review of Design and Production, as this issue is called, contains a complete survey of Britain's progress in the field of cars, lorries, accessories and service equipment.

### Northampton Electrical Association

The October meeting of the Northampton and District Electrical Association was held at the College of Technology, Northampton, when a paper on "Telephones" was read by Mr. E. J. Bagnell of the G.P.O. Engineering Department.

With the aid of slides the development of the present automatic system from the original efforts of Alexander Graham Bell was traced. An automatic telephone exchange was on show and the sequence of operations was demonstrated. Questions which followed the paper were answered by practical demonstrations on the actual equipment.

### Bideford Farm Exhibition

An Electricity on the Farm Exhibition organized by the Bideford & District Electric Supply Co., Ltd., was held recently in the Bideford Drill Hall, the miniature shooting range of which was converted into a demonstration kitchen for the purpose of giving daily electric cooking demonstrations and advice to farmers' wives. In the main hall means of



Electricity on the Farm Exhibition at Bideford

obtaining hot water for the dairy and house were exhibited. In the same section there were pumping sets, electric motors, an "Essex" mill in regular use for demonstrations, etc.

The domestic equipment stand included every form of appliance from electric irons up to washing machines and refrigerators.

There was a byre and dairy equipment section and a display of general equipment.

The general layout of the main hall was enhanced by E.D.A. show-stands, posters, display material and model kitchens. In a separate room over the machinery hall, sound film shows on modern farming and rural topics were given each evening. There was an excellent attendance throughout the week.

### Engineering Lectures in Manchester

The Regional Advisory Council for Technical and Other Forms of Further Education for Manchester and District has published a syllabus of courses in electrical and mechanical engineering in its Region during the session 1946-47. The publication is in two parts, the first giving details of evening courses in specialized branches

of engineering and the second the names of post-advanced courses in engineering which form part of the normal provision at technical colleges in the Region. Further particulars can be obtained on application to the hon. secretary of the Regional Advisory Council, Education Offices, Deansgate, Manchester, 3.

### Engineering Training

Ransomes & Rapier, Ltd., Waterside Works, Ipswich, have issued a pamphlet giving details of their engineering training scheme for boys and apprentices. The period of training is five years with a two or three years' post-graduate course. With this pamphlet the company is also issuing an illustrated folder listing the range of its products.

### Brush Company's Scheme

In order to provide more room at the Loughborough works of the Brush Electrical Engineering Co., Ltd., for the manufacture of electrical products, the section of the works manufacturing small Diesel engines is to be transferred to Wishaw, Lanarkshire, and the section concerned with large engines is to be moved to Leeds. It is unlikely that the moves will be carried out before the end of 1947. One of the biggest problems connected with the move is the provision of houses for workers.

### New American Factory

The General Electric Co. of America is to build a \$20 million plant for the manufacture of turbines and electric generators in Schenectady, according to a statement by Mr. C. E. Wilson the president of the company. A *Reuter's Trade Service* (New York) message says that the plant should be completed about twenty months after the start of construction, the date of which has not been fixed. Installation of equipment will require six to nine months more. The turbines manufactured in the new building will be of from 20,000 to 200,000 kW capacity.

### Ideal Home Exhibition

The *Daily Mail* Ideal Home Exhibition is to be revived next year and will be held at Olympia from March 4th to 29th. At the last exhibition held in April-May, 1939, the electrical industry was well represented.

### Resin-coated Yarn

Mr. E. B. Higgins, of Imperial Chemical Industries, Ltd., addressing the Blackburn Textile Society on October 25th on the use of resins in the treatment of yarns, said that one of the chief outlets envisaged by the newer methods was for the production of yarns for the manufacture of sleeveings and braidings used in the electrical trade. These outer wire coverings had to withstand a considerable amount of abrasion in the course of their daily usage and at present protection was given by



a starch treatment. Because of the heavy starch loading, however, the yarn provided a rich feeding ground for airborne micro-organisms and, in consequence, was susceptible to rapid mildew growth. The growth needed a moist atmosphere, attracted water from the air, and might lead to serious electrical defects as a result. By using a resin-coated yarn, the required resistance to abrasion was easily obtained and the danger due to mildew growth was eliminated. Also the high insulation properties of resins made them particularly suitable for this work.

### New Scottish Industrial Estate

The Vale of Leven Industrial Estate, near Glasgow, was formally opened on Thursday last week by Sir Philip Warter, of the Board of Trade. The first tenants will be the Bowser International, Ltd., which specializes in refrigerating plant, electrical gear for garages, and airport equipment, and expects to employ 600 workers in its factory which should be ready in a year.

### Rubber Bonded to Metal

Following the success of the Rubber-Bonded-to-Metal Exhibition held in Birmingham last June, Rubber Bonders, Ltd., are holding a similar display from December 16th to 20th at the Chorlton Town Hall, All Saints, Manchester. Admittance is by business card, or invitation ticket available on application to the company at Flexilant Works, Dunstable.

### Eire's Electrical Imports

From the recently published official returns of the imports and exports of Eire during the first half of the current year, the accompanying table has been compiled showing the imports of

Class	Jan.-June, 1945	1946
Electric motors	£ 8,178	£ 29,077
Electrical measuring instruments and apparatus	391	26,609
Other electrical machinery	34,634	137,669
Vacuum cleaners	1,723	22,663
Dry batteries and parts	3,929	6,829
Electric lamp bulbs	14,503	25,811
Electric fires, kettles, irons, etc.	5,898	26,740
Electric cooking apparatus and parts	1,738	22,341
Electric lighting accessories, fittings and parts	15,419	50,580
Electric wires and cables	23,182	166,871
Copper wire in coils, uninsulated	22,614	83,004
Telegraph and telephone apparatus	23,775	85,745
Wireless apparatus	30,140	127,093
Totals	£186,124	£811,032

electrical machinery and allied material during that period as compared with the corresponding six months of 1945. It will be seen that the trade has undergone a striking improvement,

the gross imports having risen from £186,124 to £811,032, an advance of over 330 per cent.

### Trade Publications

**English Electric Co., Ltd.**, Queen's House, Kingsway, London, W.C.2.—Brochure (ST.102) of tabulated details, with customers' names, of turbo-alternator sets above 5,000 kW now being built or installed since 1920.

**Mullard Wireless Service Co., Ltd.**, Century House, Shaftesbury Avenue, London, W.C.2.—Folder (MV.784) containing tabulated basic data, prices, diagrammatic illustrations of base connections and dimensions of lower power transmitting valves for amateurs.

**General Electric Co., Ltd.**, Magnet House, Kingsway, London, W.C.2.—Illustrated catalogue with separate price list of fluorescent lamps, fittings and accessories.

**Ransomes & Rapier, Ltd.**, Waterside Works, Ipswich.—Illustrated folder (No. 2/454) on mobile self-priming water pumps of various types and sizes driven electrically or by Diesel or petrol engines.

### Dissolution of Partnership

The partnership between Messrs. J. E. Lawton, J. Brown and G. A. Pickles, carrying on business as B.A. Products, electrical and mechanical engineers, at 42, St. Peter Avenue, Bethnal Green, London, E.2, has been dissolved. Mr. G. A. Pickles will attend to debts and carry on the business under the style of B.A. Products.

### Five-day Week

William McGeoch & Co., Ltd., state that they have adopted the five-day week. No goods will be received or dispatched on Saturdays but a small staff is at present available for approximately two hours to deal with urgent correspondence.

### Trade Announcements

The Electro Dynamic Construction Co., Ltd., has appointed Mr. W. A. Clare, 40, Houldsworth Street, Glasgow, C.3, (Telephone: Central 2620; telegrams: Bilgement, Glasgow) as its agent for Scotland for Admiralty, marine and all its other products, with the exception of radio power plant, which will continue to be handled by Mr. C. M. Sinclair of 93, Waterloo Street, Glasgow, C.2.

Kautex (Plastics), Ltd., has formed Silicon (Organic) Developments, Ltd., to take over the "Kex" products side of its business. The new company will operate from 11, Cavendish Place, London, W.1. (Tel. Langham 1373). Kautex (Plastics), Ltd., remains at Elstree, Herts.

A. D. Davidson Electric Co. has now changed its head office from 82a/84, Hurst Street, to 62, Granville Street, Birmingham, 1.

Oliver Melville & Co., electrical contractors, have removed to 66, High Street, Kirkcaldy.

## Forthcoming Events

**Monday, November 18th.**—LONDON.—I.E.E. London Students' Section. 7 p.m. The Students' Lecture. "The Trend of Modern Telecommunication," by A. H. Mumford.

**BIRMINGHAM.**—Grand Hotel. Birmingham Electric Club. "The German Electric Supply System, 1933-1946," by G. R. Peterson.

**Tuesday, November 19th.**—LONDON.—Magnet House, Kingsway, W.C.2, 6.15 p.m. "Notes on Present-day Cable Practice," by J. R. Harding. Joint meeting of A.S.E.E. with the Institution of Engineers-in-Charge.

**EDINBURGH.**—Freemasons' Hall, 96, George Street, 7.30 p.m. Edinburgh Electrical Society. Public lecture (with lantern slides). "Television," by A. B. Howe.

**Wednesday, November 20th.**—LONDON.—Institution of Electrical Engineers, Radio Section, 5.30 p.m. "The Voltage Characteristics of Polythene Cables," by R. Davis, A. E. W. Austen and Prof. Willis Jackson.

I.E.E. London Students' Section, 2.30 p.m. Visit to the New Southgate works of Standard Telephones & Cables, Ltd.

At E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, W.C.2, 7 p.m. Electrical Power Engineers' Association (London Local Group).—"Some Modern Developments in Switchgear," by A. T. Crawford.

**LOUGHBOROUGH.**—The College, 7 p.m. I.E.E. South Midlands Students' Section. "Lightning Protection of H. V. Systems," by J. Mitchell.

**Thursday, November 21st.**—LONDON.—Institution of Electrical Engineers, 5.30 p.m. "The Development and Design of Colonial Telecommunication Systems and Plant," and "The General Planning and Organization of Colonial Telecommunication Systems," by C. Lawton and V. H. Winson.

London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6 p.m. British Institution of Radio Engineers. "The Ionosphere and the Transmission of Radio Waves," by Prof. G. W. O. Howe.

**MANCHESTER.**—Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Centre (Radio Group). "A Method of Transmitting Sound on the Vision-Carrier of a Television System," by D. I. Lawson, A. V. Lord and S. R. Kharbanda.

**Friday, November 22nd.**—LONDON.—Institution of Electrical Engineers, Measurements Section, 5.30 p.m. "The Design of an Ellipsoid Voltmeter for the Precision Measurement of High Alternating Voltages" and "Calibration of Uniform-Field Spark-Gaps for High-Voltage Measurement at Power Frequencies," by F. M. Bruce.

**BIRMINGHAM.**—Imperial Hotel, Temple Street, 6 p.m. Illuminating Engineering Society (Birmingham Centre). "Lighting in Photography," by G. A. Jones.

Women's Engineering Society. Annual conference (from November 22nd to 24th).

**PONTYPRIDD.**—Association of Mining Electrical and Mechanical Engineers (South Wales Branch), 6 p.m. Discussion on "Electricity in Mines during the year 1945," opened by G. H. Harvey.

**Saturday, November 23rd.**—SHEFFIELD.—The University, 2 p.m. Institute of Physics (Industrial Spectroscopic Group). "The Development of the Metro-Vick Spark Unit," by Messrs. Braudo and Clayton.

**HEBBURN-ON-TYNE.**—I.E.E. North-Eastern Students' Section, 2.30 p.m. Visit to the Bushing Company.

**Monday, November 25th.**—NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "Rural Electrification: The Use of the Single-Phase System of Supply," by J. S. Pickles and W. H. Wills.

**BIRMINGHAM.**—The University, Edmund Street, 6 p.m. I.E.E. South Midland Centre. Lecture summarizing all the papers and lectures given at the Radiolocation Convention, 1946, by R. A. Smith. (Joint meeting with the Radio Group.)

**BRISTOL.**—The University, 5 p.m. I.E.E. Western Centre (Installations Group). "Engineering Principles applied to the Design of Water Heating Installations of the Solid Fuel/Electric Type," by R. Grierson and Forbes Jackson.

**Tuesday, November 26th.**—LONDON.—At the Dorchester Hotel, Park Lane, W.1, 1 p.m. Federation of Associations of Specialists and Sub-Contractors. Annual luncheon.

**COVENTRY.**—Coventry Electric Club. Film show.

## Ayrshire Board's Activities

**DURING** the year ended May 15th last, 2,392 new consumers were connected to the system of the Ayrshire Electricity Board, making the total 62,566 (42,303 in sixteen burghs and 20,263 in rural districts). In its area of 1,100 sq miles the Board last year sold 172.7 million kWh, a reduction compared with 1944-45 of 27.6 million kWh, wholly due to contraction of the industrial load (other supplies increased by 9.8 million kWh).

Dealing with industrial load prospects, the general manager (Mr. W. C. Bexon) records that a new industrial estate is being built at Kilwinning, a large factory at Kilmarnock is in course of erection, and another large factory in the northern area is being fitted with electrically driven machinery, as well as electrode boilers for heating and process steam. The lace mills which were closed down through concentration of industry are now mostly in production again.

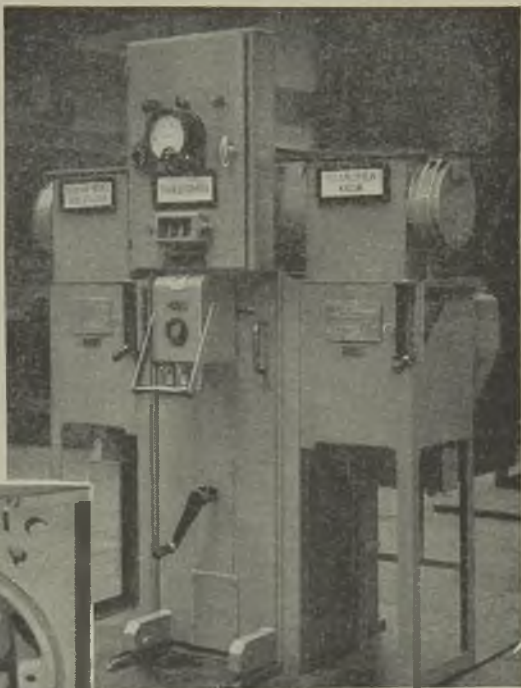
The Board's total revenue fell by £61,861 to £737,656, whereas working expenses rose by £54,527 to £690,521; after meeting loan charges, etc., the net result was a profit of £115.

# Production in South Wales

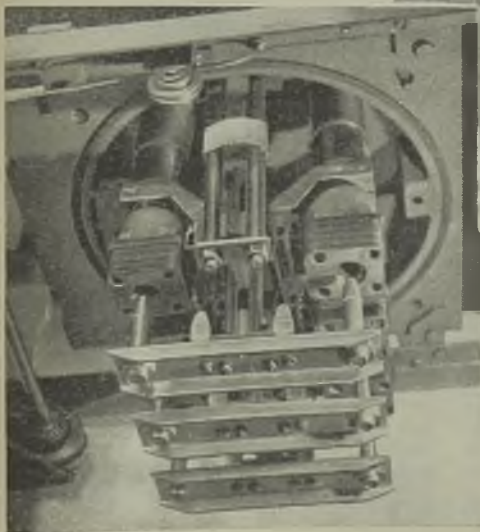
## Manufacture of Switchgear and Transformers

**I**N our issue of October 18th we referred to the recent enterprise of South Wales Switchgear, Ltd., in the establishment of a new factory at Blackwood for the manufacture of domestic appliances. It is proposed shortly to build a further new 25,000-sq ft factory there as an extension to which switchgear manufacture will be transferred later. In the meantime production continues at Treforest and the range of equipment covered includes 6.6-kV and 11-kV switchgear, tested up to 250 MVA and available as air-insulated or compound-filled gear and in single bus and double bus arrangement. When we visited the factory recently, gear in course of construction included items of large contracts for the British Nylon Co., Cardiff Corporation and many other municipalities. There was also a considerable amount of ring-main metalclad switchgear as well as several examples of kiosks incorporating 11-kV switchgear, power transformers and l.v. gear, one just completed being for Tredegar. In addition to these the products include 400-V air-insulated metalclad switchboards of up to

25 MVA rating and h.r.c. switch and fuse gear. Large contracts are also in hand for power transformers which will ultimately occupy the whole of the production capacity at Treforest. Types up to 1,000-kVA capacity at 33 kV and intermediate voltages are made and we saw numerous 300-, 400- and 500-kVA units in various stages of construction. At the moment, although the company



Compound-filled ring-main metalclad unit just completed for Cardiff Corporation and (left) 1,200-A, 250-MVA circuit-breaker for the British Nylon Co., showing contacts



supplies on-load tap-changing gear, it does not manufacture its own and we were specially interested, therefore, to see the prototype of a new tap-changing switch now being developed for incorporation in the company's gear. Small single-phase and three-phase low-voltage air-insulated transformers are now being made in sizes up to 30 kVA



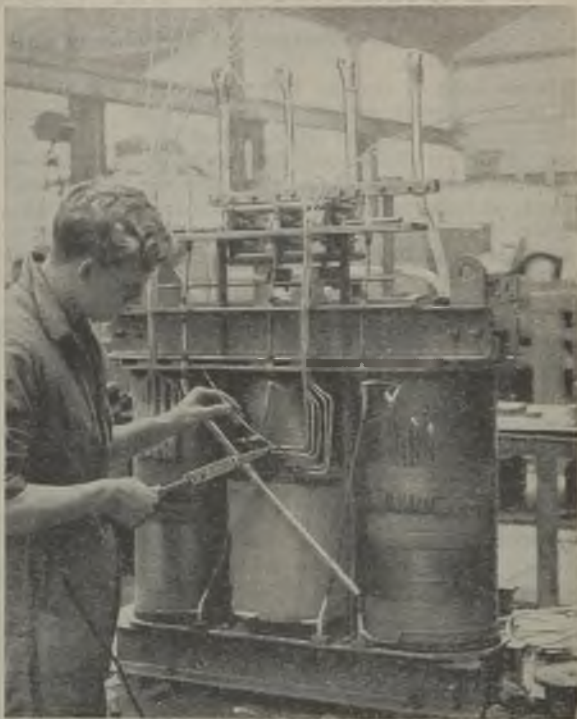
and pole-mounting transformers up to 75 kVA. An ingenious device for measuring transformer ratio constructed by the company's own engineers greatly facilitates manufacture. The "Syntron" vibration feed is another product which the company is making for its associated concern, the International Combustion Co., Ltd.

Items produced during the war for the Admiralty included a large variety of electrical plant, heavy-current ring-main units and large switchboards for all classes of vessels, and panels for Metadyne gun-control and for radar equipments. Other war-time work was the production of torpedoes and mines; a newly designed type of the latter made in Treforest was subsequently laid in large numbers in the Kiel Canal and the Baltic before "D" day.

The change-over from war to peacetime activities has proceeded very quickly and the rapid expansion programme has been achieved by recruiting personnel both from the locality and all over the country. Having started manufacture so comparatively recently, the company has been in the happy position of being able to adopt the most up-to-date designs and methods.

Although so much of the work undertaken, especially in switchgear, is to meet special requirements, quantity production is very much greater than one would have expected in a factory of this kind. This has been made possible by keeping mass produced and

jobbing lines as separate as possible and by the standardization, wherever practicable, of



Apprentice at work on a 300-kVA transformer

components which can be incorporated in apparatus required to meet any special demands. In certain respects jiggling is employed quite as much as in larger factories, both fabricating as well as machine shop jigs being extensively utilized. Considerable use is also made of extruded sections and pressings.

## Railway Coach Lighting

**S**OME idea of what the new Great Western rolling stock will be like was gained at a pre-view of a redecorated and newly furnished train that was inspected at Paddington on Tuesday of this week. The only feature of electrical interest is the artificial illumination, some of the coaches being provided with fluorescent lighting. In the first-class compartments two tubes are concealed behind the front of the luggage rack and another is fitted centrally in the ceiling. In the third-class compartments there are two ceiling fittings.

In the first-class dining saloon normal bulb

lamps are inset behind peach-coloured glass discs over the tables, while decorative circular panels are recessed centrally in the ceiling. The third-class saloon is similarly treated, except that the recesses are square and the satin-finished glassware is green. The sleeping cars have "plasticized" interiors with plastic shades for the lamps over the bed-head, wall mirror and wash basin. General lighting of the compartments is by flush fittings covered with etched glass, each lamp being separately controlled with all switches conveniently grouped alongside the bed.

# RECENT INTRODUCTIONS

## Notes on New Electrical and Allied Products

### Exhaust Fans

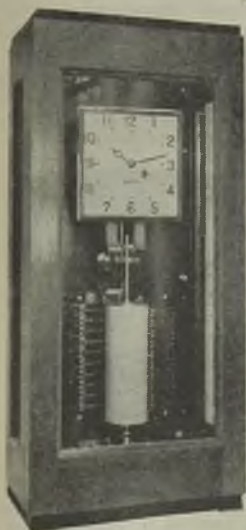
A RANGE of exhaust fans is being made in England by DELCO-REMY & HYATT, LTD., 111, Grosvenor Road, London, S.W.1. Both 8 and 10 in. models are available for three- and single-phase operation. They are mounted on rubber vibration absorbers in a cast aluminium ring arranged for three-hole fixing with a terminal box cast in the ring.

The "Delco" motor is of the shaded-pole type to impart adequate starting torque. The yoke and oil reservoir are cast integrally in one piece and the stator coils are treated to withstand humid atmospheres. The laminated rotor core is surrounded by die-cast aluminium, revolving on a stationary shaft, the rotor-end forming a boss to carry the aluminium fan blades. Cork and fibre washers are inserted for cushioning end play.

### New Gent Products

A new range of synchronous electric clocks shortly to go into production at GENT & Co.'s Faraday Works, Leicester, has reached the

prototype stage. Styling has been carried out by an authority on design and interior decoration, and new materials, notably anodized aluminium and Perspex are employed. A cheaper and more conventional model has a laminated plastic case in two colours. Several neat wall clocks will also make their appear-



Gent & Co. watchman's clock and underdome buzzer

ance soon. Another new product is a 3-in. underdome bell in which the whole of the mechanism is housed inside the dome. This unit is also available as a buzzer. Among the many revisions of design which are being carried out

is a new watchman's clock with a much more compact recording mechanism, and a cabinet of modern design.

### Battery Tester

The high-discharge battery tester made by PARTRIDGE, WILSON & Co., LTD., Davenset Electrical Works, Evington Valley Road, Leicester, is designed for testing the voltage of



Davenset high-discharge battery tester

lead acid or alkaline accumulator cells under a discharge of 100 to 140 A. Completely moulded in shock- and heat-resisting black bakelite, the shape is attractive and practical. The plane of the contact prongs and voltmeter dial is at a convenient angle to the pistol grip handle and good contact pressure may be transmitted to the prongs, which are suitably spaced for any type of cell. The dial, illuminated by a concealed light, is calibrated and zoned in different colours indicating at a glance whether the cell under test is "Dead," "Medium" or "Good" and the instrument has a centre zero.

### Improving Room Atmospheres

A wood-cabinet unit of polished walnut finish, or alternative colours, for precipitating tobacco smoke and deodorizing room atmospheres has been named "Ozono" by E.C.D., LTD., Tonbridge. The cabinet has wire-mesh grilles in its sides and a switch at the front, the loading being 12 W, for connection to a.c. mains. Model E/2, measuring 14.5 by 10.5 by 7 in., is suitable for up to 20,000 cu ft of air, or about half that volume under adverse conditions.

### Brass-Alloy Electric Iron

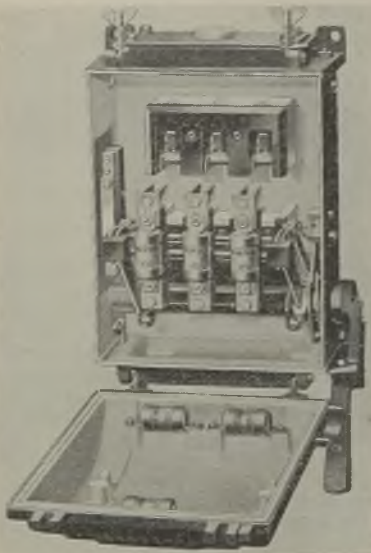
One of the range of household clothes irons made by CRAFT ELECTRICAL INDUSTRIES, LTD., Tonge Lane Works, Whitworth, near Rochdale, Lancs, is the patented "Quickheat" which is totally die-cast of a brass alloy originally evolved for the Admiralty. It is a bright gold colour when hot and will not rust, so cannot soil linen; there is no plating to peel, thus obviating "plucking" of silk and other fine fabrics. The number of components is less than



half the normal; a one-stud locking device is employed and a standard element procurable from any dealer can be fitted for replacement without needing to return the iron to its makers. There are no loose connections or pins and the one-piece plastic handle embodies a patented terminal box that enables the connector cord to be renewed quickly. Asbestos deflector plates prevent overheating of the upper part of the body.

### Redesigned Switches

The well-known range of distribution switches known as the "Glasgow-Rex" series has been redesigned for more arduous duties by the



Redesigned M.E.M. fuse-switch

MIDLAND ELECTRIC MANUFACTURING CO., LTD., Reddings Lane, Birmingham, 11. Ratings are now available from 30 to 200 A for use on double-pole, triple-pole, or triple-pole and neutral circuits, either as switches or fuse-switches.

A feature is their simple interchangeability; switches can be readily converted to fuse-switches by removing links and substituting cartridge fuses of the "Kantark" high rupturing capacity type. Also triple-pole models can be converted for triple-pole and neutral operation by means of a special link, which is attached by two screws to the side of the case. The box is strongly constructed and has been "styled" by a well-known industrial designer.

### Simple Lamplock

A simple lamp locking ring, which is suitable for both brass and moulded holders, has been patented by Mr. C. Mancha-Bennett and, like

his other devices, is being produced by LAMLOK, LTD., 163, Vivian Avenue, Wembley, Middlesex. It is known as the "B o B" ring and is made in one piece and one type only. It can be used in tunnel shades and skirted holders.

The ring is slipped over the lamp cap to rest on the shoulder. After it has been turned until the cap pins register with the peg and locking screw of the ring, the lamp can be bayoneted home in the ordinary manner. The locking screw can then be tightened with the aid of a "Lamlok" key, which can be carried in the pocket like a pencil, no other tools being needed. The ring is quite free on the lamp as well as the holder, so that neither is subjected to any strains.

### Sound-film Projector

A sound-film projector of the 16 mm size designated type-301 is being placed on the market by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby. It is entirely British made and half the weight of its predecessor, furnishing twice the screen illumination and twice the volume of sound.

The projector is driven by a constant-speed motor of the synchronous capacitor type, so avoiding sound distortion due to speed variation. The machine is energized through a mains input transformer, which serves the motor, lamp and amplifier; it incorporates a number of constructional improvements and is built on the unit principle for quick replacement of complete sections and ready accessibility to simplify servicing.

All controls are grouped on one side of the projector, which weighs 39 lb and, with spare parts, fits into a carrying case less than 9 in. wide. A 12 in. permanent magnet loudspeaker is mounted in a second carrying case, with accessories.



Coloured toaster of modern form

### Enamelled Toaster

A household toaster has been introduced under the "Clem" trade name by CLAYTON, LEWIS & MILLER, LTD., Manilla Road, Southend-on-Sea, Essex. It has a die-cast aluminium body, modernistic in shape, finished in non-chipping enamel of pastel shades, the "doors" and other parts being chrome-plated. A reversing device is incorporated.

**Imports into Ceylon.**—During the first eight months of the current year imports of electrical goods and apparatus (not machinery) into Ceylon were valued at Rs.2,235,320, compared with Rs.1,069,964 in the corresponding period of 1945.



# ELECTRICITY SUPPLY

## London School Lighting. Manchester's 200,000th Consumer.

**Cheadle and Gatley.—HIGHER CHARGES.**—When a report by the Electricity and Lighting Committee relating to proposed increases in charges came before the Urban District Council, Dr. Gaubert moved that the subject should be referred back with a view to still further increasing the charges "as this would have the immediate and welcome effect of cutting consumption." Only four members, however, voted against the report of the Committee.

**Chichester.—APPEAL TO CONSUMERS.**—In September last year work was started on an £85,000 scheme for cable and plant reinforcement, but delays have been experienced and the first section will not be in operation before mid-December. The electrical engineer and manager (Mr. F. H. Skinner) has therefore appealed to consumers to limit their use of apparatus during peak periods.

**Dover.—SURPLUS ON YEAR'S WORKING.**—The accounts of the Electricity Department for the year ended March 31st last show a net profit of £14,299.

**Ecceles.—SUPPLY TO ROYAL ORDNANCE FACTORY.**—The Electricity Committee is to provide an additional supply to the Royal Ordnance factory, Patricroft, at a cost of £30,794.

**Essex.—REPRESENTATIONS BY FARMERS.**—The Essex Farmers' Union has sent a resolution to the N.F.U. in which it "calls upon the Government to deal with the difficulties that are preventing the electricity supply industry from developing rural electrification." Members instanced cases in which electric motors had been on order for two years and installation schemes had been held up for long periods because of lack of materials.

**Exeter.—BULK SUPPLY TO EXE VALLEY CO.**—The Electricity Committee is seeking sanction to borrow £47,000 for cables and plant in connection with the increased bulk supply required by the Exe Valley Electricity Co., Ltd.

**Farnworth (Lancs.).—PROPOSED TARIFF REVISION.**—It is estimated that the electricity undertaking will incur a loss of £6,500 in the present financial year, and to meet the situation the Electricity Committee has decided to make application to the Electricity Commissioners for approval of an increase of 10 per cent in tariffs to be put into operation as from April 1st, 1947, and to withdraw the invested reserve fund of £8,033. The electrical appliance hire scheme is to be discontinued.

**Finchley.—LOAN APPLICATION.**—The Electricity Commissioners have asked for details of the proposals of the Corporation Electricity Committee for extensions at a cost of £118,857 for which loan application has been made.

**Friern Barnet.—SODIUM LIGHTING.**—The U.D.C. Highways Committee has approved a scheme for the provision of sodium discharge lighting at a cost of £6,500.

**Fulham.—ELECTRICITY FOR EX-SERVICEMEN'S FLATS.**—Electricity is to be installed in place of gas in the flats of disabled ex-servicemen at the Sir Oswald Stoll Mansions if the tenants wish it. At a meeting of the Sir Oswald Stoll Foundation Council an estimate of £10,000 was submitted for this work, towards which the Fulham Council will make a grant.

**Hawarden.—UNDERTAKING "COMES OF AGE."**—The electricity undertaking's twenty-first anniversary was celebrated by a dinner given by the Rural District Council at Queen's Ferry. Mr. L. F. Bartle (Penmaenmawr), chairman of the North Wales and South Cheshire Electricity Association, said that the undertaking was sturdy and strong and was bigger than many of much greater age. Mr. L. McKeon said that Hawarden was the second largest undertaking operated by a rural district Council and to-day it had 7,516 consumers and 116 miles of transmission lines.

**Leigh (Lancs.).—STREET LIGHTING CHANGE-OVER TO ELECTRICITY.**—The Electricity and Highways Committees on Friday last week inspected the second section of the converted street lighting in Manchester Road, a length of three-quarters of a mile. The borough electrical engineer, Mr. T. S. Parkinson, explained that the road was lighted to the Ministry of Transport Departmental Committee's recommendation for main road lighting (Group A). The type of lighting is 400-W high-pressure, mercury vapour fluorescent. After the inspection, tributes were paid to the chairman of the Electricity Committee and the electrical engineer on the speed with which the work had been carried out, since it was the second road to be so lighted within two months, and to the great improvement effected.

**London.—LIGHTING IN SCHOOLS.**—As the first instalment of a scheme to ensure that as soon as practicable all schools shall be lighted by electricity, the London County Council has authorized the installation of electricity in twenty schools, and has sanctioned an expenditure not exceeding £38,000.

**ELECTRICAL INSTALLATIONS AT BECONTREE.**—At a cost not exceeding £1,800, the L.C.C. has agreed to the installation of electricity in 120 houses on the Ilford section of the Becontree estate.

**PROPOSED HIGH-VOLTAGE CABLES.**—The London Power Co., Ltd., has notified the London and Home Counties J.E.A. of its application to the Electricity Commissioners for consent to the establishment of main transmission lines

as follows: Four 3-core 22-kV cables from Short's Gardens to Birkbeck Street, E.2, for the bulk supply to the Bethnal Green Corporation (estimated cost £115,000); two 3-core 22-kV cables from Crutched Friars to John Street (£56,000); and one 3-core 66-kV cable from Battersea power station to Gypsy Corner, Acton (£160,000), for reinforcing the bulk supply to the Metropolitan Co.'s system.

**PROPOSED BANKSIDE STATION EXTENSIONS.**—The City of London Electric Lighting Co., Ltd., has applied to the Electricity Commissioners for consent to an extension of the company's Bankside generating station. The plant proposed to be installed comprises two turbo-alternators each having a maximum continuous rating of 50,000 kW, complete with the necessary ancillary plant, the associated boiler plant, and the necessary buildings and civil engineering works.

**Long Eaton.**—RING MAIN.—A scheme for improving the high-voltage system and for completing an 11-kV ring main at Toton to cope with increased load has been approved by the Urban District Council. The cost is estimated at £14,000.

**Luton.**—HIRE-PURCHASE.—The Council has approved a scheme for the hire-purchase of domestic apparatus by the Electricity Department, commencing with saucepans and kettles.

**RATE CONTRIBUTION.**—The undertaking is contributing £13,841 in aid of the rates, £15,000 is to be transferred to the reserve fund and £2,150 applied to deferred repairs.

**SERVICES IN NEW HOUSES.**—A request was recently received from the National Union of General and Municipal Workers that the Council should increase the proportion of houses (23 per cent) served with gas on new estates. It was decided that a report should be prepared on the comparative costs to consumers and the estimated cost of providing both services on the Farley Hill estate.

**Manchester.**—200,000TH CONSUMER.—The Corporation Electricity Department recently connected the 200,000th consumer to its mains and to mark this milestone on November 8th at the electricity showrooms, Alderman Sir William Walker, chairman of the Electricity Committee, presented Mrs. A. R. White, wife of the 200,000th consumer, with a set of aluminium saucepans. The Department has been supplying electricity for over fifty-three years, and in the first decade only 4,500 consumers were connected. The 100,000 mark was reached at the end of the fourth decade. This period marked the beginning of the scheme of wiring in existing premises on hire-purchase terms, and very soon the flow of applications grew into a flood, reaching the record figure of 20,583 new connections in the year 1937. The total number of consumers is distributed roughly into the following groups:—Bulk supplies to distribution undertakings 5; large industrial users 285; smaller industrial and commercial users 32,900; domestic users 166,810.

**Newcastle-on-Tyne.**—EXTENSION OF TIME.—The City Council is to apply for an order extending for a further twelve months the Council's right to take over the local undertakings of the North-Eastern Electric Supply Co., Ltd., and the Newcastle-on-Tyne and District Electric Lighting Co., Ltd.

**Penge (Kent).**—LIGHTING SCHEME.—At a cost of £5,300 the street lighting is to be changed from gas to electricity.

**St. Marylebone.**—SUPPLY IMPROVEMENTS.—The Electricity Committee is to improve the distribution system and erect four new substations at a cost of £55,000.

**Scotland.**—SEVENTH CONSTRUCTIONAL SCHEME.—Only one formal objection has been lodged against the seventh hydro-constructional scheme of the North of Scotland Hydro-Electric Board, the Mullardoch-Fasnakyle-Affric project and no request has been made for an inquiry.

**Scunthorpe.**—DISTRIBUTION IMPROVEMENTS.—The Town Council is to spend £140,000 on an 11-kV ring main transmission system which will be superimposed on the existing system.

**Southall.**—THREE-PIN PLUGS.—The General Purposes Committee is requesting the Housing Committee to install three-pin plugs in existing and future houses.

**Stafford.**—FRINGE ORDER APPLICATION.—The Corporation is to apply to the Electricity Commissioners for a Fringe Order to enable a supply to be given to new housing estates at Moss Pit and Rickerscote, which are outside the Corporation undertaking's area.

**Swindon.**—RATE AID FROM PROFITS.—Reporting a surplus for the year of £26,615, the Electricity Committee states that of this £13,150 is to be allocated to rate relief.

**Wallasey.**—JUBILEE.—The Electricity Committee is to make arrangements for the celebration of the jubilee of the undertaking on January 29th.

**CHANGE-OVER.**—It is proposed to change over the supply in the New Brighton area at a cost of £33,588.

## TRANSPORT

**Newcastle-on-Tyne.**—TROLLEY BUSES.—The City Council is to be recommended by the Transport and Electricity Committee to accept a tender for the supply of fifty trolley-buses which will be used for changing-over the remaining tram routes. There are already thirty-six trolley vehicles on order. At present the city transport services are using about 130 trolley-buses, 90 trams and 140 motor-buses. The last trams are expected to be taken off the roads in 1948.

**Sunderland.**—INQUIRY.—An inquiry has been held by the Ministry of Transport into the Town Council's plan to extend the Durham Road tram track by three quarters of a mile. The Town Clerk (Mr. G. S. McIntire) said the chief reason for the extension was to meet the needs of the new housing estates.

# Teaching Electrical Methods

Manchester's Residential College for Members of the Forces

**D**OMESTIC science and allied subjects have been taught for a long time but specialized instruction in electrical methods appears to be sadly lacking. To help in remedying this deficiency Manchester Electricity Department has been playing a prominent part in a venture undertaken by the Manchester University Extra Mural Department through the Manchester Regional Committee for Education in the Forces. At "Holly Royde," originally a large private house, a residential college has been established accommodating thirty-five students, drawn from all branches of the Services. Of these, eight women students at a time take the fortnightly course in home management. The remainder take the main courses, usually covering subjects of a cultural nature, some of which, such as "Citizenship" and "Home of To-day and To-morrow," also impinge on electricity's sphere of interest.

By R. L. Hodgson, A.M.C.T.

Visits are also arranged to power stations, repair workshops and testing laboratories, and to electrically equipped show houses.

First impressions are lasting and it was therefore considered important that equipment supplied for instructional purposes should be plentiful and suitable. For cooking instruction there is a medium-size cooker with super-speed plate and thermostatic control. In the laundry washing is carried out in a post-war, flush action washing machine presented to the college by the

Scullery with Heatrae 60-gal. storage heater and Santon 3-gal. draw-off water boiler



Attendance is voluntary and a fee is charged to cover the cost.

Of the students passing through her hands at "Holly Royde," Miss J. Elliott, the housecraft instructress, estimates that 75 per cent have never before used an electric cooker, 90 per cent a washing machine and 95 per cent a refrigerator. Surprise and delight are often expressed as experience with the various appliances is gained, particularly the laundry equipment. It is disturbing to think that many young people should be starting life with but a very superficial knowledge of methods which must inevitably figure largely in their lives. Ignorance and prejudice are serious and difficult obstacles to surmount. The electrical method often involves the eradication of old-fashioned ideas, and calls for a new approach altogether.

The college is kept up to date with appropriate literature, and the students frequently visit the Electricity Department's showrooms for lectures, demonstrations and film shows.

makers. A drying cabinet constructed of brick and timber is heated by two 1-kW air heaters and on test 12 lb dry weight of clothes was put through, from the wringer, at a consumption of 0.8 kWh per lb. A separate ironing room is equipped with four standard domestic irons.

Wartime difficulties led to a certain amount of improvisation for the electric cooking equipment. Cooking is carried out on one medium-size and one large cooker, both fitted with thermostatic oven control and super-speed plates. Two gas cookers are also in use. An old electric oven, originally supplied



for dish warming purposes, has been fitted with a hob and two hot-plates, upon which all vegetable boiling is carried out. Soup and boiled puddings are prepared in two 10-gal. wash-boilers. An electric griller deals efficiently with everything from toast to kippers. Boiling water for tea making is supplied by a 3-gal. automatic water boiler, together with two 6-pint copper kettles. A 60-gal. water heater provides amply for kitchen use, the general hot water supply being from a coke-fired boiler. The refrigerator, a 75-cu ft model, is sufficient to meet increased future demands.

Eight 2-kW and twenty 1-kW electric fires are supplemented by coal and gas fires. At present the total installed load is:—Lighting, 6.2 kW; fans, vacuum cleaners, washer, radio sets, etc., 5 kW; water heating, 8 kW; radiators, 31 kW; cooking, 48.7 kW; total, 98.9 kW. Consumption from July 26th, 1945, to July 19th, 1946, was 59,519 kWh. Of this total, cooking took roughly 20 per cent, water heating and boiling 35 per cent, space heating 40 per cent, and lighting and small appliances 5 per cent. The overall annual load factor was 6.9 per cent.

From the opening of the college to the present day about 300 students have taken the course.

## Electrical Production

**P**ARTICULARS are given in the October *Monthly Digest of Statistics* of the production of certain electrical equipment. It is shown that during the first half of this year electric motors (1-300 H.P.) to the value of £6,202,000 were produced, compared with £5,814,000 for the first six months of last year. In the first nine months of the year 4,099 arc welding sets valued at £577,000 were made, comparing with 5,015 (£971,000) in January-September, 1945. Resistance welding sets numbered 1,463 (£327,000) as compared with 1,852 (£431,000). Portable power tools produced in the first seven months of this year numbered 54,991 (no value given) against 79,062 in January-July, 1945.

The production of domestic electrical appliances continues to show a rapid rise. During the first quarter of the current year the monthly rate of electric fires was 179,700 (163,900 for the home market); by the second quarter it had increased to 225,000 (199,900 home market); the 1937 monthly rate of production was estimated at only 115,000 (100,000 home). Monthly production of electric irons was 250,500 (214,100) in the first quarter of the year and 302,700 (241,700) in the second; the 1937 average was put at 112,000 (100,000). Vacuum cleaners were produced at the rate of 33,100

(26,700) per month in the first quarter and 302,700 (241,700) in the second; 1937 average 34,000 (33,000). Electric kettle production was at the monthly rate of 34,900 (29,400) in the first quarter and 48,200 (37,200) in the second; 1937 rate estimated at 35,000 (30,000).

Of equipment designed particularly for new houses the production during September showed a very substantial advance over that of the corresponding month of last year. The figures were as follows, the gas equivalents being included for comparison purposes; September, 1945, quantities are shown in parentheses:—Cookers: electric 13,300 (6,200); gas 30,000 (11,000). Wash-boilers: electric 19,300 (5,300); gas 38,300 (20,700). Water heaters: electric (immersion heaters) 39,800 (11,800); gas 27,500 (10,100). Meters: electric 99,600 (39,100); gas 79,600 (34,500).

## Finance for Industry

**T**HE Industrial & Commercial Finance Corporation, Ltd., was formed last year by the Bank of England and joint stock banks to provide credit or finance for business enterprises in Great Britain in the form of loans, subscription of loan or share capital, etc., in cases where existing facilities were not readily or easily available. The Corporation has now issued its first report, covering the year ended September 30th last. It has an authorized share and loan capital of £45 million, of which £1,650,000 has been issued and called up and during the year it incurred a loss of £29,175 (carried forward) but a balance on the right side is expected next year.

A statement presented by the chairman, Lord Piercy, at the annual meeting last week showed that advances totalled £5,071,000. The largest number of advances were in the £20,000-£50,000 class; there were 38 of these, taking 28.3 of the total amount advanced. There were 35 in the £5,000-£10,000 class, but they took only 5.1 per cent of the total. Nine concerns received over £100,000, representing 28.0 per cent of the total.

Mechanical engineering, analysed into seven branches, received advances totalling £1,259,200 (24.8 per cent of the whole), but electrical engineering was in fact the branch of industry which received the greatest amount of advances—£357,200 or 7 per cent of the total. The Corporation's assistance is complementary to facilities provided by the banks.

During the first year the amount of business much exceeded what was expected in some quarters and no special steps were taken to seek business. As a result the Corporation's facilities may not be so widely known as they deserve to be and something may remain to be done in this direction. So far the volume of business has not been great, but Lord Piercy thinks that in the next year or two substantial annual figures will be reached.

# FINANCIAL SECTION

## Company News. Stock Exchange Activities.

### Reports and Dividends

**Ferranti, Ltd.**—At the annual meeting on November 7th Mr. V. Z. de Ferranti (chairman and managing director) said that the accounts under review covered the first year of transition and a great deal of rearrangement and adaptation to peace conditions had been accomplished, but there was still much to be done which would affect the results of the coming year. One major operation involving the move of the instrument department from a requisitioned building in Bury to that part of their factory at Moston which was employed in the manufacture of fuzes during the war, had been completed. The total number employed, after falling rapidly from the wartime peak of 12,000 had now steadied and showed an upward tendency, the present figure being 7,000.

The use of electricity, which had been increasing for a number of years at approximately 10 per cent per annum, effected a great saving in coal, and in the present year would probably save 30 million tons of coal compared with the quantity which was required to give equivalent amounts of heat, light and power at the beginning of the century. It was desirable that the progress being made should be continued by an adequate supply of plant and appliances.

Their activities covered two fields—the manufacture of equipment for the electricity supply industry and for the public. The former consisted of electricity meters and transformers of all sizes, the latter of apparatus for the home, such as electric fires, water heaters, radio, television and clocks. The export field had not been neglected during the year as instanced by the obtaining of orders from Finland for £250,000 worth of transformers which included several 64,000-kVA 230,000-V 3-phase units. The Canadian company had taken over a factory erected by the Government at Mount Dennis, Toronto, for the manufacture of instruments.

**Electrical Components, Ltd.**, reports an income for the year ended June 30th of £46,064, as compared with £12,230 for the preceding year, and a net profit of £44,283 (against £11,657). Tax absorbs £35,655, reserve £1,403, and a balance of £10,308 is carried forward (against £3,855 brought in). As announced in the prospectus last May, no dividend has been declared. At an extraordinary meeting which will follow the annual meeting on November 15th resolutions will be submitted increasing the nominal capital of the company to £250,000.

**Erinoid, Ltd.**—In his speech circulated with the report and accounts the chairman (Mr. W. G. Waldron) refers to the intensified demand for the company's products from all over the world to the extent that it has been found

impossible to cope with the large export inquiries. Permission has now been obtained by the company to proceed with an ambitious scheme for the building of new laboratories.

**Falk, Stadelmann & Co., Ltd.**, report a profit for the year ended March 31st last of £158,875, as compared with £121,063 in the preceding year. After placing £52,359 to reserve for taxation, and making other deductions, the balance available is £94,003, to which is added profit on the sale of securities, £1,019, and reserve for sub-contracts no longer required, £13,000. The ordinary dividend for the year is maintained at 10 per cent and the staff pension and benevolent fund receives £3,000. The balance carried forward is £53,303, as compared with £47,531 brought in.

**Strand Electric Holdings, Ltd.**—The gross trading profit of the Strand Electric & Engineering Co., Ltd., for the past year was £123,183 (£125,972) and the profit after meeting expenses, etc., was £37,064 (£38,313), before providing £26,851 (£30,197) for E.P.T. and income tax. The income of the holding company, less expenses, was £16,154 (£15,752), before deduction of income tax, £7,216 (£7,882). The dividend is maintained at 10 per cent with a bonus of 2½ per cent (same), and £3,549 (£2,518) is carried forward.

**Tube Investments, Ltd.**, proposes to pay a final dividend of 12½ per cent, making 22½ per cent for the year. Last year's dividend was the same but there was also a special distribution of 10 per cent from contingency reserve, making 32½ per cent altogether. The aggregate profits of the subsidiary companies for the year ended August 3rd amounted to £2,048,422 compared with £2,027,195 for 1944-45, after providing for E.P.T. and depreciation but not income tax. The net income of the parent company other than from subsidiaries for the year ended October 31st last was £162,736 (£136,910).

**Yarrow & Co., Ltd.**—The report for the year ended June 30th last shows a gross income of £113,433 (against £105,835 for 1944-45), with a profit after providing for depreciation and taxation of £56,569 (£49,634). It is again proposed to pay a dividend of 10 per cent and a bonus of 5 per cent, both tax free, leaving £105,191 (£71,122) to be carried forward.

**Cable & Wireless, Ltd.**—According to the *Financial Times*, it is understood that the Government will probably take over the shares of the operating company during December although the form in which the undertaking will be run has not been finally decided.

**Drake & Gorham, Ltd.**, report a net profit for the past year of £13,554, as compared with

£12,104 for the previous year. The dividend for the year remains unchanged at 5 per cent.

**The Revo Electric Co., Ltd.**, is again paying an interim dividend of 5 per cent.

**Ward & Goldstone, Ltd.**, have increased their interim dividend from 15 to 20 per cent.

## New Companies

**Chance-Londex, Ltd.**—Registered October 29th. Capital, £10,000. Manufacturers of, and dealers in, battery-operated navigational marine lights, fog signals, loud speakers, radiolocation apparatus, etc. Directors: N. J. B. Raymond (managing director, Chance Bros., Ltd.), F. W. G. Beaumont (divisional sales manager, Chance Bros., Ltd.), W. Stern (director of Londex, Ltd.), and A. Ney (director of Londex, Ltd.). Regd. office: 207, Anerley Road, S.E.20.

**T. Hammond & Co. (Electrical Engineers), Ltd.**—Registered October 30th. Capital, £8,000. Directors: T. E. Hammond and E. P. Woodbridge. Regd. office: The Broadway, Penn Road, Beaconsfield, Bucks.

**Barratt's Rentals, Ltd.**—Registered October 29th. Capital, £1,000. Hirers of, dealers in, and financiers for, the sale by hire-purchase, deferred payments or otherwise of radio, television, electrical and mechanical apparatus, including radio parts, etc. Directors: A. T. Barratt and Mrs. I. M. Barratt. Regd. office: Refuge Assurance Buildings, 46, Corporation Street, Manchester, 4.

**Stevenage Electrical Engineering Co., Ltd.**—Registered October 28th. Capital, £1,000. To acquire the business of electrical engineers carried on by W. J. Burrows & Son. Directors: W. J. Burrows and J. J. Burrows. Secretary: P. L. Burrows. Regd. office: 5, Middle Row, High Street, Stevenage.

**Edwards & Co. (Electrical), Ltd.**—Registered October 30th. Capital, £3,000. Directors: F. Hollinghurst, D. P. Woodstock and R. Bulbick. Secretary: J. H. F. Gelton. Regd. office: Upper Hinton Chambers, Bournemouth.

**Frank Johnson (Longton), Ltd.**—Registered October 31st. Capital, £2,000. Electrical engineers, and electrical installation contractors, wireless and motor engineers, etc. Directors: F. Johnson, T. L. Wright, and H. Johnson. Regd. office: Cromartie Works, King Street, Foley, Longton, Stoke-on-Trent.

**Greenwich Manufacturing Co., Ltd.**—Registered November 1st. Capital, £500. To manufacture, install, maintain and service electrical equipment and domestic articles, etc. Directors: W. A. Powell, N. W. G. Pye, and J. W. Downie. Regd. office: 15, Greenwich South Street, S.E.10.

**Druce (Electrical), Ltd.**—Registered November 1st. Capital, £1,000. Electrical engineers and contractors, etc. Directors: E. W. Druce, J. H. Stean, F. Pearce, and R. Broad. Secretary: E. W. Druce. Regd. office: 4, Albion Parade, Stoke Newington, N.16.

**Guardian Electric, Ltd.**—Registered November 1st. Capital, £3,000. Manufacturers of, and dealers in, electrical and mechanical apparatus, and accessories, particularly radio sets and valves, etc. Directors: S. E. Drew and T. A. Johnson. Regd. office: Imperial House, Dominion Street, E.C.2.

**Allied Insulators, Ltd.**—Registered October 30th. Capital, £1,000. Manufacturers of insulators and insulating materials, electrical and mechanical engineers, etc. Directors: J. Fitzgerald and G. C. Hulbert. Regd. office: Beachy Road, Old Ford, E.3.

**Windex, Ltd.**—Registered October 24th. Capital, £2,000. Electrical equipment specialists, etc. R. C. Smith signs as director. Solicitor: T. K. Brown, The Mall, Ealing.

**G. L. Andrews, Ltd.**—Registered November 6th. Capital, £4,000. General electrical engineers, electrical installation contractors, etc. G. L. Andrews is to be one of the first directors. Regd. office: 14, Grey Street, Newcastle-on-Tyne, 1.

## Increases of Capital

**Clear-Hooters, Ltd.**—Increased by £10,000, in 1s. ordinary shares, beyond the registered capital of £30,000.

**Ensure Battery Co., Ltd.**—Increased by £10,000, in £1 preference shares, beyond the registered capital of £10,000.

## Receiver Appointed

**Goddard Sound Equipment, Ltd.**—H. Williams, of 105, Parkway, N.W.1, has been appointed receiver and manager under powers contained in debenture dated August 6th.

## Liquidations

**Harrison & Co. (Electrical), Ltd.**—Winding-up order made October 21st. Meetings of creditors and contributories November 22nd at Columbia House (3rd Floor), Aldwych, W.C.2.

**Green Electrical Industries, Ltd.**—Winding-up order made October 21st. Meetings of creditors and contributories November 20th at Columbia House (3rd Floor), Aldwych, W.C.2.

## Bankruptcies

**G. F. Coupe**, electrical engineer, carrying on business at 2, Spring Gardens, Stockport.—Last day for receiving proofs for dividend November 20th. Trustee, Mr. P. M. Milward, 20, Byrom Street, Manchester, Official Receiver.

**W. S. Poole**, electrician, residing and carrying on business at High Street, Queensbury, near Halifax.—Receiving order dated December 14th, 1937, rescinded and Order of Adjudication dated December 14th, 1937, annulled on November 1st, 1946, as all debts have been paid in full.





**MOTORS  
GENERATORS**

**CONTROL GEAR**

AIR BREAK  
OIL IMMERSD  
HAND OPERATED  
AUTOMATIC

**SWITCHGEAR**

SWITCHES  
FUSES  
SWITCHBOARDS  
AIR BREAK  
OIL IMMERSD

**FANS**

CEILING  
DESK and  
BRACKET  
VENTILATING

**OF IMPORTANCE TO YOU**

In order that we may give you the best service under the present difficult conditions we appeal to you to utilise standard equipment, ratings, etc., whenever possible. Your co-operation in this respect will enable us to concentrate on standard production with consequent reduction in despatch time.

**USE "STANDARD"**

**LIGHTING FITTINGS**

GAS FILLED  
DISCHARGE

**VERITYS Ltd.**

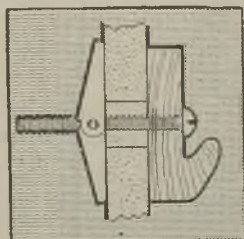
**Sales Headquarters : BRETENHAM HOUSE, LANCASTER PLACE, W.C.2**

**Works : ASTON, BIRMINGHAM 6**

# PERMANENT FIXINGS

*Can now be made to Wallboards, Plaster Boards  
Insulating and Laminated Boards  
Hollow Bricks and Tiles*

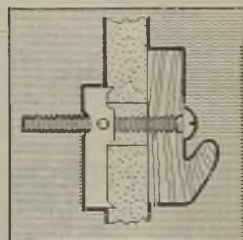
## TOGGLE BOLTS



### SPRING TYPE

The wings of the toggle spring open at right angles to the screw when pushed through the hole.

Rawlplug Toggle Bolts provide a simple means of making fixings to hollow partition walls or ceilings, asbestos board, hollow bricks and tiles, etc. They are ideal because they distribute the strain over a wide area.

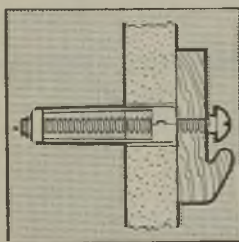


### GRAVITY TYPE

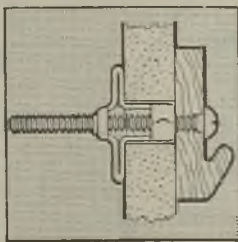
The toggle has a long end which falls into position when pushed through the hole.



## RAWL-ANCHORS

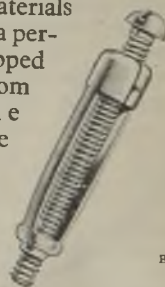


**RAWL-ANCHORS** are manufactured from ductile steel and ensure very firm fixtures. Fixing is simplicity itself—just a  $\frac{1}{8}$ " diam. hole



into which the Rawl-Anchors is placed and then the screw is tightened. Millions have been used on housing contracts.

An extremely ingenious device. When the screw is tightened the Rawl-Anchors collapses as shown in the illustration. In certain materials this makes a permanent tapped fitting from which the screw can be removed & replaced at will.



B322

★ Samples of any or all of these fixing devices will be gladly supplied to the trade for testing purposes. Also the advice of our Technical Service Department is available for free unbiased assistance in overcoming any peculiar fixing problems.

**THE RAWLPLUG Co. Ltd., CROMWELL ROAD, LONDON, S.W.7**

## STOCKS AND SHARES

**S**TOCK Exchange markets were bowling merrily along, prices were rising, orders to buy stocks and shares "at best" were pouring into the House, and the great difficulty was to find supplies with which to satisfy insatiable buyers. Then a Government speaker stepped in remarking that the general outlook was grave, and hinting at repetition of the slump which followed the last war. Some quarters suggested that these lucubrations were deliberately intended to lay a check upon the demand for industrial issues in order that the money might be diverted into the present  $2\frac{1}{2}$  per cent loan now on tap from the Treasury. The net result was to halt the upswing of industrial prices and to place a hand of restraint upon optimism.

By way of illustration, Southern Railway preferred may be quoted, the price rising to 79 and going back to  $76\frac{1}{2}$ . Cable & Wireless after touching  $116\frac{1}{2}$  reacted to  $114\frac{1}{2}$ , and the list might be extended to cover several hundreds of quotations. Nevertheless, on balance, prices are better than they were a week ago, and compare very favourably with those last set out here on October 18th. Radio shares have been one of the dullish spots. E.M.I., for instance, reacting to 28s. 6d., though Pye deferred are a good spot at 33s. Thomas Tilling, after a jump to 58s. 6d., went back to 57s.

### Gilt-Edged Stocks

Amongst gilt-edged issues, Central Electricity Board  $4\frac{1}{2}$  and 5 per cent stocks hold attraction for investors, notwithstanding the high premiums at which the prices are quoted, and the consequent prospect of capital loss on redemption. The  $3\frac{1}{2}$  per cent issue, dated 1963-93, stands at a premium of 13 points, and the  $3\frac{1}{2}$  per cent stock, 1974-94, is similarly quoted. The present yield is £3 2s. 1d. per cent. On both stocks, the return is barely  $2\frac{3}{4}$  per cent, allowing for loss of capital on repayment at the earliest date. Neither is a trustee security. In the trustee list, London Electric Transport  $2\frac{1}{2}$  per cent guaranteed stock at 101, yields £2 9s. 3d. per cent outright, or £2 6s. per cent to redemption in 1950.

### Price Rises

In the market for electricity supply shares, the chief movement has been an advance of 2s. in Electrical Finance & Securities, to 67s. 6d. Scottish Power at 46s. 6d. are 1s. 6d. to the good, while Newcastle Electrics at 33s. and Bournemouth & Poole at 67s. have each gained 1s. Advances of 6d. to 9d. have been fairly common. In the overseas section, a jump of 3 points to  $40\frac{1}{2}$  in Tokyo Electric "sixes" is noticeable. Electrical equipment shares have also made further progress on the week. Associated Electrical Industries advanced 1s. 9d. to 70s. 3d. British Insulated and Henley's have put on 1s. each, to 46s. 6d. and 27s. 6d.

respectively. Crabtrees, at 47s. 6d., London Electric Wire, 40s. 9d., and Telegraph Condensers, 33s., are all 1s. 3d. better. Gains of half-a-crown are shown by Tube Investments at  $6\frac{1}{2}$ , Ward & Goldstone, 50s., Westinghouse Brakes, 76s., and Hopkinsons, £5. Vactrics have risen 1s. to 17s. 6d.

### New Shares

Johnson & Phillips at 78s. are quoted ex-rights to the new shares offered to shareholders at 65s. The new shares are changing hands at a premium of 13s., which serves as a reminder that, on these occasions, there is generally a small minority of shareholders who fail to realize that their rights have a value, although they may not intend to take up the shares. Another consideration not always appreciated is that a buyer of shares in the shape of renounced allotment letters is not called upon to pay the heavy 1 per cent transfer stamp charges. On the current 15 per cent dividend, Johnson & Phillips shares yield £3 17s. per cent on the money. Midland Counties Electric new shares are quoted at 50s. They were offered to stockholders at 35s., in the proportion of one for every £6 stock held. The recently-introduced Parmiter Hope 1s. shares are being dealt in around 5s. No dividend forecast was included in the published particulars, but current earnings were estimated at a figure representing about 55 per cent on the ordinary capital.

### Stock on Offer

Yields on the higher-priced electricity supply preference shares are down to the neighbourhood of 4 per cent. This is the return on British Power & Light and London Associated "sixes," which are on offer at the common price of 30s. The 6 per cent issues of Yorkshire Electric and "Three Counties" Electric are available at 31s. 6d. to yield £3 16s. per cent. Shares quoted nearer their par value continue to give much lower returns. Lancashire Electric  $3\frac{1}{2}$  per cent preference, at 24s., pay only £3 2s. 6d. per cent on the money. West Kent  $4\frac{1}{2}$  per cents can be bought at 25s. to yield £3 12s. per cent. It is a sign of the times that jobbers who normally issue lists of stock on offer are now canvassing for shares they want to buy.

### Company Results

Electrical Components 5s. shares were introduced to the market at 7s.  $7\frac{1}{2}$ d. about six months ago, and are now quoted at 13s. 3d. Accounts just published show a substantial increase in trading profits, but an almost equal rise in taxation provisions. No dividend is to be paid for the past year; an interim payment is expected early next year. A further increase of capital is proposed. Falk Stadelmann profits show a useful expansion which enables the company to fortify the reserves while maintaining the dividend at 10 per cent. Broadcast Relay Services are offering shareholders 750,000 4 per cent preference shares at par.



# Canadian Overseas Trade

## Analysis of Imports and Exports in 1945

**D**ETAILED statistics of Canadian import and export trade for 1945 have just been received in London from Ottawa. From these the values of the imports and exports of electrical goods have been extracted, with increases or decreases compared with 1944. It will be seen that although small increases are shown in the value of most imports except the radio group, the steep decline that occurred in the latter more than offset the more active lines of business. The grand total of Canadian imports of electrical machinery and apparatus in 1945 was \$43,052,000 (\$40,494,000 from the United States and \$2,482,000 from the United Kingdom).

Class of Goods	1945 \$ ('000)	Inc. or dec. on 1944 \$ ('000)
<i>Batteries, primary</i>	210*	+ 34
<i>Batteries, storage</i>	494	+ 138
From United Kingdom	73	+ 263
" United States	421	+ 401
<i>Heating apparatus</i>	398	+ 85
From United Kingdom	12	+ 4
" United States	386	+ 81
<i>Dynamos and parts</i>	3,158	+ 205
From United Kingdom	76	+ 13
" United States	3,074	+ 188
" Switzerland	6	+ 3
<i>Lamps, carbon filament</i>	3*	+ 1
<i>Lamps, metal filament</i>	586	+ 304
From United Kingdom	4	+ 3
" United States	581	+ 300
<i>Lamps, arc</i>	114*	+ 82
<i>Torches, flashlights, side and tail lights</i>	586	— 42
From United Kingdom	10	—
" United States	572	+ 45
<i>Lighting fixtures and appliances</i>	1,739	+ 875
From United Kingdom	18	+ 8
" United States	1,720	+ 883
<i>Electricity meters</i>	544	+ 11
From United Kingdom	55	+ 21
" United States	489	+ 20
<i>Motors valued at less than \$10</i>	62*	—
<i>Motors and complete parts, other</i>	3,731	+ 311
From United Kingdom	131	+ 52
" United States	3,594	+ 254
" Sweden	5	+ 5
" Switzerland	1	—
<i>Rheostats, controllers, etc.</i>	1,938	+ 488
From United Kingdom	22	+ 12
" United States	1,904	+ 475
" Switzerland	12	+ 2
<i>Self-contained lighting outfits</i>	501*	+ 231
<i>Electric irons</i>	66*	+ 69
<i>Socket outlets, etc.</i>	305*	+ 29
<i>Magnetos and parts for i.c. engine manufacturers</i>	38*	+ 12
<i>Spark plugs, magnetos, etc.</i>	44	+ 11
From United Kingdom	4	+ 4
" United States	40	+ 15
<i>Flameproof switchgear for use underground in coal mines (all from United Kingdom)</i>	4	— 4
<i>Switches, switchboards and circuit breakers</i>	2,154	+ 321
From United Kingdom	95	+ 37
" United States	2,029	+ 256
" Switzerland	30	+ 28

Class of Goods	1945 \$ ('000)	Inc. or dec. on 1944 \$ ('000)
<i>Telegraph apparatus</i>	340	— 79
From United Kingdom	36	— 3
" United States	304	— 72
<i>Radio receiving sets</i>	507	— 558
From United Kingdom	37	— 9
" United States	471	— 548
<i>Radio set parts</i>	1,125*	— 915
<i>Radio valve parts</i>	1,402*	— 198
<i>Other radio apparatus, n.o.p.</i>	10,126	+ 10,663
From United Kingdom	1,459	+ 543
" United States	8,667	+ 11,205
<i>Radio valves</i>	2,474	+ 3,466
From United Kingdom	128	+ 102
" United States	2,347	+ 3,567
<i>Telephone apparatus</i>	2,128	+ 369
From United Kingdom	42	+ 7
" United States	2,086	+ 362
<i>Transformers and complete parts</i>	394	+ 115
From United Kingdom	29	+ 25
" United States	362	+ 87
" Switzerland	2	+ 2
<i>Electric steam generators and parts</i>	435	— 15
From United Kingdom	20	+ 218
" United States	414	+ 202
<i>Electric dry shavers</i>	126*	+ 72
<i>Electrical precision instruments</i>	589	— 306
From United Kingdom	49	— 30
" United States	540	+ 276
<i>Electrical apparatus, n.o.p.</i>	4,615	— 19
From United Kingdom	164	+ 126
" United States	4,438	+ 96
" Switzerland	10	+ 8

\* All or nearly all from U.S.A.

### Exports

Canadian exports of electrical goods in 1945 totalled \$60,957,000 in value compared with \$71,700,000 in 1944. Of the 1945 total \$45,130,000 worth went to the British Empire and \$15,827,000 to foreign countries. Australia was a less valuable customer than in 1944. The decline was very marked in radio apparatus. On the other hand there were small advances in storage batteries, domestic appliances and in the total of unspecified electrical goods.

Class of Goods	1945 \$ ('000)	Inc. or dec. on 1944 \$ ('000)
<i>Batteries, storage</i>	6,769	+ 5,480
To Egypt	626	+ 479
" South Africa	86	+ 33
" India	2,602	+ 2,233
" Italy	952	+ 878
" United Kingdom	2,164	+ 1,756
<i>Batteries, other</i>	535	— 72
To Argentina	49	+ 49
" Newfoundland	76	— 7
" Italy	281	+ 266
<i>Radio apparatus</i>	35,949	+ 15,524
To United Kingdom	25,371	+ 2,127
" India	2,476	+ 1,618
" Australia	1,004	+ 587
" New Zealand	99	+ 267
" France	471	+ 471
" Italy	1,091	— 3,071

## Canadian Overseas Trade (Continued)—

Class of Goods	1945 \$ (000)	Inc. or dec. on 1944 \$ (000)	Class of Goods	1945 \$ (000)	Inc. or dec. on 1944 \$ (000)
<i>Dynamos, generators and motors</i>	5,614	— 2,403	<i>Spark plugs, magnetos, etc.</i>	424	+ 47
To United Kingdom	1,519	— 1,790	To Sweden	18	+ 18
„ Russia	2,041	+ 2,041	„ South Africa	176	— 21
„ New Zealand	138	— 66	„ New Zealand	52	— 42
„ India	661	— 104	„ India	7	+ 14
„ Australia	334	+ 146	„ Jamaica	51	+ 51
<i>Electric stoves</i>	481	+ 204	„ Porcelain insulators	10	+ 3
To South Africa	204	+ 21	To South Africa	286	+ 69
„ Chile	36	+ 36	„ India	50	— 17
„ Colombia	50	+ 44	„ Russia	37	+ 74
„ Southern Rhodesia	36	+ 8	<i>Electrical apparatus, n.o.p.</i>	10,747	+ 2,538
„ New Zealand	14	+ 8	To United Kingdom	6,446	+ 3,132
<i>Other domestic cooking and heating devices</i>	100	+ 42	„ Brazil	89	+ 49
To United Kingdom	6	+ 6	„ Chile	93	+ 70
„ South Africa	22	+ 16	„ Mexico	241	+ 125
„ Mexico	10	+ 10	„ New Zealand	60	+ 73
<i>Telegraph and telephone apparatus</i>	193	— 1,208	„ Australia	129	— 42
To United Kingdom	24	— 849	„ India	191	+ 153
„ Italy	94	— 220	„ France	69+	+ 694

## 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.

**C.** S. AGATE and A. H. Cooper.—“Radio direction finding systems.” 12412. September 25th, 1941. (581806.)

Automotive Products Co., Ltd., and R. E. Smith.—“Electric welding apparatus.” 1817. February 10th, 1941. (581802.)

R. W. Bailey and Metropolitan-Vickers Electrical Co., Ltd.—“Power plant for the propulsion of ships.” Cognate applications 3010/40 and 6377/41. May 16th, 1940. (581680.) “Power plant.” Cognate applications 67/41, 1695/41, 17559/40, 6237/41, 7013/41 and 7766/41. March 2nd, 1941. (581681.) “Power plant.” 8670. July 9th, 1941. (581684.) “Steam generator furnaces combined with gas producers.” Cognate applications 4445/42 and 5654/42. April 2nd, 1941. (Divided out of 581681.) (581692.) “Gas producers for use in power plant.” Cognate applications 8628/42 and 9010/41. June 19th, 1941. (Divided out of 581681.) (581694.) “Combustion components for combustion power plant.” Cognate applications 16635/39 and 3207/40. August 6th, 1939. (581800.)

J. Bell, E. M. Langham and C. S. Wright.—“Electrical potentiometer.” 1200. January 23rd, 1943. (581740.)

Belliss & Morcom, Ltd., and A. A. Jude.—“Electro-propulsion machinery for ships.” March 6th, 1943. (581741.)

British Industrial Plastics, Ltd., and A. Brookes.—“Thermo-setting resins.” 3853. March 1st, 1944. (581702.)

British Thomson-Houston Co., Ltd., and A. Bowen.—“Means for causing synchronous oscillatory movements of a plurality of objects about their axes.” 15201. November 25th, 1941. (581686.)

British Thomson-Houston Co., Ltd.—“Liquid level control systems.” 5971/44. April 2nd, 1943. (581825.)

British Thomson-Houston Co., Ltd., and A. L. Whiteley.—“Remote control systems.” 7299. May 7th, 1943. (581743.)

British Thomson-Houston Co., Ltd., and K. J. R. Wilkinson.—“Networks for generating pulses of electrical energy.” 11327. June 13th, 1944. (581861.)

Callender's Cable & Construction Co., Ltd., and A. King.—“Manufacture of electric cables.” 1493. January 18th, 1945. (581830.)

Cannon Iron Foundries, A. F. Oatley and A. Harris.—“Door hinges of gas and electric cookers.” 12325. May 16th, 1945. (581798.)

R. Chadwick and Smart & Brown (Engineers), Ltd.—“Snap action electrical switches.” 5703/44. February 2nd, 1945. (581824.)

J. Collard.—“Reducing the intensity of electromagnetic waves reflected by reflecting objects.” 13962. August 26th, 1943. (581746.)

English Electric Co., Ltd., E. A. Howell and R. W. Newcombe.—“Electrical measuring and like arrangements.” Cognate applications 8040/44 and 3483/45. April 28th, 1944. (581846.)

Expanded Rubber Co., Ltd., H. N. Sheldermine and A. Cooper.—“Sheathing of buoyant cables.” 8155. June 27th, 1941. (581761.)

Ferranti, Ltd., and J. Wood.—“Wired intercommunication systems.” 6636. March 16th, 1945. (581715.)

General Electric Co., Ltd., and R. J. Clayton.—“Electric switches for oscillations of very high frequency.” 249. January 7th, 1942. (581688.)

General Electric Co., Ltd., and W. R. Stevens.—“Directional lighting fittings.” 5000. March 17th, 1944. (581821.)

General Electric Co., Ltd., and W. E. Willshaw.—“Signalling by means of very short electrical waves.” 16818. December 31st, 1941. (581687.)

General Electric Co., Ltd., R. J. Ballantine and E. G. James.—“Short-wave electrical oscillators.” 15853. September 27th, 1943. (531781.)

General Electric Co., Ltd., A. H. McKeag and P. W. Ranby.—“Luminescent materials.” 12712. August 6th, 1943. (581778.)

S. H. Gordon, J. M. Sinclair, W. H. Millwood and W. F. Young.—“Electric welding.” 18226. December 30th, 1940. (581721.)

W. T. Henley's Telegraph Works Co., Ltd., and H. H. Daker.—“Electric cables.” 4628. April 7th, 1941. (581723.)

W. T. Henley's Telegraph Works Co., Ltd., and E. Moor.—“Multi-outlet plug and socket adaptor for electric circuits.” 2407. January 31st, 1945. (581831.)

A. L. Hodgkin.—“Directional radio systems.” 15242. September 16th, 1943. (581696.)

D. I. Lawson and Pye, Ltd.—“Pulse modulation signalling systems.” 18030. December 18th, 1942. (581811.) “Multi-channel signalling systems.” Cognate applications 321/43 and 757/43. January 7th, 1943. (581812.)

Marconi's Wireless Telegraph Co., Ltd.—“High-frequency converter circuits.” 6132/44. April 3rd, 1943. (581826.)

D. H. Preist.—“Radio signalling systems.” 16196. October 2nd, 1943. (581782.)

Revo Electric Co., Ltd., and A. E. Felton.—“Electric lighting fittings.” 10324. May 27th, 1944. (581710.)

B. Schwarz.—“Electrical regulating systems and apparatus.” 9143. May 12th, 1944. (581850.) “Secondary windings of induction motors.” 12758. July 4th, 1944. (581871.)

W. J. Scott and T. J. Davies.—“Speed control of electric motors, rotary converters and the like.” 5620. March 6th, 1945. (581832.)

G. R. Shepherd (Westinghouse Electric International Co.).—“Dynamo electric machines.” 8453. May 4th, 1944. (581847.) “Electric circuit-breakers having shock absorbing means.” 10886. June 6th, 1944. (581859.)

Simplex Electric Co., Ltd., and A. V. Barton.—“Electric fires.” 22639. November 16th, 1944. (581791.)

Sperry Gyroscope Co., Inc.—“High-frequency electron discharge apparatus.” 7583/44. April 26th, 1943. (581707.)

P. A. Sporing, C. P. Johnson and Telegraph Condenser Co., Ltd.—“Tubular containers for electrical condensers or other apparatus.” 8684. May 8th, 1944. (581848.)

Standard Telephones & Cables, Ltd.—“Radio direction finding apparatus.” 2809/42. March 5th, 1941. (581807.) “Radio direction finders.” 7005/42. May 22nd, 1941. (581808.) “Arrangements for generating high voltage electric pulses.” 4541/44. March 13th, 1943. (581819.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—“Means for tuning electrically resonant cavities.” 15103. November 25th, 1941. (581727.)

Standard Telephones & Cables, Ltd., and C. W. Earp.—“Receiving systems for pulse modulated electromagnetic waves.” 10005. July 17th, 1942. (581733.)

Standard Telephones & Cables, Ltd., and M. L. Gayford.—“Subaqueous sound receivers.” 18048. December 18th, 1942. (581739.)

Standard Telephones & Cables, Ltd., and K. E. Hartridge.—“Metal plating of electric insulators.” 3268. February 22nd, 1944. (581701.)

Standard Telephones & Cables, Ltd., and L. W. Houghton.—“Radio locating systems.” 15285. November 27th, 1941. (581728.)

Standard Telephones & Cables, Ltd., and M. M. Levy.—“Amplifiers of electromagnetic energy.” 7176. June 6th, 1941. (581683.) “Receivers for electrical pulses.” 20114. December 1st, 1943. (581698.)

Standard Telephones & Cables, Ltd., and E. O. Willoughby.—“Antenna systems.” 5717. May 2nd, 1941. (581724.) “Electromagnetic wave radiators.” 7494. June 13th, 1941. (581725.)

Standard Telephones & Cables, Ltd., P. K. Chatterjea and C. T. Scully.—“Receivers for time modulated electrical pulses.” 5366. April 21st, 1942. (581731.)

Stone Platt Engineering Co., Ltd., and E. C. Hatcher.—“Electric gyroscopes.” 17873. December 16th, 1942. (581737.)

A. A. Thornton (Warner Electric Brake Manufacturing Co.).—“Systems for controlling the energization of electromagnetically operated brakes.” 7702. March 27th, 1945. (581796.)

G. R. Young.—“Magnetic depolarization of ships.” 17021/40. November 29th, 1939. (581801.)

## Lighting in Old Buildings

**M**ODERNIZATION of the interior lighting of old buildings was the subject of a paper prepared by MESSRS. E. H. PENWARDEN and S. ANDERSON for a joint meeting of the Royal Institute of British Architects and the Illuminating Engineering Society in London last week. Types of buildings considered included historic, civic, official and domestic, various methods of treatment being suggested; both actual and theoretical examples were described and illustrated.



# 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.*

**Abertillery.**—November 21st. Sheet-steel kiosks and equipment, e.h.v. and l.v. underground cables and l.v. service cables in connection with the Council's housing site at Penrhiw, Bryn Ithel, Llanhilleth. (November 8th.)

**November 23rd.** E.h.v. underground cables, kiosks and equipment, substation switchgear and l.v. underground and service cables for the Swffrid housing site, and Rectory Road substation, Crumlin. (See this issue.)

**Birmingham.**—November 25th. Electric Supply Department. Domestic electrical apparatus. (November 8th.)

**Edinburgh.**—November 22nd. Electricity Committee. Meters for twelve months. (November 1st.) Cables for switchgear extensions. (November 8th.)

**Epsom and Ewell.**—December 16th. Electricity Department. One 500-kVA three-phase transformer and one ten-panel 11,000-V 150-MVA truck type switchboard. (November 8th.)

New plant at the East Street pumping station, including electrical plant with all accessories. Borough water engineer, East Street, Epsom.

**Glasgow.**—November 26th. Public Health Department. Five electric vehicles. (November 8th.)

**Great Yarmouth.**—November 29th. Electricity Department. Domestic appliances for twelve months. (November 1st.)

**Harwich.**—December 6th. Borough Council. Six sets of electrically driven sewage pumps. John Taylor & Sons, Artillery House, Westminster, S.W.1.

**Kingston-upon-Thames.**—December 9th. Corporation. Paper-insulated cables. (See this issue.)

**Litherland.**—November 30th. Urban District Council. Electric wiring in twenty-four bungalows, Field Lane. Surveyor, Town Hall.

**Littleborough.**—November 25th. Electricity Department. One 350-kVA transformer, e.h.v. and l.v. underground cables and switchgear. (November 8th.)

**London.**—Metropolitan Water Board. 25-H.P., 200/220-V, 1,450 r.p.m. vertical-spindle (or suitable for adaptation as vertical spindle) motor and starter. (November 8th.)

**North Scotland.**—Hydro-Electric Board. Supply, delivery and erection of a 132-kV transmission line. (November 8th.)

**Manchester.**—December 6th. Electricity Department. Air-cooling pipework for Nos. 67 and 68 boilers. (See this issue.)

**December 13th.** Soot-blowers for Nos. 65 and 66 boilers. (See this issue.)

**Plympton St. Mary.**—December 6th. R.D.C. Electricity Department 6,600/415/240-V, three-phase transformers. (November 8th.)

**Stoke-on-Trent.**—November 25th. North West Midlands J.E.A. Outdoor type static transformers. (November 8th.)

**Wallasey.**—November 23rd. Corporation. One 500-A three-phase meter testing set. (November 8th.)

**Warwick.**—December 2nd. County Council. Contracts for heating and electrical engineers. (See this issue.)

**West Riding.**—November 30th. County Council. Plant for highway and bridge work, including electrical plant.—County Engineer, County Hall, Wakefield.

**Woolwich.**—November 27th. Electricity Department. Electricity meters, transformers, h.v. and m.v. cable for twelve months. (November 1st.)

## Orders Placed

**Birkenhead.**—Electricity Committee. Accepted. Switchboards for various substations.—Switchgear & Cowans, Ltd. Transformers.—British Power Transformer Co.; Bryce, Ltd.; Yorkshire Electric Transformer Co.; Foster Engineering Co.

**Durham.**—County Council. Accepted. X-ray plant for the Hollywood Hall Sanatorium (£2,854).—Watson & Sons (Electro-Medical).

**Littlehampton.**—Housing Committee. Accepted. Electrical installations at houses on the Hill Road estate (£2,074).—Rockall's Radio.

**Mansfield.**—Electricity Committee. Accepted. Switchboards at electricity works (£1,708) and Mansfield Woodhouse substation (£1,260).—Ferguson, Pailin.

**Manchester.**—Electricity Committee. Accepted. Boiler replacement work, Barton power station.—Babcock & Wilcox. Batteries and charging equipment, Ancoats and Cheetham Hill substations.—Britannia Batteries. D.c. traction switchgear, Moss Side, Rusholme, and Newton Heath substations.—Bertram Thomas (Engineers). Mercury arc rectifier equipment, Moss Side, Rusholme, and Newton Heath substations.—Hewitt Electric Co. Sub-contractors for transformers.—Hackbridge Electric Construction Co. Supervisory control equipment, Ancoats and Cheetham Hill substations.—Standard Telephones & Cables. L.v. switchboards for distribution substations.—English Electric Co.

## 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.*

**Alloa.**—Houses (150), Deer Park, Sauchie; burgh surveyor, Municipal Buildings, Bank Street.

**Aylesbury.**—Houses (46), California (£60,517); C. & F. Ricketts, Ltd., builders, 16, Walton Street.

**Bentley.**—Houses (57), Bentley Rise, for U.D.C.; Walter Firth, Ltd., builders, Armthorpe Road, Doncaster.

**Blackpool.**—Houses (24) and 12 flats, Grange Park estate; North Western Construction Co., 21, Queen Street.

**Brixton.**—Extensions, School of Building (£12,470); L.C.C. architect.

**Cardiff.**—Crematorium (£100,000); city engineer.

**Chester.**—Houses (40), Brown's Lane, Handbridge; borough engineer, Municipal Offices.

**Chippenham.**—Permanent houses (40), Derriads; Walter Rudman & Edwards, 32, Market Place.

**Dunston.**—Factory for the Tyne Watch Co., Newcastle; Hadden & Hillman, 123, New Bridge Street, Newcastle-on-Tyne.

**Eastleigh.**—Permanent houses (115), Chestnut Avenue; borough engineer, Town Hall.

**Eastry (Kent).**—Houses (160), in various parishes, for R.D.C.; surveyor, Council Offices, Sandwich.

**Ellesmere Port.**—Houses (102), Wolverham Road, Stanney estate, for U.D.C.; surveyor, Queen Street.

**Enfield.**—Flats (48), Northfield Road, for U.D.C.; Frank Lee, surveyor, 7, Little Park Gardens.

**Fawdon.**—Factory for Scott & Turner, health salt manufacturers, Gallowgate, Newcastle; Stanley Miller, 17, North Street, Newcastle-on-Tyne.

**Hackney.**—Flats (100), Banister House extension, Priestley Street; housing manager, 219, Mare Street, E.8.

**Halesowen.**—Houses (30), Hasbury Farm estate; A. H. Farmer, builder, 27, Attwood Street.

**Hampstead.**—Flats (92), Parkhill Road (£183,000); William Moss & Sons, Ltd., contractors, North Circular Road, Cricklewood, N.W.2.

**Harrow.**—Four blocks of flats, Alexandra Road; U.D.C. surveyor.

**Hartlepool.**—Houses for key workers (60), Middle Warren; borough surveyor, Borough Buildings.

**Hornsey.**—Flats (116), North Hill, Highgate; borough engineer, Town Hall, Crouch End, N.8.

**Hull.**—Rebuilding mills, Foster Street (£1,000,000); British Oil & Cake Mills, Ltd.

**Huyton-with-Roby.**—School buildings for R.C. school managers; Tallis Bros., builders, 182, South Street, Liverpool, 8.

**Lichfield.**—Houses (24), Queen Street, Chase-town, for R.D.C.; L. Dainty, Ltd., builders, Walsall Wood Road, Aldridge.

**Malvern.**—Extensions, Brick Barns Hospital (£54,600); county architect, Worcester.

**Manchester.**—Rebuilding offices, etc., for Sutcliffe's Ventilating & Drying Co., Ltd.; F. Butterworth (Blackley), Ltd., builders, Blackley.

County secondary and primary schools, Brownlow Green; R. Carlyle & Co., Ltd., builders, Elsinore Road.

**Melksham (Wilts.).**—Houses (38), Lambourn and Beanacre, for U.D.C.; surveyor, Town Hall.

**Monmouth.**—Permanent houses (50), Wyesham estate; borough engineer, Council Offices.

**Nantwich.**—Houses (52), Beam Street, for U.D.C.; E. H. Bailey, surveyor, Brookfield House.

**Newcastle-on-Tyne.**—Extensions to works for J. Herring & Co., Water Street; F. J. Hepple, Ltd., Dunn Street.

**Norwich.**—Maternity home, Earlham Hall (£17,000); city engineer.

**Nottinghamshire.**—Extensions, Balderton mental colony (£253,242); county architect, Nottingham.

**Nuneaton.**—Works extensions, Bath Road, Hart & Levy, Ltd., clothiers; J. C. Kellett & Son, builders, 40, Southgate, Leicester.

**Otley.**—School on Grammar School site, West Riding; H. Bennett, county architect, County Hall, Wakefield.

**Plympton St. Mary.**—Permanent houses (54), Woodford, for R.D.C.; P. T. Loosemore, clerk, Council Offices.

**Sheffield.**—Hostel for students' training college; T. Roper & Sons, Ltd., builders, Mowbray Street.

**Watford.**—Three blocks of flats, near Willow Way, Radlett, for R.D.C.; surveyor, Council Offices, 25, King Street.

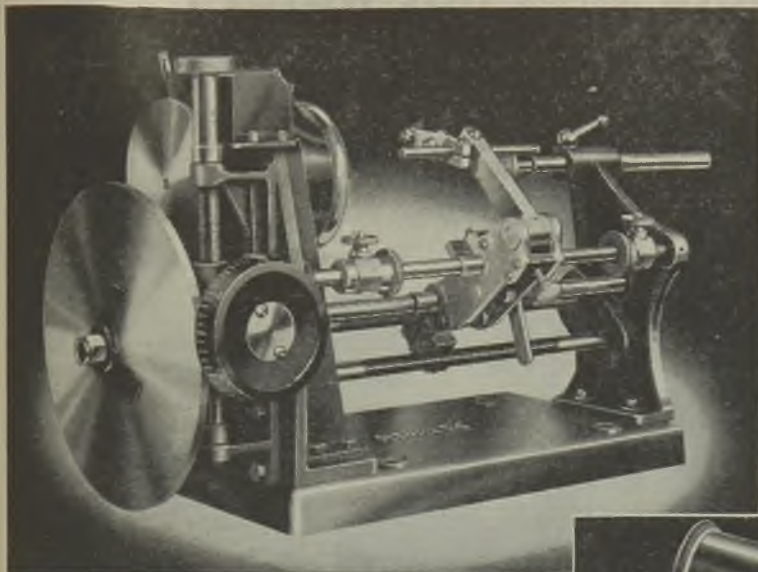
**Wirral.**—Houses (42), Somerset Road, Pensby, for U.D.C.; L. L. Roberts (Cheshire), Ltd., builders, Old Chester Road, Bebington.

**Wishaw.**—Extensions, including laboratory, for Lanarkshire Steel Co., Wishaw (£12,000); manager, Steel works, Craigneuk Street.

**Workington.**—Houses (100), Salterbeck estate; John Laing & Son, Ltd., builders, Dalston Road, Carlisle.

**Wrexham.**—Houses (44), Minera and Broughton, for R.D.C.; J. W. Bostock, builder, Woodblue Villa, Gwersyllt.

# Coil winding MACHINES



## THE NEVILLE'S PRETORIA MODEL

**For winding solenoid, transformer, choke and field coils.**

A bench-mounting universal automatic coil winder embodying many refinements hitherto only obtainable on expensive machines. A special foot-operated clutch gives smooth control of the winding spindle and it is possible to wind up to four coils simultaneously.

**CAPACITY :** Coils from 3/16" to 6" in length. Gauges of wire 22—48 S.W.G.

**DIMENSIONS :** The machine is 23½" long, 10" wide and 12" high.

**DRIVE :** 1/4 H.P., 1425 R.P.M. Electric Motor.

**SPINDLE SPEEDS :** 400, 530, 800, 1250, 3000, R.P.M.

Write to department EW for full particulars. An experienced staff is available to give individual attention to any coil winding problems. Your enquiries are invited.



*A typical selection of coils wound on the Neville's Pretoria Coil Winding Machine.*

# NEVILLE'S (LIVERPOOL) LTD

THE SIMMONDS TOWER · GREAT WEST ROAD · LONDON  
A COMPANY OF THE SIMMONDS GROUP





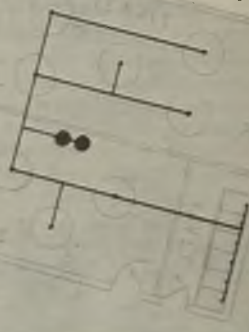
# The Factory Manager gets into hot water!

**Q** In our new factory employing some 500 female and 300 male workers a hot water system will be required to feed 8 wash fountains, and a staff toilet with 6 wash basins. Can you advise us if electric water heating is practicable under these.....



The model illustrated is just one from the wide range of G.E.C. water heating appliances designed to meet every domestic and industrial application.

**A** Two G.E.C. 350 gallon water heaters with a loading of 27 kW each as illustrated, would provide an abundance of hot water to cover the requirements indicated on the sketch-plan. Equipped with suitably arranged thermostatically controlled mixing valves the installation would supply water at the correct temperature to meet the needs of up to 1,000 employees.



## **G.E.C. ELECTRIC WATER HEATING**

*Advs. of The General Electric Co. Ltd., Magnet House, Kingsway, W.C.2*

# CLASSIFIED ADVERTISEMENTS

**ADVERTISEMENTS** for insertion in the following Friday's issue are accepted up to **First Post on Monday**, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

**THE CHARGE** for advertisements in this section is 2/- per line (approx. 7 words) per insertion: **ONLY OFFICIAL AND GOVERNMENT ANNOUNCEMENTS CAN NOW BE DISPLAYED**:—30/- per inch. Where the advertisement includes a Box Number this counts as six words and 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.

Please address your envelope

## CLASSIFIED ADVERTISEMENT DEPARTMENT

### OFFICIAL NOTICES, TENDERS, ETC.

#### COUNTY BOROUGH OF GREAT YARMOUTH ELECTRICITY DEPARTMENT

##### Domestic Appliances

**TENDERS** are invited for the supply and delivery of Domestic Appliances required during the period of 12 months ending 31st March, 1948. Specification, conditions and form of tender for all or any items as listed may be obtained from G. T. Alcock, Esq., Chief Engineer and Manager, Electric House, Great Yarmouth:—

Large, small and breakfast cookers, boiling rings, toasters, electric kettles, percolators, waterheaters, wash boilers, refrigerators, washing machines, irons, vacuum cleaners, fires, clocks, towel rails.

Tenders, enclosed in plain sealed envelope, properly endorsed "Tender for Domestic Appliances," must reach me not later than 12 noon on Friday, 29th November, 1946. The Council do not bind themselves to accept the lowest or any tender.

FARRA CONWAY,

Town Hall, Great Yarmouth. Town Clerk,  
19th October, 1946. 3242

#### COUNTY OF WARWICK

##### To Heating and Electrical Engineers

**FIRMS** desirous of having their names placed upon an approved list of Contractors from whom the Warwickshire County Council will invite tenders for heating, hot and cold water supplies, steam services, laundry and kitchen equipment, and electric lighting and power installations, should make application on or before Monday, the 2nd December, 1946, to the County Architect, Shire Hall, Warwick.

Applicants must forward particulars of contracts recently executed by them, giving the names and addresses of the persons to whom reference can be made.

Tenders will be considered only from firms included in the official list, which will be compiled by the appropriate Committee after consideration of applications.

L. EDGAR STEPHENS,

Shire Hall, Warwick. Clerk of the Council. 3451

#### ROYAL BOROUGH OF KINGSTON-UPON-THAMES

**TENDERS** are invited for the supply and delivery of Paper Insulated Cables. Tenders and all documents (which must be in plain sealed envelopes not bearing any name or mark indicating the sender), endorsed "Tender for Cable," must be delivered to the Borough Electrical Engineer, 17, High Street, Kingston-upon-Thames, from whom specifications and forms of tender may be obtained.

Tenders must be delivered before noon on Monday, 8th December, 1946. No tender will be considered which does not comply with the above conditions, and the Council does not bind itself to accept the lowest or any tender.

A. W. FORSDIKE,

Guildhall, Kingston-upon-Thames. Town Clerk,  
8th November, 1946. 3525

**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.

#### ABERTILLERY URBAN DISTRICT COUNCIL

##### Tenders for Electrical Works

**TENDERS** are invited for the supply, delivery, construction and erection of E.H.T. Underground Cables, Sheet Steel Kiosks and Equipment and Substation Switchgear, also L.T. Underground Cables and L.T. Service Cables for the Swifryd B.I.S.F. Housing Site, Crumlin, and the substation at Rectory Road, Crumlin. Specification, schedule of quantities and conditions of contract can be obtained upon application to the Electrical Engineer and Manager, 40, Somerset Street, Abertillery, on payment of a deposit of £2 2s., which deposit will be refunded upon receipt of a bona fide tender.

Tenders, in plain sealed envelopes endorsed "Tender for Electrical Equipment," are to be delivered to the undersigned not later than noon of Saturday, the 23rd November, 1946.

The Council do not bind themselves to accept the lowest or any tender and reserve the right to accept the whole or part of any tender.

H. J. WILLIAMS,

Clerk of the Council.

Council Offices,

Abertillery, Mon.

6th November, 1946.

3466

#### CITY OF MANCHESTER ELECTRICITY DEPT.

**TENDERS** are invited for the supply, delivery and erection at the Stuart Street Power Station of the following plant:—

Specification No. 881—Air-cooling Pipe Work for Nos. 67 and 68 Boilers.

Specification No. 882—Soot-blowers for Boilers Nos. 65 and 66.

Specifications, etc., may be obtained on application to Mr. R. A. S. Thwaites, Chief Engineer and Manager, Electricity Dept., Town Hall, Manchester, 2, on payment of a fee of one guinea for each specification, which amount will be refunded on receipt of a bona fide tender.

Tenders, addressed to the Chairman of the Electricity Committee, to be delivered not later than 10 o'clock a.m. on the dates mentioned hereunder:—

Specification No. 881—Friday, 6th December, 1946.

Specification No. 882—Friday, 13th December, 1946.

The Committee does not bind itself to accept the lowest or any tenders.

PHILIP B. DINGLE,

Town Hall, Manchester, 2.

8th November, 1946.

Town Clerk.

3524

#### SITUATIONS VACANT

##### BEDFORD CORPORATION ELECTRICITY UNDERTAKING

##### Junior Shift Engineer

**A** PPLICATIONS are invited for the position of Junior Shift Engineer at the Council's Selected Generating Station. The salary will be in accordance with Grade 9, Class G, of the National Joint Board Schedule (at present £380 per annum).

Applications, stating age, giving particulars of training and experience, together with copies of recent testimonials, should be forwarded to the undersigned, suitably endorsed, not later than Friday, 29th November, 1946.

P. G. CAMPLING,

Electricity Offices,

Prebend Street, Bedford.

6th November, 1946.

Chief Engineer and

General Manager.

3446

### CITY AND COUNTY BOROUGH OF BELFAST ELECTRICITY DEPARTMENT

**A**PPPLICATIONS are invited for the following positions:  
(a) **MAINS ENGINEER.** Applicants must have a sound engineering training, have a University Degree in Electrical Engineering or be Corporate Members of the Institution of Electrical Engineers. They must not be more than 40 years of age on the 1st December, 1946.

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

(b) **ASSISTANT TECHNICAL ENGINEER.** Applicants must have a sound engineering training, have a University Degree in Electrical Engineering or be Corporate Members of the Institution of Electrical Engineers. They must not be more than 40 years of age on the 1st December, 1946.

The commencing wages for the position are £8 2s. 11d. per week, being in accordance with Grade 9, Class J, of the National Joint Board Schedule of Salaries for Technical Engineers on the staff of Authorised Undertakers. The scale is £425 for the first two years, £435 for the third and fourth years, and £445 after the fourth year. Upon completion of twelve months' satisfactory service the position will be established on the salary list.

(c) **METER ENGINEER.** Applicants should have served an apprenticeship with a meter manufacturer or in the meter department of a Supply Authority, and possess the Higher National Certificate in Electrical Engineering or be Corporate Members of the Institution of Electrical Engineers. It is desirable that applicants have experience in the operation of a Class A testing station. They must not be more than 40 years of age on the 1st December, 1946.

The salary for the position is in accordance with Grade 8b, Class J, of the National Joint Board Schedule of Salaries for Technical Engineers on the staff of Authorised Undertakers. The scale is £456 for the first two years, £466 for the third and fourth years, and £477 after the fourth year.

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

Applications must be made on official forms, which can be obtained from the City Electrical Engineer and General Manager, Electricity Department, East Bridge Street, Belfast, and, with copies of not more than three recent testimonials, should reach the Town Clerk, City Hall, Belfast, not later than 4 p.m. on Friday, 25th November, 1946. Canvassing, oral or written, if proved to the satisfaction of the appointing authority, will disqualify.

JOHN DUNLOP,

City Hall, Belfast.  
8th November, 1946.

Town Clerk.  
3510

### NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

**A**PPPLICATIONS are invited for:—

(1) **SENIOR ASSISTANT** in Secretary's Department, preferably between 35 and 45 years old; good administrative experience essential, preferably in connection with the construction of works and the operation of public utilities. Starting salary £600 p.a.

(2) **ASSISTANTS (TWO)**, preferably over 29 and under 45 years old; legal qualifications in one case and administrative experience on construction of works and the operation of public utilities in the other, will be an advantage. Starting salary £500 p.a.

(3) **ASSISTANT**, age preferably between 35 and 50 years, with experience of the administration of large camps. The successful applicant will be required to co-ordinate welfare through camp welfare officers and to carry out routine correspondence and negotiations with catering contractors. Starting salary £550 p.a.

(4) **ENGINEERING ADMINISTRATIVE ASSISTANT**, age preferably between 29 and 45 years, with experience in general building and the construction of large camps. Starting salary £550 p.a.

Successful applicants will be required to pass a medical examination and become contributors to the Board's Superannuation Fund.

Application forms may be obtained from the undersigned and should be returned not later than the 2nd December, 1946.

T. LAWRIE, Secretary.

16, Rothesay Terrace, Edinburgh, 3. 3508

### LEYTON BOROUGH COUNCIL ELECTRICITY DEPT.

**SENIOR SALES ASSISTANTS.** Applications are invited for the appointment of Two Senior Sales Assistants (Male). Salary in accordance with the National Joint Board Schedule, Grade 9, Class F (at present £375 18s. per annum rising to £391 13s.). Note: The classification is likely to rise to G next year.

Applicants, who must be not more than 40 years of age at the time of the appointment, must hold the Electricity Development Association Domestic Electricity Salesmanship Certificate, and should have had experience in an Electricity Supply Authority's showroom, sale and hire of all types of domestic electrical apparatus. Sound knowledge of the principles of electric cooking, water heating, refrigeration and illumination required, and experience of practical installation work an advantage.

**SHOWROOM ASSISTANTS.** Applications are invited from young persons over 18 years of age for the appointment of Four Showroom Assistants at a salary commencing at £200 per annum, rising by annual increments of £15 to £250, plus bonus of £48 5s. per annum for females, or £60 per annum for males.

Applicants must have had a good general education, have a knowledge of salesmanship, and be capable of dealing promptly and efficiently with enquiries in the showroom. Accuracy with figures, clear handwriting, tactful and courteous personality essential.

The above appointments will be subject to the Council's conditions of service applicable to such appointments, and to the provisions of the Local Government Superannuation Act, 1937, and the successful candidates will be required to satisfy the Council's Medical Officer of Health as to their medical fitness. It will be a condition of employment that the successful candidates must be members of a trade union.

Applications in the candidates' own handwriting, stating age, qualifications, experience, particulars as to membership of a trade union, and when able to take up duties, accompanied by copies of not more than three recent testimonials, to be sent to the Borough Electrical Engineer and Manager, Electricity Offices, Cathall Road, Leytonstone, E.11, not later than first post Monday, 2nd December, 1946. Canvassing in any form will be a disqualification.

Town Hall, Leyton, E.10.  
8th November, 1946.

D. J. OSBORNE,  
Town Clerk.  
3460

### CITY OF GLOUCESTER ELECTRICITY DEPT.

#### Assistant Mains Draughtsman

**A**PPPLICATIONS are invited for the position of Assistant Mains Draughtsman at a salary in accordance with Class G, Grade 9, of the N.J.B. Schedule (£380 per annum rising by biennial increments to £395 per annum).

Applicants must be fully qualified draughtsmen with a sound knowledge of modern drawing office practice and general mains records, and be familiar with building and structural engineering as applied to substations, etc. The successful candidate will be required to pass a medical examination, and the appointment is subject to the Local Government Superannuation Act, 1937.

Applications, stating age, qualifications and experience, accompanied by copies of three recent testimonials, should be addressed to reach the undersigned not later than first post on Monday, November 25th, 1946.

Commercial Road,  
Gloucester.  
EMIL BRAATHEN,  
Chief Engineer and  
General Manager. 3359

### CITY OF LANCASTER

#### Assistant Shift Charge Engineer

**A**PPPLICATIONS are invited for an Assistant Shift Charge Engineer at Caton Road Generating Station. Salary in accordance with the N.J.B. Schedule, at present Grade 9, Class H, £402 per annum.

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

Experience of the operation of large boilers and general power station operation desirable.

Applications, stating age, qualifications and particulars of training and experience, also probable date on which duties can be taken up, together with copies of two testimonials, must reach the undersigned not later than Saturday, November 16th, 1946.

"Electricity," GEO. C. MILNES, M.C., M.I.E.E.,  
North Road, Lancaster. City Electrical Engineer.  
3233



# METROPOLITAN BOROUGH OF STEPNEY ELECTRICITY DEPARTMENT

## Appointment of Mains and Public Lighting Engineer

**A**PPPLICATIONS are invited from Corporate Members of the Institution of Electrical Engineers for the position of Mains and Public Lighting Engineer at a salary in accordance with Class H, Grade 3, of the National Joint Board Schedule of Salaries, commencing at £761 5s. per annum.

Applicants must have had a thorough training and experience of E.H.T. and L.T. underground mains work, including change-over from D.C. to A.C., and the keeping of the necessary plans and records, and be capable of supervising the Public Lighting Department, having knowledge of modern practice in design and layout of street lighting.

The appointment will be subject to the provisions of the Stepney Borough Council (Superannuation) Acts, 1905-1931, and to the Council's bye-laws, and will, in the first instance, be for a probationary period of six months. The successful applicant will be required to pass a medical examination and reside within easy access of the Borough.

Applications, stating age, whether married or single, present appointment and salary, experience and qualifications, accompanied by copies of not more than three recent testimonials, should be forwarded to the Town Clerk, Municipal Offices, London Fruit Exchange, Duval Street, E.1, not later than 12 noon on the 30th November, 1946. Candidates are required to state whether they are related to any member or senior officer of the Council. Canvassing, directly or indirectly, will disqualify.

J. E. ARNOLD JAMES, Town Clerk.

Municipal Offices,  
London Fruit Exchange,  
Duval Street, E.1. 3438

# COUNTY BOROUGH OF MIDDLESBROUGH ELECTRICITY DEPARTMENT

## Appointment of Lady Demonstrator

**A**PPPLICATIONS are invited for the above appointment at a salary of £252 per annum rising by annual increments to £288 per annum, plus a cost-of-living bonus of, at present, £48 2s. per annum.

Candidates must have had a good general education, hold the E.A.W. Diploma or Certificate or other approved qualifications, and have a thorough knowledge of domestic electrical appliances; they must be competent to conduct lectures, cockery demonstrations, advise on the selection and use of electrical apparatus, and competent to advise consumers on the use of such appliances in their own houses. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and to the successful candidate passing satisfactorily a medical examination.

Applications, giving full particulars of training and experience, and accompanied by copies of recent testimonials, must reach the Borough Electrical Engineer, Corporation Electricity Works, Snowden Road, Middlesbrough, not later than 9 a.m. Monday, 2nd December, 1946.

E. C. PARR, Town Clerk.

Municipal Buildings,  
Middlesbrough,  
31st October, 1946. 3374

# COUNTY BOROUGH OF WEST HARTLEPOOL ELECTRICITY DEPARTMENT

## Appointment of Lady Demonstrator

**A**PPPLICATIONS are invited for the above appointment at a salary of £252 rising to £288 per annum, plus cost-of-living bonus, at present £48 per annum. Candidates must have had a good general education and possess an E.A.W. Diploma or equivalent certificate. They must be competent to arrange and conduct lectures, demonstrations and exhibitions, and to advise consumers on kitchen planning and the selection and use of electrical appliances of all types. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, endorsed "Lady Demonstrator," giving particulars of age, qualifications, and full details of experience, accompanied by two recent testimonials, should be submitted to the undersigned not later than 27th November, 1946.

S. TILLOTSON, Borough Electrical Engineer.

Electra House,  
Church St., West Hartlepool. 3480

# LONDON AND HOME COUNTIES JOINT ELECTRICITY AUTHORITY

## Surbiton and Twickenham Districts

**A**PPPLICATIONS are invited for the appointments of Junior Female Showroom Attendants at the Surbiton and Twickenham district undertakings of the Authority. The scheme of conditions of service of the National Joint Council for local authorities' administrative, etc., services will apply to the appointments. Salary will be in accordance with the general division of such scheme. The salaries in this division range from £120 per annum at 20 years of age to £264 per annum at 30 years of age. The salary mentioned includes the weighting for the London area. In addition to the above basic salary there is a cost-of-living bonus, which is now £59 10s. per annum at age of 21 years and over.

Candidates must have been educated to matriculation standard. They should have had experience in the show-room of an electricity supply undertaker or electrical contractor, and be conversant with domestic electrical apparatus. Age not to exceed 26 years. The persons appointed will be required satisfactorily to pass a medical examination by the Authority's medical adviser, and to become subject to the Authority's Superannuation Scheme, which applies generally the provisions of the Local Government Superannuation Act, 1937, including the provisions of that statute relating to transfer values.

Applications, stating age, qualifications and experience, and endorsed "Junior Female Showroom Attendant," accompanied by copies of not more than three recent testimonials, must be sent to the District Manager of the Authority at 22, Claremont Road, Surbiton, or 42, York Street, Twickenham, as the case may be, so as to reach him by not later than Tuesday, the 30th November, 1946. Canvassing, directly or indirectly, will be a disqualification.

A. L. BURNELL,  
Clerk to the Authority.

5-6, Lancaster Place,  
Strand, W.C.2.  
7th November, 1946. 3472

# PORTLAND URBAN DISTRICT COUNCIL

## Appointment of Electrical Engineer

**A**PPPLICATIONS are invited for the post of Electrical Engineer, at a salary in accordance with the Agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers dated 9th July, 1941, viz.: First year £524, second year £570, third year £616, plus war bonus (at present 23s. per week), and car allowance of £60 per annum. The above salary is based on the units sold during the year ended 31st March, 1946, which were 4,704,557, and of which 1,624,350 were sold to a large consumer.

Applicants should be competent to undertake the complete control and management of the Council's Undertaking, comprising E.H.T. transmission and L.T. 3-phase 4-wire underground and overhead distribution systems.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the person selected will be required to pass a medical examination and to reside within the Urban District. He will also be required to devote his whole time to the duties of his office. The appointment will be subject to two calendar months' notice on either side.

Applications, stating age, experience, and qualifications, and accompanied by copies of three recent testimonials, to be sent to me in sealed envelopes endorsed "Electrical Engineer" not later than Wednesday, 20th November, 1946. Canvassing, directly or indirectly, will disqualify.

HARRY WALKER,  
Clerk to the Council.

Council Offices, Portland.  
1st November, 1946. 3423

# WOLVERHAMPTON AND STAFFORDSHIRE TECHNICAL COLLEGE

## Mechanical and Electrical Engineering Dept.

**SENIOR ASSISTANT.** Burnham Salary Scale for Senior Assistants £600 to £750 per annum by annual increments of £25, with addition for time spent in approved study and/or training (maximum addition £45 for five years).

**Also POST OF RESPONSIBILITY.** Salary £380 to £605 per annum by annual increments of £15; addition for approved study or training as above; previous teaching and industrial experience taken into account in fixing commencing salary.

Particulars and forms of application from F. Lonsdale Mills, Clerk to the Governors, Education Offices, North Street, Wolverhampton. 3483

## COUNTY BOROUGH OF SWANSEA ELECTRICITY DEPARTMENT

### Appointment of Generation Engineer

**A**PPPLICATIONS are invited from qualified Engineers, not over 45 years of age, unless at present in the service of a local authority for the position of "Generation Engineer." Applicants must have had a thorough mechanical and electrical engineering training, preferably including experience in a manufacturing engineering works; possess a degree or equivalent technical qualifications admitting to Corporate Membership of the Institution of Mechanical or Electrical Engineers, and have held a similar appointment in a large Power Station operating under the direction of the Central Electricity Board.

The successful candidate will be required to take charge of the operation and maintenance of the Department's Generating Station with any extensions or modifications thereto and to devote the whole of his time to the duties of his office.

The salary will be in accordance with Grade 2, Class J, of the N.J.B. Schedule of Salaries, which, at the present time, is £874, rising to £913 per annum. The appointment will be subject to the provisions of the Local Government and Other Officers Superannuation Act 1937, and the successful candidate will be required to pass a medical examination.

Applications, which must be made on a prescribed form obtainable from the Borough Electrical Engineer and Manager, Guildhall, Swansea, together with copies of not more than two recent testimonials, must be delivered to the undersigned not later than Saturday, the 30th November, 1946. Canvassing, either directly or indirectly, is prohibited and will be a disqualification.

T. B. BOWEN,

Town Clerk.

Guildhall, Swansea.  
2nd November, 1946.

3403

## BOROUGH OF HASLINGDEN ELECTRICITY DEPARTMENT

### Mains Assistant

**A**PPPLICATIONS are invited for the position of Mains Assistant in the Electricity Department, at a salary in accordance with Grade I of the Administrative, Professional and Technical Division, National Joint Council's Scale for Local Authorities' Staffs (£330 × £15 to £375 per annum).

Candidates must possess the Higher National Electrical Engineering Certificate and must have had experience in the laying of 6.6 kV high tension mains, three-phase distribution, and maintenance and operation of static substations.

The appointment is subject to the provisions of the Local Government Superannuation Act, 1937. The successful candidate will be required to pass a medical examination by the Council's Medical Officer of Health.

Applications, accompanied by copies of three recent testimonials, must be forwarded to the Borough Electrical Engineer, John Street, Haslingden, Lancashire, not later than Wednesday, 20th November, 1946.

L. M. BURTON,

Town Clerk.

Municipal Offices, Haslingden.  
28th October, 1946.

3305

## COUNTY BOROUGH OF ST. HELENS ELECTRICITY DEPARTMENT

**A**PPPLICATIONS are invited for the appointment of Deputy Borough Electrical Engineer at a salary in accordance with Class G, Grade 1 of the N.J.B. Schedule, commencing at £833 per annum.

Candidates, preferably not more than 45 years of age, should possess an Engineering Degree or its equivalent and also Corporate Membership of one of the leading Engineering Institutions. Thorough experience in generation, distribution and the commercial development of an electricity supply undertaking owning a selected generating station is essential, particularly in regard to the layout and erection of modern power station plant.

Applications, accompanied by copies of not more than three testimonials, must be made on the form obtainable from the undersigned, and be received not later than 25th November in an envelope clearly endorsed "Deputy Borough Electrical Engineer." The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

P. BREGAZZI,

Engineer and Manager.

Electricity Works,  
Carlton Street, St. Helens, Lancs  
1st November, 1946.

3382

## CITY OF BIRMINGHAM ELECTRIC SUPPLY DEPT

**A**PPPLICATIONS are invited for the following positions in the Generating Stations:—

**JUNIOR ENGINEERS ON SHIFT.** Applicants should have a sound technical education and possess technical qualifications admitting to Corporate Membership of the Institution of Electrical or Mechanical Engineers. Appointments will be made in accordance with N.J.B. conditions, commencing at £381 per annum, with prospects of further advancement.

**ASSISTANT MECHANICAL MAINTENANCE ENGINEERS.** Applicants should have served an apprenticeship to mechanical engineering and have technical qualifications at least equal to the Higher National Certificate in Mechanical Engineering, and be capable, under the direction of the Mechanical Maintenance Engineer, of supervising the erection of new plant, detailing drawings from site measurements and compiling maintenance records and costs. Experience with the running and maintenance of high pressure steam plant is essential. The salary and conditions of employment will be in accordance with the National Joint Board Schedule, Class N, Grade 10b, at present £408 per annum.

The appointments will be subject to the Local Government Superannuation Act, 1937, and to the passing of a medical examination. Applications must be made on the appropriate forms, which can be obtained from the undersigned, and should be returned not later than 25th November, 1946.

F. W. LAWTON, M.I.Mech.E., M.I.E.E.,

Chief Engineer and Manager.

14, Dale End,  
Birmingham, 4.

3440

## BOROUGH OF BARKING ELECTRICITY DEPT.

### Appointment of Substation Engineer

**A**PPPLICATIONS are invited for the position of Substation Engineer at a salary in accordance with the N.J.B. Schedule, Class F, Grade 6, commencing at £534 per annum.

Candidates must be Corporate Members of the Institution of Electrical Engineers or hold an equivalent qualification, and must have had technical and practical experience of all work connected with rotary, rectifier and static substations. The selected candidate will be responsible to the Borough Electrical Engineer for the design of substations, design of all equipment, protective and supervisory systems, preparation of estimates and forms of tender, responsible for equipping and maintaining all substations, responsible for substation fitting staff, together with any other work which may arise.

It is anticipated that a house owned by the Corporation will be available for the successful applicant. The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications must be submitted on the appropriate form, which may be obtained from the undersigned, and should be returned, together with copies of three recent testimonials, by Thursday, 28th November, 1946, endorsed "Substation Engineer." Canvassing in any manner will be deemed a disqualification.

E. R. FARR,

Town Clerk.

Town Hall, Barking.  
2nd November, 1946.

3470

## COUNTY BOROUGH OF HALIFAX ELECTRICITY DEPARTMENT

### Appointment of Relief Charge Engineer

**A**PPPLICATIONS are invited for the position of Relief Charge Engineer at the Foundry Street Power Station of the above Authority. The conditions of employment are in accordance with the National Joint Board Agreement, Class G, Grade 8b, at present £408 rising to £422 per annum.

Candidates must be experienced in the operation of steam turbo alternators, high pressure boilers and auxiliary plant in a modern selected power station. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful applicant will be required to pass a medical examination.

Applications, endorsed "Relief Charge Engineer," stating age, training and experience, and accompanied by copies of not more than three recent testimonials, should reach the undersigned not later than 12 noon, Monday, 2nd December, 1946. Canvassing, either directly or indirectly, will disqualify.

A. G. CONNELL, M.I.E.E., M.I.Mech.E., F.Inst.F.,  
Borough Electrical Engineer and Manager.

19/23, Northgate, Halifax.

3467



# COUNTY BOROUGH OF WALSALL ELECTRICITY SUPPLY DEPARTMENT

## Appointment of Technical Assistant

**A**PPPLICATIONS are invited for the position of Technical Assistant. Candidates must have passed the Graduateship Examination of the I.E.E., or hold equivalent qualifications, and have had responsible practical experience in the design, construction, operation and maintenance of a large A.C. system, including 3-phase E.H.T. transmission, 4-wire L.T. distribution, transformers, switchgear and substations.

Salary and conditions of employment will be in accordance with the National Joint Board Schedule, (Class G, Grade 4 (at present £630-£642-£654)).

The appointment will be subject to the provisions of the Local Government and Other Officers Superannuation Acts and the successful candidate will be required to pass a medical examination. Applicants must disclose whether they are related to any member of the Walsall Town Council, and canvassing, directly or indirectly, will disqualify.

Applications should be in the appropriate form, which may be obtained from the undersigned, and should be submitted, together with copies of testimonials, not later than Tuesday, 26th November, 1946.

D. HOLT,  
Engineer and Manager.

Electricity Supply Dept.,  
Upper Bridge St., Walsall.  
4th November, 1946. 3484

## THE BRITISH SCIENTIFIC INSTRUMENT RESEARCH ASSOCIATION

**T**HE British Scientific Instrument Research Association has vacancies in their new laboratories for scientists with first-class academic and professional qualifications. The following appointments will shortly be made in the Electrical Instruments and Electronic Departments located in the outskirts of South-East London.

- Physicist with at least four to five years' experience in electronic instruments or electronic circuits.
- Physicist or Engineer with at least four to five years' experience in electrical (non-electronic) or magnetic instruments.
- Junior Physicists or Engineers with some experience in the field of electrical or electronic instrument technology.

The appointments will be made in the first instance in the Scientific Officer grade, £300-£550, and carry F.S.S.U. benefits after a probationary period. Applications in writing only, giving full details to Director of Research and Secretary, B.S.I.R.A., 26, Russell Sq., W.C.1. 3431

## BOROUGH OF WATFORD ELECTRICITY DEPT.

**A**PPPLICATIONS are invited for the position of Salesman Representative. Applicants, who should be between the ages of 25 and 35 years of age and have had experience in electricity showrooms, should be familiar with tariffs and general showroom routine, whilst preference will be shown to those having display ability.

The salary offered is £255/£300 per annum, plus a cost-of-living bonus of £59 16s., in accordance with the Miscellaneous Division, Grade 1, of the National Joint Council Scale of Salaries. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937.

Applications, giving full details of age, education and experience, together with copies of testimonials, to be forwarded to the undersigned and be received not later than 5th December, 1946.

A. W. BARHAM,  
Chief Engineer and General Manager.  
Borough of Watford Electricity Department,  
Electricity House, The Parade, Watford. 3323

## THE GALLOWAY WATER POWER COMPANY

Shift Charge Engineer Vacancy  
Modern Bungalow Available

**A**PPPLICATIONS are invited for the position of Shift Charge Engineer at Kendon Power Station. Hydro-electric experience not essential, but shift charge experience with grid operation desirable.

N.J.B. Agreement, (Class C, Grade 8, salary scale £368-£387). The position includes the occupancy of a modern "all-electric" bungalow at low rental.

Applications with full particulars to the Director and Manager, Tomland Power Station, Kirkcudbright, Scotland. 3511

## BOROUGH OF GILLINGHAM (KENT) ELECTRICITY DEPARTMENT

### Appointment of Assistant Mains Engineer

**A**PPPLICATIONS are invited for the above appointment, with salary and conditions in accordance with Grade 8, Class F, of the National Joint Board Schedule, at present £442-£459 per annum.

Candidates must be Corporate or Graduate Members of the I.E.E., or hold equivalent qualifications, and must have had sound technical and practical experience in the construction, operation and maintenance of 3-phase, E.H.T. and L.T. distribution systems, including transformers, switchgear and substations. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, stating age, qualifications and experience, together with copies of not more than three recent testimonials, and endorsed "Assistant Mains Engineer," should be received by the undersigned not later than first post, Monday, 25th November, 1946.

H. HALL, A.M.I.E.E.,  
Borough Electrical Engineer.  
Electricity Offices,  
Gardiner Street,  
Gillingham, Kent. 3436

## METROPOLITAN BOROUGH OF WOOLWICH ELECTRICITY DEPARTMENT

### Appointment of Two Control Room Engineers

**A**PPPLICATIONS are invited for the appointment of two Control Room Engineers for shift duties at the Woolwich Power Station. Candidates should have had previous experience in a similar position, must have first-class technical qualifications and sound practical experience in the operation of a modern power station.

The salary will be in accordance with Grade 9, Class J, of the National Joint Board Schedule, commencing at £446 5s. per annum. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidates will be required to pass a medical examination.

Applications, stating age, qualifications and experience, together with not more than three testimonials, should be addressed to the Borough Electrical Engineer, Electric House, Powis Street, Woolwich, S.E.18, to reach him not later than 23rd November, 1946. Canvassing, either directly or indirectly, will disqualify.

DAVID JENKINS,  
Town Clerk.  
Town Hall,  
Woolwich, S.E.18. 3316

## CITY OF BIRMINGHAM ELECTRIC SUPPLY DEPT.

### Central Testing Department—Instrument Mechanics

**A**PPPLICATIONS are invited for the position of Instrument Mechanics with good knowledge of the operation, repair and maintenance of all types of instruments used in the control of boilers and turbines (other than electricity meters). Applicants should preferably have a knowledge of Kent and Bailey steam flow meters, Foster (temperature indicating and recording installations, and Kent Multelee superheat temperature controllers.

Wages will be equivalent to those for Grade 1 fitter, as laid down in the District Joint Industrial Council Scale for No. 5 West Midlands Area, Zone A, at present 29.28d. per hour for a 47-hour week. Applications to be made on a form obtainable from the undersigned, to be returned, accompanied by copies of recent testimonials, not later than the 2nd December, 1946.

F. W. LAWTON, M.I.Mech.E., M.I.E.E.,  
Chief Engineer and Manager.  
14, Dale End,  
Birmingham, 4. 3471

## LONDON TRANSPORT

**L**ONDON Transport has a vacancy for an Electrical Tester for maintenance work on supervisory control equipment of the automatic telephone type used for the remote control of traction substations. Previous experience of this type of equipment or of auto-telephone exchange equipment is essential. Inclusive rate of pay 134s. per week of 47 hours.

Applications, stating age and giving full particulars of experience and qualifications, together with references regarding general and technical education should be sent to the Superintendent of Recruitment and Training (W.R.S.2273), London Passenger Transport Board, 566, High Road, Chiswick, W.4. 3380



**BOROUGH OF FARNWORTH ELECTRICITY DEPT.****Appointment of Consumers' Engineer**

**A** PPLICATIONS are invited for the above position, at a salary in accordance with the National Joint Board Schedule, Class D, Grade 8, at present £397 to £408 per annum, inclusive of bonus. Candidates should hold the Higher National Certificate in Electrical Engineering, or an equivalent qualification, and have had considerable experience in the electricity supply industry.

Application forms, which can be obtained from the undersigned, should be received by me not later than Monday, the 25th November, 1946.

H. CUNLIFFE,

Town Hall, Farnworth, Lancs.  
November, 1946.Town Clerk.  
3482**IMPERIAL COLLEGE OF SCIENCE & TECHNOLOGY****City and Guilds College**

**T**HERE is a vacancy in the Electrical Engineering Department, on the side of electrical machine and power, for an Assistant Lecturer. The appointment is for a period of three years with salary of £400 p.a. with F.S.S.U. superannuation. An Honours Degree and some practical experience of heavy electrical engineering are essential.

Applications, accompanied by full statement of qualifications, and with references, should be sent to the Head of the Electrical Engineering Department, City and Guilds College, Exhibition Road, London, S.W.7. 3397

**CITY OF LINCOLN ELECTRICITY DEPARTMENT**

**M**AINS Assistant required, with experience of H.T. and L.T. networks. Must have good knowledge of mains records. Salary in accordance with N.J.B. Scale, Class G, Grade 8a, commencing £437 per annum.

Applications, together with copies of two testimonials, to be submitted to the undersigned not later than the 30th November, 1946.

F. NEWBY, M.I.E.E.

Electricity Dept.,  
Brayford Side North, Lincoln.  
5th November, 1946. 3494**NORTHAMPTON POLYTECHNIC, LONDON, E.C.1**

**L**ECTURERS are required for the full-time permanent staff of the Polytechnic in the Electrical Engineering Department. Candidates should be qualified to teach telecommunications, electrical machine design, electrical power or electrical measurements.

Salary in accordance with the revised Burnham Scale for technical teachers in London. Further particulars and form of application can be obtained from the Secretary. 3464

**A** British firm of Telephone Manufacturers in India has vacancies for experienced Telephone Engineers. Applicants should be capable of planning automatic telephone exchange networks, developing area layouts, assessing traffic data, and generally advising customers on technical requirements. The post offers good prospects to suitable engineers who should, preferably, be aged about 30. Good salary with kit and travelling allowances and usual leave. Apply, giving full details of qualifications and experience and whether married or single, to—Box No. 112, Dorlands, 18/20, Regent Street, London, S.W.1. 3221

**A** British firm of telephone manufacturers in India has vacancies for Telephone Engineers with experience in installation and maintenance of automatic and manual telephone exchange equipment. Applicants should be capable of carrying out exchange installation work on their own initiative under the general supervision of the Senior Installer. The post offers good prospects to young single men. Good salary with kit and travelling allowances and usual leave. Apply, giving full details of experience and age, to—Box 148, Dorlands, 18/20, Regent Street, London, S.W.1. 3456

**A**CCOUNTANT for senior position required by the Sussex Electricity Supply Co. Ltd. at Littlehampton. Preference given to one with experience of electricity supply or similar public utility undertaking. Appointment will be permanent and pensionable. Applications in writing, giving details of age, experience, etc., and salary required, to—Electricity Office, Littlehampton. 3302

**A**RMATURE Winders and Improvers urgently required. Top rates and good conditions.—Collins Electrical Ltd., 22, St. Alban's Place, London, N.1. 85

**A** PPLICATIONS are invited for the position of Sales Manager with a progressive wholesale electrical company in London. The qualifications necessary are ability, initiative, pleasing personality and wholesale experience. This is a permanent and progressive post offering excellent opportunities for a first-class man. Apply, giving full details of experience, qualifications, salary expectations, etc., to—Box 3513, c/o The Electrical Review.

**A**RMATURE Winder for Merseyside area. Must have knowledge of A.C. and D.C. machines. One capable of organising, with prospects of taking charge of a new department. Write, giving details of training and experience, together with copies of references, to—James McKenzie Ltd., Oxtou Road, Birkenhead. 3444

**A**RMATURE Winders and Improvers urgently required. Top rates and good conditions.—Box 113, c/o The Electrical Review.

**A**SSISTANT Chemist required for laboratory of electrical engineering works in London area. Exempt from or completed national service, age 20-25 years. Salary £250-£350 according to age and experience.—Box 3023, c/o White's Ltd., 72, Fleet Street, E.C.4. 3477

**A**SSISTANT Control Engineer. Large supply undertaking in the London area requires an Assistant Control Engineer for load dispatching duties. He should have first-class technical qualifications, and preferably some experience in the operation of modern generating stations or large H.T. distributing stations. Salary £550-£575 per annum. State age and particulars of training and experience to—Box No. 498, c/o Dawsons, 28, Craven Street, London, W.C.2. 3435

**A**SSISTANT Engineer required by established firm of electrical contractors (London). Applicant must be of good education, with practical, technical and commercial experience. Full particulars to—Box 3201, c/o The Electrical Review.

**A**SSOCIATED Portland Cement Manufacturers Ltd. Senior Assistant Electrical Engineer, with initiative and experience of the installation and maintenance of distribution systems in large factories. Applicants should be capable of negotiating contracts with equipment manufacturers, and should preferably have a degree and have spent some years on the manufacturing side. The post carries with it good prospects of advancement. Salary will be between £600 and £700 per annum, depending upon experience, plus £105 per annum war bonus plus staff bonus. Pension fund. Applications, which should give full details of training and subsequent experience, should be submitted not later than the 22nd November, 1946, and should be addressed to the Chief Engineer, A.P.C.M. Ltd., 192, Ashley Gardens, S.W.1. 3211

**C**ABLE Makers in Midlands require experienced Foreman capable of taking complete charge of production of rubber longitudinal and forcing machines, also rubber mixing, callendering, etc. Apply, stating age, experience and salary required, to—Box 3263, c/o The Electrical Review.

**C**ABLE-Making Engineer, familiar with manufacturing processes and machines for paper, rubber or plastic cables, offered permanent position with considerable scope in an established London firm. Knowledge of costing or estimating desirable. Good general education essential. State salary required, age and details in full. —Box 3495, c/o The Electrical Review.

**C**HIEF Assistant required by electrical contractors and radio retailers. Applicants must be capable of taking charge of staff, be sound on electrical theory, and have practical experience in a majority of the activities of the firm, which include general electrical installations, ship and yacht wiring, radio and allied equipment, neon lighting, and electrical and radio retail sales. Commencing salary £8-28 per week. Prospects depend upon ability to develop existing good class business.—Laslett & Co., Queen Street, Ramsgate. 3432

**C**LERICAL Assistant required for stores office. Must have good knowledge of electrical material.—London Electrical Co., 92, Blackfriars Road, S.E.1. 104

**C**OMBUSTION Engineer required to take charge of boiler house operating at extra high pressure. Experience of modern boiler plant and sound electrical knowledge essential. Salary in accordance with the N.J.B. Schedule, Class H, Grade 8a. Applications giving full particulars of qualifications and experience should be addressed to the Power Station Superintendent, Northmet Power Company, Taylor's Lane, Willesden, London, N.W.10. 3499

**D**RAUGHTSMAN, with experience of electrical and mechanical design, required by company with small drawing office. Prospects of advancement. East London area. Write, giving age, experience and salary required. —Box 3458, c/o The Electrical Review.

**CONSULTING** Engineers in North Lincolnshire, require for their office, Assistant Electrical Engineer, age 29-30. Drawing office experience essential.—Box 9906, c/o The Electrical Review.

**DESIGNER**, Jig and Tool. Applications invited for highly responsible position in large engineering concern, North London area. Applicants must have considerable pre-war experience with firms of repute, should be familiar with modern mass production practice, and must be competent to supervise design of tooling for wide range of products. Applications must be made in writing, giving full details, age, previous experience and positions held, with salaries, to—Box 3447, c/o The Electrical Review.

**DRAUGHTSMAN** (Intermediate) required for general instrument work. Permanent and progressive post for the right man.—Box 3463, c/o The Electrical Review.

**DRAUGHTSMAN** required (Walthamstow district) with good general experience in machine and plant design. Good working conditions. Pension scheme. Reply, stating age, experience and salary required, to—Box 3448, c/o The Electrical Review.

**DRAUGHTSMAN** (Senior) required for general instrument work. Good salary and progress for right man.—Box 3462, c/o The Electrical Review.

**DRAUGHTSMAN**—Designer, thoroughly experienced in fractional horse-power motors, required by a modern firm of precision instrument makers. Good opportunity for a keen man.—Box 3461, c/o The Electrical Review.

**DRAUGHTSMEN**. Applications are invited from Senior and Junior Switchgear Draughtsmen with experience of general switchboard work, high and low voltage, control panels, diagrams, etc. Applicants should state age, experience and salary required to—Employment Officer, Messrs. Johnson & Phillips Ltd., Victoria Way, Charlton, S.E.7.

**DRAUGHTSMEN** required in N.E. London area. Two Senior men with sound mechanical knowledge and experience in E.H.T. outdoor switchgear of the oil minimum type. One Senior with experience of steelwork, cable ducting, overhead lines, etc., for outdoor switching stations. One Intermediate with experience of control boards, indoor cellular gear and kickers, knowledge of diagrams an advantage. Good salary offered to suitable men. Apply, stating age and experience.—Box 3243, c/o The Electrical Review.

**DRAUGHTSMEN**, preferably with telecommunications experience, required by large firm in the Midlands. Maximum salary £350 plus cost of living bonus. Write, giving details of experience, age, and salary required.—Box 11, c/o The Electrical Review.

**ELECTRIC** Wire and Cable Makers in the Midlands invite applications for a vacancy as Chief Inspector. Duties will include quality control of all products during manufacture and final inspection. Applicants should give age, past experience and salary required to—Box 3264, c/o The Electrical Review.

**ELECTRICAL** Engineer with practical and general experience of installation, maintenance and fault-localising required, for permanent employment in the specialised field of X-ray engineering. Applicant must be willing to travel in the United Kingdom. Apply by letter, stating age, experience, etc., to—Victor X-ray Corporation Ltd., 15/19, Cavendish Place, London, W.1. 3371

**ELECTRICIAN** Fitter, for maintenance and overhaul of electric goods and passenger lifts and small electric fan motors. London area.—Alpha Manufacturing & Electrical Co. Ltd., 21, Cedars Road, S.W.4. 3500

**ENGINEER** required by large firm in London area for design and development work on fractional horse-power motors. Previous experience essential. A degree in electrical engineering is desirable. Write giving full details of experience and qualifications, also salary required, to—Box 3295, c/o The Electrical Review.

**EXPERIENCED** Constructional Steelwork Draughtsman, used to transmission lines and masts, required for mast design section. Location of work is at Chelmsford. Basic salary up to £7.10s. per week, according to experience and ability, plus 25% staff war bonus.—English Electric Co. Ltd., Queens House, Kingsway, W.C.2. 3232

**EXPERIENCED** Electrical Inspector and Tester wanted for mercury arc rectifiers and air-cooled transformers. South London district. State experience and salary required.—Box 3354, c/o The Electrical Review.

**EXPERIENCED** Practical Photographic Processor or Photo-printer required, female, age 25-35. Experience in Barco, Photostat and Blue printing processes an advantage. Opportunity to take charge of section. Permanent position. Write, stating age, experience and salary required, to—Staff Officer, British Insulated Callender's Cables Ltd., Erith Works, Belvedere, Kent (Ref. SR/11). 3478

**ENGINEERS** and Draughtsmen are invited to apply to a large electrical engineering firm in the Midlands which has vacancies in the switchgear department for Technical Sales, Contract, Costing and Design Engineers; also experienced Technical Engineers capable of handling large projects for generation, transmission and distribution. Vacancies also exist for Draughtsmen for circuit diagram and general work.—Box 69, c/o The Electrical Review.

**FOREMAN** Armature Winder, A.C. and D.C. rewinds up to 100 h.p., willing to travel between subsidiary companies. Good rate for the right type, but must be first-class workman.—Box 3526, c/o The Electrical Review.

**FOREMAN** Electricians, N.F.E.A. conditions, at 2s. 8d. an hour. Good experience in industrial and domestic installations necessary. Apply—General Manager (L.R.S.), Finborough Hall, Stowmarket, Suffolk. 3455

**FOREMAN** required, take charge electrical assembly and testing fluorescent lighting units. Able train and control male and female staff. East London area.—Box 3327, c/o The Electrical Review.

**FOREMAN** wanted by leading firm of cable manufacturers for copper wire mill, including pickling plant and annealing ovens. Applicants should be between 30 and 40 years of age and must be conversant with all modern methods and fully capable of taking complete charge of plant, including die room for the refinishing of synthetic and diamond dies. The position, which is a staff appointment, is progressive, and superannuation benefits are available.—Box 3390, c/o The Electrical Review.

**FULLY** experienced Female Tracer required, age 25-30. Write, stating age, experience and salary required, to—Staff Officer, British Insulated Callender's Cables Ltd., Erith Works, Belvedere, Kent (Ref. SR/12). 3476

**LEADING** Draughtsman required for progressive position with well-established firm in North-West, manufacturing domestic electric appliances. Production and design experience of domestic appliances essential. Write, stating age, salary required and details of experience, to—Box 3473, c/o The Electrical Review.

**LONDON** Passenger Transport Board. Applications are invited from suitable candidates for the following temporary positions on the technical staff of the Signal Engineer at Earls Court Station. Probable duration of employment two to three years. ER/E.403 Signalling Trainees.—Qualifications to include the possession of the National Certificate in Electrical Engineering, or its equivalent, and preferably some drawing office experience. Training will be given in railway signalling for a period of three months, at the end of which an examination will be held. Successful candidates will be appointed as Temporary Technical Assistants and will be employed in the production of signalling drawings. Salary, including the training period, £250 to £325 per annum, plus £72 16s. per annum war advance. It is intended that the training shall commence in November or December, 1946. ER/E.404 Temporary Draughtsman.—Qualifications to include the possession of a National Certificate in Mechanical Engineering, or its equivalent, drawing office experience, including the design of electrical and mechanical components, and ability to prepare improvised sketches. Salary £250 to £325 per annum, according to age and qualifications, plus £72 16s. per annum war advance. ER/E.405 Temporary Junior Draughtsman.—For the preparation of drawings of enamelled iron and glass signs and sign cases. Applicants should previously have been employed in a drawing office, and experience of the type of work required would prove to be an advantage. Salary £150 to £220 per annum plus £72 16s. per annum war advance. ER/E.406 Temporary Technical Assistants.—Qualifications to include the possession of a National Certificate in Electrical Engineering, or its equivalent, and preferably some drawing office experience, knowledge and experience of lighting or electrical track equipment on an electric railway third or fourth rail traction system. Experience should include the preparation of estimates and drawings, and association with the installation of cables, cable runs, low tension feeders and lighting systems. Salary £250 to £325 per annum, according to age, qualifications and experience, plus £72 16s. per annum war advance. Applications, giving full particulars of education, business and other experience, professional qualifications and age, should be sent not later than 30th November, 1946, to the Assistant Staff Officer (quoting the relative ER/E reference), London Passenger Transport Board, 55 Broadway, S.W.1. 3488

**MANAGER** or Manageress of good appearance and personality required for high-class electrical and radio retail and art goods business, 30 miles from London. Must be thoroughly capable and able to take full control. Write with particulars, stating age, experience and salary required.—Box 115, c/o The Electrical Review.



**MACHINE** Shop Foreman required, East London area, for manufacturers of light electrical equipment. Applicants must be fully experienced and able to take complete charge. Write, giving age, experience and salary required. —Box 3457, c/o The Electrical Review.

**MATERIAL** Controller required for employment in radio factory in Yorkshire area. Preference given to applicants with experience of radio and electrical industries. Interviews will be held in London area. Write, giving full particulars, experience, age, salary required, etc., to —Box 3516, c/o The Electrical Review.

**MINISTRY** of Education: H.M. Inspectors. Applications are invited from men and women for posts as H.M. Inspector under the Ministry of Education. Candidates, who should be under 50 on the 31st March, 1947, should possess appropriate professional qualifications and/or degrees, together with teaching experience in technical colleges or universities, and industrial experience in one of the following: Textiles, electrical engineering, aeronautical engineering, industrial chemistry (artificial fibres, food technology), building. Those candidates who appear most suitable from their application forms will be invited to appear before a Selection Board in London. The posts, which are permanent and pensionable, carry a salary scale of £750 × £30 — £1,050 × £50 — £1,200 (man) and £600 × £25 — £750 × £30 — £1,025 (woman), together with a consolidated addition varying from £90 to £120 for men and £72 to £96 for women. Inspectors working in the London area receive an additional £50 at each point of the scale. In special cases, successful candidates may be appointed at a commencing salary above the minimum. Further particulars, together with the application form, may be obtained on application in writing to —The Secretary (Inspectors' Section), Ministry of Education, Belgrave Square, London, S.W.1. 3439

**OFFICE** Assistant (Female) wanted for switch-board/filing. Write, stating age, experience and salary required. —Man. Director, Z Electric Co., 21, Newman Street, W.1. 3514

**PRODUCTION** Manager required by engineering firm engaged in the manufacture of A.C. and D.C. motors and switchgear. Applications will be considered from engineers with good academic qualifications together with executive works experience. The position demands capability of controlling functions such as production planning, manufacturing methods, time study and tool design. Excellent prospects with an expanding company for a person with initiative and drive. —Box 3313, c/o The Electrical Review.

**RADIO** Engineer. Large radio firm in London area requires a deputy to the head of its radio laboratory. The engineer concerned should have both theoretical and practical experience, preferably of radio equipment for the Services. Write, stating age, experience and salary required, to —Box 3517, c/o The Electrical Review.

**REPRESENTATIVES** required by Internal Telephone Company (rental) for London, Cardiff, Newcastle, Glasgow, Norfolk and Suffolk, Kent. Thorough training given. Applicants must have had previous experience speciality selling and must not be older than 45. Very good income for right men. —Box 3297, c/o The Electrical Review.

**REQUIRED**, an experienced Attendant for static substation. Wages and conditions in accordance with D.J.I.C. Scale, No. 10 Area. Present inclusive wage £6 7s. 2d. per 48-hour week. The position is subject to the provisions of the Local Government Superannuation Act, 1937, and the person selected will be required to pass a medical examination. Applications to be made immediately in writing, giving age, particulars of experience and copies of testimonials, to —Chief Engineer and Manager, Electricity House, Durnsford Road, Wimbledon, S.W.19. 3498

**SALES** Engineer required by large electrical organisation for developing sales of specialised mercury switches. Qualifications include regular electrical training, experience in sale or manufacture of mercury switches, and knowledge of modern methods of sales promotion. Salary £500-£600 p.a. —Box 3449, c/o The Electrical Review.

**SALES** Manager. Electrical condenser manufacturers in South London area require Sales Engineer with good technical knowledge and sales experience. Our staff are aware of vacancy. Write, giving details of career and salary required, to —Box D.6705, A.K. Adv., 212A, Shaftesbury Avenue, W.C.2. 3493

**SALES** Representatives required by London electrical wholesalers for Surrey, Sussex and Hampshire and Southern London territories where well-developed connections already exist. Experience and possession of a car are essential. Remuneration or salary, commission and expenses basis. Write, giving full particulars, to —Box 3512, c/o The Electrical Review.

**SEALER** in required for electric lamp factory. Good prospects for right man. Applications, giving full details of age, experience and salary expected, to —The Manager, British Luma Co-operative Electric Lamp Society Ltd., Shieldhall, Glasgow. 3372

**SECOND** Assistant Radio Engineer required by the Government of Iraq for the Basrah Port Directorate for a tour of one year in the first instance. Salary, Iraq Dinars 40 a month, plus a high cost of living allowance of between Iraq Dinars 114 and Iraq Dinars 144 a month according to number of dependants (Iraq Dinar 1 = £1). Provident fund. Free passages. Candidates must be Associate Members of the British Institute of Radio Engineers or hold the City and Guilds of London Institute's Diploma in Radio Communications (Part III) and the Postmaster-General's First-Class Certificate in Radio Communication. They must have had at least five years' experience of radio engineering work, including not less than two years on radio transmitters. Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M/N/14691, on both letter and envelope. 3433

**SHOWROOM** Assistant required, previous experience essential. Apply in writing, stating experience, age and salary required, to —Giles (Electrical Engineers) Ltd., 9/11, Victoria Colonnade, Southampton Row, W.C.1. 3223

**SKILLED** Armature Winder required for India. £45 per month plus ten per cent. of Bombay concern's profit. Fare paid out and home after four-year period. Must be single man with full winding tradesman apprenticeship. —Box 3191, c/o The Electrical Review.

**STORKEEPPER** Assistant required with knowledge of electrical contractors' stores. Apply in writing, giving previous experience, age and salary required, to —Giles (Electrical Engineers) Ltd., 9/11, Victoria Colonnade, Southampton Row, W.C.1. 3224

**STORKEEPPER** for manufacturers of lighting fittings. East London area. Experienced all electrical accessories and keep records. —Box 3522, c/o The Electrical Review.

**SUPERVISOR** required for pressure diecasting dept. of a large light electrical engineering firm in the West London area. Sound engineering background and training essential. Should have had some previous supervisory experience. Age not over 35. Salary from £500. Please apply, giving details of age, experience, qualifications and salary required, to —Box 3485, c/o The Electrical Review.

**SWITCHBOARD** Attendant required for Class F station, should possess technical knowledge and have had experience in the operation of E.H.T. and L.T. switchboards. Present rate of pay 2s. 7½d. per hour. Applications to the Chief Engineer, Slough Estates Ltd., Trading Estate, Slough. 3309

**THE** Civil Service Commissioners announce that a special competition will be held for appointments as Assistant Engineer (New Style), Male, in the Post Office Engineering Department, and Assistant Traffic Superintendent in the Telephone Department of the General Post Office. Approximately 100 vacancies in each grade will be filled by examinations spread over a period of two or three years. Candidates must have been born on or after the 2nd August, 1915, and have attained the age of 18 by the 1st January of the year in which they compete. Allowance will be made for service in H.M. Forces prior to 3rd September, 1939. Men only are eligible to compete for appointment as Assistant Engineer (New Style). The salary scales are as follows: —Assistant Engineer (New Style). London, £280 rising by annual increments of £20 to £380; Provinces, £265 × £20 to £360 (including consolidation addition). Assistant Traffic Superintendent: Men, London, £190 rising by annual increments of £18 to £465; Provinces, £180 × £18 to £435; Women, London, £190 × £12 to £375; Provinces, £180 × £12 to £345 (including consolidation addition). There will be prospects of promotion to higher grades. Candidates now serving in H.M. Forces must send in their application forms in time to reach the Civil Service Commission not later than six months after the completion of their service. All other candidates must send them in by 1st April, 1947, except that for candidates who are under 18 years old on the 1st April, 1947, the latest date for sending in the forms is the 1st January following their 18th birthday. Copies of the regulations and forms of application may be obtained from the Secretary, Civil Service Commission, Burlington Gardens, London, W.1, or from the Chief Officer, Civil Service Commission, at the following addresses, quoting No. 1679: (India) 10 Underhill Lane, Delhi; (Egypt) 8 Sharia Tolumbat, Garden City, Cairo; (Italy) c/o G.H.Q., C.M.F.; (Germany) c/o 2nd Echelon, G.H.Q., B.A.O.R. 3465



**SWITCHBOARD** Attendant required for shift duties in generating station operating in parallel with C.E.B. Grid; must have experience in operation of E.H.T. switchgear and parallel running of alternators. Salary Class G, Grade 9a. N.J.B. Schedule, London Area, at present £360 per annum. The position is subject to the Local Government Superannuation Act, and selected applicant will be required to pass a medical examination. Applications, stating age, experience and technical training, with copies of testimonials, to be addressed to—Chief Engineer and Manager, Electricity House, Durnsford Road, Wimbledon, S.W.19. 3502

**SWITCHGEAR** Draughtsmen required. Knowledge of layouts and wiring diagrams. London area. Experience, details, etc., to—Box 3489, c/o The Electrical Review.

**TECHNICAL** Sales Engineer required by London company to develop the sale of high-grade insulating material in this country. Applicants should have wide practical and selling experience and preferably possess a knowledge of French. Send full details training, qualifications and experience and remuneration required to—Box 3300, c/o The Electrical Review.

**TRANSFORMER** Design Engineer required, experienced in all types up to 500 kVA. Promising and highly paid position. Write, stating age and experience, to—Brentford Transformers Ltd., Windmill Road, Brentford, Middlesex. 3520

**WIDE** Strip Mill. Electrical Engineer required for specification layout and installation of power distribution, substations, lighting, also electricians in plant, including tandem mills and electric furnaces. Permanent position for suitable man.—Northern Aluminium Co. Ltd., General Engineering Department, Banbury. 3452

**WORKS** Manager required for electrical manufacturers with works in Brazil. Must be experienced production man, high grade executive ability, modern ideas, knowledge of Portuguese an advantage. Only energetic men of high calibre should apply with fullest particulars.—Box 3338, c/o The Electrical Review.

**X-ray** Technician required for India. Must be able to construct, repair and service X-ray equipment of all types. Apply in first instance to—Box 3269, 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.

**BOX 2457**—Asst. Electrical Engineer; Preece, Cardew & Rider—Engineering Assistant; Stalybridge, Hyde, Mossley & Dukinfield Transport & Electricity Board—Asst. Station Supt. All applicants are thanked.

#### SITUATIONS WANTED

**A** production executive (34), desires responsible position in instrument or radio factory. Good technical and production experience, 14 years in industry.—Box 9816, c/o The Electrical Review.

**A**BLE Electrical Engineer desires change. Experienced in planning and installation plant and wiring, test and overhaul electrical equipment. Sound technical education, some sales experience. Good references.—Box 9892, c/o The Electrical Review.

**A**M.I.E.E. (32), seeks responsible position in or near London with a growing firm. Flair for compiling advertising literature, technical letters, and replying speedily to customers' correspondence.—Box 9864, c/o The Electrical Review.

**A**N Electrical Installation Engineer and Draughtsman wishes to open negotiations for a permanent executive appointment in London, Herts. or Beds. Preferably in surveyor's dept. of organisation controlling hotels, multiple stores, etc., or with insurance co., manufacturers or contractors. Sound technical and practical background, 25 years' experience in all branches of contracting and maintenance. Well versed in building and allied trades, and in general engineering. Minimum salary £800 p.a.—Box 9871, c/o The Electrical Review.

**BUYER** M.P.O.A., 20 years' experience, Birmingham, London, electrical engineering, desires change. Resident Birmingham.—Box 9810, c/o The Electrical Review.

**CHIEF** Draughtsman or Designer desires change. Many years' varied mechanical and electrical experience, including management, tool design and planning. S.W. London.—Box 9796, c/o The Electrical Review.

**CHIEF** Draughtsman with many years' experience on experimental and production design of domestic appliances, radio equipment, measuring instruments, light mechanisms, etc., seeks position in London.—Box 9818, c/o The Electrical Review.

**EDUCATION** and Training. Young man, 24, college trained, 4½ years' Assistant Apprentice Supervisor at a Midland engineering works (400 apprentices, all grades), requires similar post to extend experience, preferably in South. Willing to initiate scheme if necessary.—Box 9858, c/o The Electrical Review.

**E**LECTRICAL and Mechanical Engineer, B.Sc.(Eng.). Graduate of Institutions of Electrical and Mechanical Engineers, etc., young and energetic, having practical and sales experience, wishes to represent well-established engineering firm in Midland area.—Box 9887, c/o The Electrical Review.

**E**LECTRICAL and Mechanical Engineer, 26 years power station, 6 years' war service, warrant officer artificer, at present electrical maintenance factory, requires change.—Box 9874, c/o The Electrical Review.

**E**LECTRICAL Engineer, A.M.I.E.E., age 31, 8 years' experience in light electro-mechanical engineering, including design, development, production problems, etc.; also acted for two years as technical representative. Previous experience in heavy engineering. Seeks position, for preference, in an administrative or executive capacity.—Box 9847, c/o The Electrical Review.

**E**LECTRICAL Engineer, Grad. I.E.E., works apprenticeship with large electrical concern, 3 years' design and estimating experience, seeks experience in operation, installation, layout of electrical equipment in large plant, Birmingham district.—Box 9893, c/o The Electrical Review.

**E**LECTRICAL Engineer (25) D.F.H.(Hons.), Grad. I.E.E. seeks permanent progressive position South of England or Continent. Four years as electrical officer R.N.V.R. following thorough practical training. At present engaged on switchgear development.—Box 9833, c/o The Electrical Review.

**E**LECTRICAL Fitter, maintenance repair, desires permanent post, good references, East London or South Essex areas.—Box 9898, c/o The Electrical Review.

**E**LEC. Foreman, 20 yrs.' exp., large installations and maintenance, requires progressive position, London area, own car.—Box 9827, c/o The Electrical Review.

**E**LECTRICAL Installation Engineer, over twenty years' executive experience in all aspects of contracting, capable of taking complete charge of contracting business or department.—Box 9877, c/o The Electrical Review.

**E**LECTRICAL Supervisor, fully qualified, desires progressive position, London, South Essex areas preferred. Full details from—Box 9905, c/o The Electrical Review.

**E**LECTRICIAN Chargehand, general installation and maintenance, factory work, etc., just back from overseas tour, desires further post at home or overseas, good worker, keen and ambitious. Further particulars.—Box 9873, c/o The Electrical Review.

**E**LECTRICIAN wants job, 30 years' experience all systems, anywhere, charge or otherwise.—B., 13, South Vale, S.E.19. 9872

**E**NGINEER, age 38, with 16 years' experience in administrative posts, desires situation as Works Manager. Wide experience in all classes of engineering, planning and rate fixing. Special study made of mass production methods, jigs and tools. General electrical knowledge. London area preferred.—Box 9910, c/o The Electrical Review.

**E**NGINEER, A.M.I.E.E., Representative with 12 years' contacts in Birmingham and Midland Counties, desires change; details.—Box 9865, c/o The Electrical Review.

**F**OREMAN Armature Winder, 29 years' varied experience, new or repair, rotary or static, industrial power application, conversions, some drawing, requires good position.—Box 9830, c/o The Electrical Review.

**L**ONDON General Mains Foreman, age 40, desires change to post where initiative and organisation would be recognised. Good practical and technical training. Experienced in super-tension, H.T., L.T., A.C. and D.C. networks and substations, change-over and over-heads. Fault location. Used to handling large cable gangs, jointers and departmental transport. Present salary £390 p.a.—Box 9878, c/o The Electrical Review.

**L**ONDON Sales Engineer wishes to represent manufacturers London and the south, full time; 20 years' experience selling A.C. and D.C. machines, control gear, rectifiers; car and telephone; A.M.I.E.E., public school and university training; excellent references.—Box 9904, c/o The Electrical Review.

**Q**UALIFIED Instrument Engineer seeks progressive post. Production, development or sales.—Box 9806, c/o The Electrical Review.

**R**ESearch Laboratory Mechanic, sound practical knowledge and able to make electronic devices from theoretical circuit diagrams, desires change of position, London area.—Box 9859, c/o The Electrical Review.

**R**ADIO and Electrical Engineer (32). Higher National Certificate both radio and electrical engineering; 6 years apprenticeship in electrical installation and maintenance; 2 years small electric motor manufacture and repair; 1 year corporation electricity dept. as technical adviser in generating station; 8 years with old-established firm as manager of dept. manufacturing radio and electrical equipment for H.M. ships. Holder of P.O. transmitting licence. Keen radio experimenter.—Box 9851. c/o The Electrical Review.

**W**ORKS Executive, A.M.I.E.A. (42), seeks responsible position. Experience of works management, organising, production planning and control, supervising, time study and personnel administration as applied to all types of precision electrical measuring instruments and radio. Good disciplinarian and used to handling labour to obtain co-operation for best results.—Box 9854. c/o The Electrical Review.

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**W**ORKS Manager, M.I.E.E., M.I.P.E., 25 years' experience production and administration, experience radio, television (and components), domestic appliances, seeks similar position, London area. Energetic and efficient organiser, good administrator. Excellent references.—Box 9911. c/o The Electrical Review.

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#### FOR SALE

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

**A**. Cooksley & Co. Ltd. offer large selection of used  
**E**lectric Motors, A.C. and D.C. Write—21/25, Tabernacle Street, London, E.C.2 (Monarch 3357/58). 46  
 A quantity of Electric Ceiling Heater Units, 10 kW loading, 400 volt working.—Maintenance Manager, Pawsons & Leafs Ltd., 9, St. Paul's Churchyard, London, E.C.4 (City 4455). 3468

A quantity of 4 ft. Met-Vick. Fluorescent Twin Tube  
 Troughs, complete with all gear and tubes. Immediate delivery.—John Phillips & Co. Electrics, 31, Fortune Green Road, W. Hampstead, N.W.6 (Hampstead 8132). 3459

**A**BOUT 25,000 yards unused 1036 paper-insulated,  
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 and prepayment, reconditioned, guaranteed one year. Repairs and recalibrations.—The Victa Electrical Co., 47, Battersea High Street, S.W.11. Tel. Battersea 0780. 19

**A**.C. and D.C. Motors, all sizes, large stocks, fully  
 guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 2278-9). 102

**A**.C./D.C. 5-valve Superheterodyne Sensitive 3-wave  
 Band Receiver. Excellent tone. Attractive modern cabinets in "Plasteel" or polished wood, £16 16s. Usual trade terms and facilities. Early delivery. Trade only.—Morgan, Osborne & Co. Ltd., Southview Road, Warringham, Surrey. 110

**A**.C. Motors, 1/75th h.p. to 5 h.p., all voltages. Also  
 D.C.—The Johnson Engineering Co., 319, Kennington Road, London, S.E.11. Telephones, Reliance 1412/3. 57

**A**LTERNATING Petrol/Paraffin Sets, 400/3/50, direct  
 coupled on bed. First-class order. 25 kVA, 35 kVA, 50 kVA, 70 kVA. Fully tested, for quick delivery.—Electroplant Co., Wembley, Middx. 3529

**A**LTERNATOR, 200 kVA, 250 r.p.m., 400/3/50, for  
 coupling.—The Electroplant Co., Wembley. 3528

**A**TTRACTIVE weekly offers from The Electroplant Co.,  
 Wembley, Middx. A number of complete Dynamos or Sets, 150 amps.-600 amps., 6/10 v. A number of Alternators from 1.5-3 kVA, 230/1/50, almost new. Many M.G. Sets of various descriptions. Ask for further details. 3530

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**B**.T.A. A comprehensive service is now available for  
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**B** & W. Water Tube Boilers for disposal. Two 50,000  
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 2-6-12 v., 1, 2 or 4 amp. D.C., any mains voltage. Generous trade terms. Write for catalogue.—The Banner Electric Co. Ltd., Hoddesdon, Herts. Tel.: Hoddesdon 2639. 97

**B**EETANTEE Festoon Striplight Holders, made of X20  
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**B**ELLS, Tangent and G.E.C., 12 volt to 220 volt; also  
 Buzzers, Gongs, Fire Alarms, Domes, Pushes, etc. All new surplus stocks ex Admiralty. Bargain prices. Lists.—Electrical Agencies (Belfast) Ltd., College Street, Belfast. 9884

**B**URDETTE & Co. Ltd. stock Reconditioned A.C. and  
 D.C. Motors and Starters equal to new. Day and night service.—Stonhouse St., Clapham, S.W.4. Mac. 4555. 17

**C**HOKES, suitable for 80-w. fluorescent tubes, 220/230  
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 Brackets; also Shade Makers, Gymbals, etc. Actual manufacturers.—Central London Engineering (Fabrications) Ltd., 120, Old Street, E.C.1 (CLE 2586). 103

**D**.C. Motors, new, 200/230 volts, 1,400 r.p.m.; 8 to 31  
 h.p., also 110 volts, D.C., 21 h.p., several available with starters.—Stewart Thomson & Sons (L'pool) Ltd., Fort Road, Seaford, Liverpool, 21 (Telephone Number, Route 2697) or 28, Victoria Street, Westminster, London, S.W.1 (Telephone Number, Abbey 2101). 96

**E**LECTRIC Lamps, Flashlights, Flashlight Bulbs, Portable  
 Fires, Accessories. Prompt delivery.—Suplex Lamps Ltd., 50, Gray's Inn Road, London, W.C.1. Holborn 0225. 116

**E**LECTRIC Motors, 1/3 h.p., 3,000 r.p.m., D.C. 110  
 volts. Also 220 volts. Stock delivery, £6 each.—John Steel, Clyde Mills, Bingley, Yorks. 84

**E**LECTRIC Motors and Dynamos. We hold one of the  
 largest stocks of new and second-hand motors. Second-hand machines are thoroughly overhauled. Inspection and tests can be made at our works. For sale or hire. Send your enquiries to—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Phone, 5512-3 Clerkenwell). 13

**E**LECTRIC Motors, A.C. and D.C. We supply all types  
 and sizes of electrical machinery. Slow speed reduction gears can be supplied to customers' requirements with short deliveries. Send your enquiries to—Be-Be Engineering, 3, Retreat Close, Kenton, Middx. (Wordsworth 4928). 42

**E**LECTRIC Welding Plant, Engine and Electric, A.C.  
 driven, 300 amps. output, complete with weather-proof covers.—Box 34. c/o The Electrical Review.

**E**XCEPTIONAL Offer: 19/064, 660-volt T.R.S. Pure  
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**G**ENWIN'S, manufacturers of electric vacuum cleaners, have the following Wires in stock, in perfect condition, for disposal at to-day's current prices. Preference will be given to purchasers taking the whole, or whole individual items. 263 lbs. enam., 17g., 49 lbs. enam., 19g., 473 lbs. 26g., enam.: 173 lbs. 32g., ss. and enam.: 118 lbs. 36g., ss. and enam.: 29 lbs. 38g., ss. and enam.: 49 lbs. 40g., ss. and enam. Write—Genwin's, Bentley Heath, Knowle, Birmingham. 3434

**G**EORGE Cohen, Sons & Co. Ltd. for guaranteed Electrical Plant, Motors, Generators, Switchgear, etc.—Wood Lane, London, W.12 (Telephone, Shepherds Bush 2070) and Stanningley, near Leeds (Telephone, Pudsey 2241). Established 1834. 27

**G**LASS Shades, cylindrical, for outside fittings, 2,000 to clear, half price.—Electrical Agencies (Belfast) Ltd., College Street, Belfast. 9885

**I**NSTALLATION Tester, 500 v. Record Minor, £11. From stock.—Robins Electrics, 222 & 222b, West End Lane, N.W.6. 83

**I**NSULATING Sleeving (PVC and Rayon) to clear at 10s. 6d. gross yards for 50 gross lots. Ass'd. shades and sizes 0.5 to 3.0 m/ms. Enquiries also invited large variety PVC covered wire.—Lowther, 8, Paton Street, Manchester, 1. 9901

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**K**OHLER Automatic Sets, 5 kW, 10 kW, 220 v. D.C.; 5-h.p. Petter Diesel Set, 200/220 v. A.C.: Pelapone Set, 100/140 v., 11 a. and panel; Dynamo, 7.8 kW, 250 v., comp. 550 r.p.m.; Dynamo, 100/140 v., 10 kW, 850 r.p.m. Sh/Comp.; Dynamo, 75 v., 60 a., 1,500 r.p.m.: Pelapone Diesel Set, 5 kW, 100/140 v.; 5-h.p. Petter Diesel Engine; 5-h.p. and 3½-h.p. oil Engines; Panels, etc. E. Binns, 156a, Falsgrave Rd., Scarborough. 9899

**L**. Goodman (Radio) Ltd., 9, Percy Street, Tottenham Court Road, W.1. are sole London agents for the "Midco" Elongated Fluorescent Choke and Fluorescent Starter Switches. Museum 0216. 76

**L**ARGE number of Plating and Anodising Generators, up to 1,200 amps. for the most part unused. Send requirements to—Lyfe, Wilson & Co. Ltd., Bishop's Stortford. Tel. B.S. 1000/1. 3504

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**L**ADDERS, single and extension, from—Ramsay & Sons (Forfar) Ltd., Forfar. 9004

**L**ESLIE Dixon & Co. for Dynamos, Motors, Switchgear, Chargers and Telephones.—214, Queenstown Road, Battersea, S.W.8. Telephone, MA Caulay 2159. Nearest Riv. Sta.: Queen's Road, Battersea (S.R.). 18

**M**AY we send our Engineers' Stethoscope on approval (without obligation)? Particulars on request.—Capac Ltd., 2, Ullswater Road, London, S.W.13. 78

**M**E.M. Starters and Reversers, new, List Nos. 51DS, 55DS, 24AR and 14AR, 10% below nett price. Quantities of 5, 10 and 15-amp. New Porcelain Oblong Outlets, 10 and 15-amp. S.P. New Brass Switches and Porcelain Wireless Insulators. Offers to clear, 240/250-volt Motor and Starter, with pulley, 12 h.p., slip-ring, single-phase, £55.—Monks of Wimbledon, 139, The Broadway, S.W.19. 3437

**M**ETERS, 200/250 v., 50 cycle, 2-wire, prepayment pattern, comprising 150 10-amp. and 20 5-amp. Electrical Apparatus Co. type ECP, with shilling coin mechanism and 9d. price compounds. These compounds may be easily changed. Due to tariff changes the meters have recently been removed from circuit and are no longer required. Price as removed, £2 each, or if certified, £3 each.—J. S. Pickles, B.Sc., M.I.E.E., County Electrical Engineer, Marchmont, Dumfries. 3481

**M**ONOMARK. Permanent London address. Letters re-directed, 5s. p.a. Write—BM/MONOSW. W.C.1. 68

**M**OTOR Generator Sets and Convertors, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, City Road, London, N.1. Telephone, Clerkenwell 5512, 5513 & 5514. 28

**M**OTORS and Starters, 1 h.p., 2,880 r.p.m.; 1½ h.p., 2,910 r.p.m.; 2 h.p., 710 r.p.m.; 4 h.p., 1,425 r.p.m.; 6 h.p., 1,425 r.p.m.—J.W. C.S. Ltd., Staffa Works, Staffa Road, E.10. 3441

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**N**EW Porthole Fans, 12" and 18" sizes. Motorised either 400/3/50 or 230/1/50. Ex-stock.—A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, E.C.2. Phone Nos. Monarch 3357/8. 3416

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**P**HONE 98 Staines. 90-kW Ruston Diesel Set, 110 v. D.C.; 25-kW Mirreles ditto, 110 v.; 7/9-kW Ruston ditto, 110 v.; 5-kVA Ruston ditto, 400/1/50; Weir Feed Pump, 8½" x 6" x 13".—Harry H. Gardam & Co. Ltd., Staines. 60

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**P**V.C. Flex and Bell Wire, coloured and transparent, single, twin, triple and four core. Large variety, from 6s. 9d. per 100 yards. Send 6d. for samples and lists. Also in stock, Fires, Irons, Extension Speakers, Plugs, Sockets, Cable, Radio Accumulators and Car Batteries, etc.—Northern Industries, 199, Broughton Lane, Salford. 7. 3424

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**10** cwt. "Clear Space" Massey Pneumatic Hammer, stroke 27", capacity M.S. Bar 10", M.D. 400/3/50; ditto Guided type, clear between slides 12 1/2", 400/3/50. —Thos. W. Ward Ltd., Brettenham House, Lancaster Place, Strand, W.C.2. Tel. Temple Bar 9631. 339

**27** kVA Diesel-driven Alternator Set, consisting of 4-cylinder Diesel Engine and direct-coupled to 27.5-kVA, 3-phase, 50-cycles, 400-volt Alternator, complete with switchboard and automatic voltage regulator (two sets available).—Newman Industries Limited, Yate, Bristol. 3415

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**WANTED**, D.C. and A.C. ball bearing Motors. Full details to—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 29

**WANTED**, Rotary Converters, any size.—Universal, 221, City Road, London, E.C.1. 22

**WE** are immediate buyers for electrical machinery and heavy power plant of all descriptions. Good prices offered for Al plant.—G.P.C. Ltd., Wembley, Middlesex, 3531

**1** h.p., 230-v. A.C. or D.C. Motor.—Universal Electrical, 221, City Road, London, E.C.1. 25

**1** inch to 1 1/2 inch Steel Chain, suitable for electrical fittings.—Box 9857, c/o The Electrical Review. 3507

**1** 25-h.p. and 1 1/2-h.p., 400-volt, 3-phase Motors & Starters.—Alpha Manufacturing & Electrical Co. Ltd., 21, Cedars Road, S.W.4. 3501

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**5** and 15-amp. Single-pole Skeleton Kick Switches.—Rowe Bros. & Co. Ltd., Pall Mall, Liverpool, 3. 3312

**7** h.p. A.C. Slip-ring Motor, 3-phase, 50 cycles, 380 v., screen protected, horizontal spindle. New or secondhand. Write immediately to—The Long Eaton Cable Co. Ltd., 256, Westminster Bridge Rd., London, S.E.1. 3445

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**E**XPERIENCED Sales Engineer with leading manufacturer, free to take additional agency.—Box 9882, c/o The Electrical Review. 9882

**G**ENTLEMAN, with office in London and knowledge of electrical engineering, would undertake representation of firms.—Box 9840, c/o The Electrical Review. 9840

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### PATENT NOTICES

**N**OTICE is hereby given that The M-O Valve Co. Ltd., and William Ernest Willshaw seek leave to amend the Specification of the application for Letters Patent No. 278,585 entitled "Improvements in magnetrons". Particulars of the proposed amendment were set forth in the Official Journal (Patents) No. 3016, dated November 13th, 1946. Any person may give Notice of Opposition to the amendment by leaving Patents Form No. 19 at the Patent Office, 25, Southampton Buildings, London, W.C.2, on or before the 13th December, 1946.—H. L. Saunders, Comptroller General. 3509

### MISCELLANEOUS

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**S**HORTHAND Typists, Private Secretaries, Clerks, etc. If you are in urgent need of staff, contact Embassy Secretarial Employment Bureau, Excel House, Whitcomb Street, W.C.2 (Whitehall 5924). We specialise in efficient personnel. 90

**Y**ORKSHIRE Business Agencies specialise in advice regarding the sale and purch. of businesses. Skilled in investigation on behalf of purchasers, and can give sellers the benefit of expert opinion on the value of their business. All prospective buyers and sellers will find an interview with us to their advantage.—Yorkshire Business Agencies, Business Consultants, 15, East Parade, Leeds, 1. 3217



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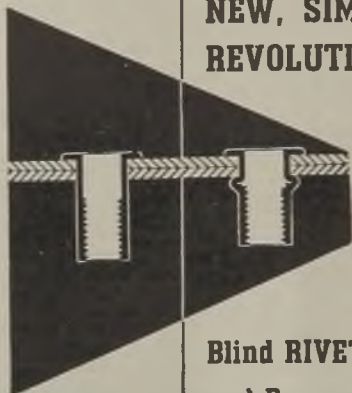
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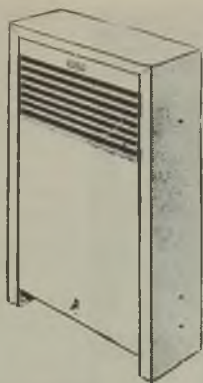
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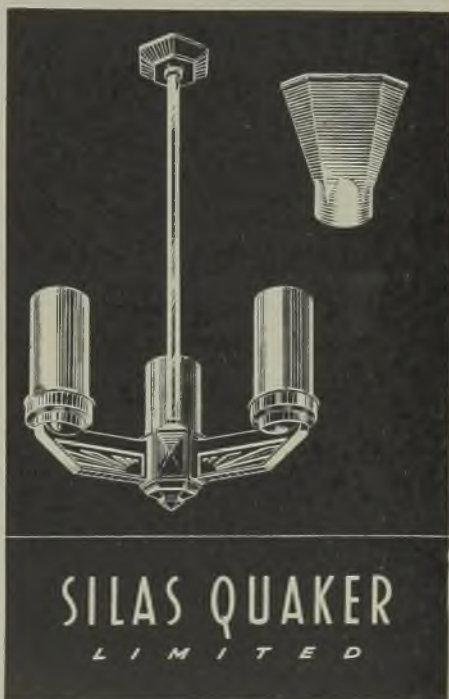
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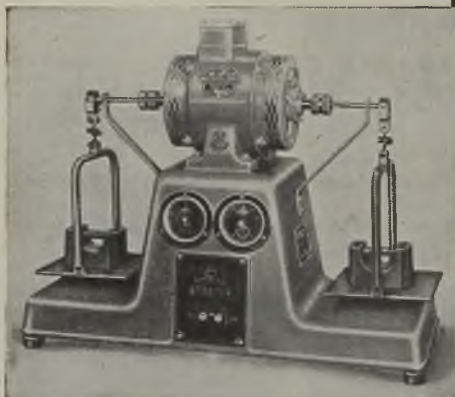
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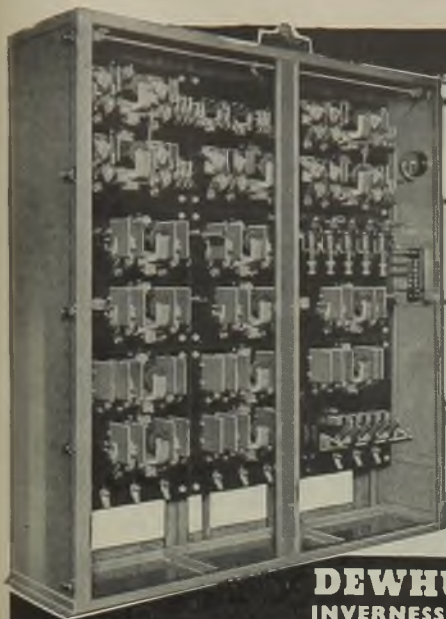
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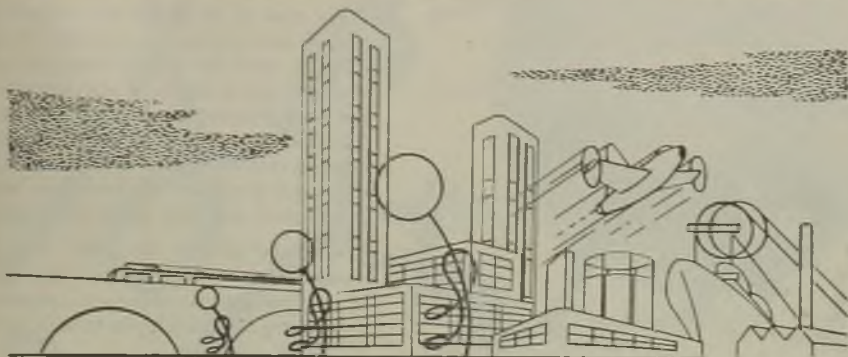
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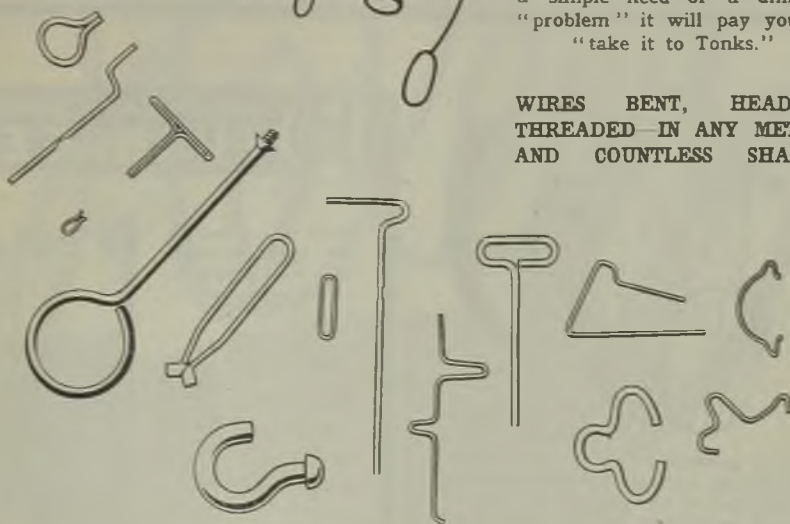


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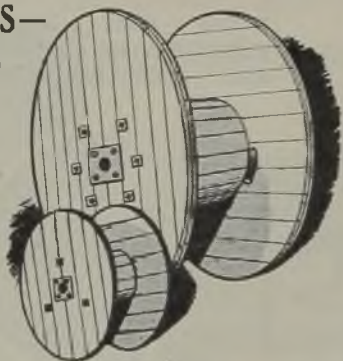
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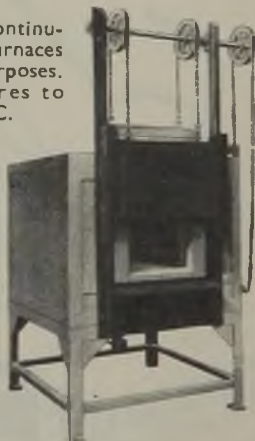


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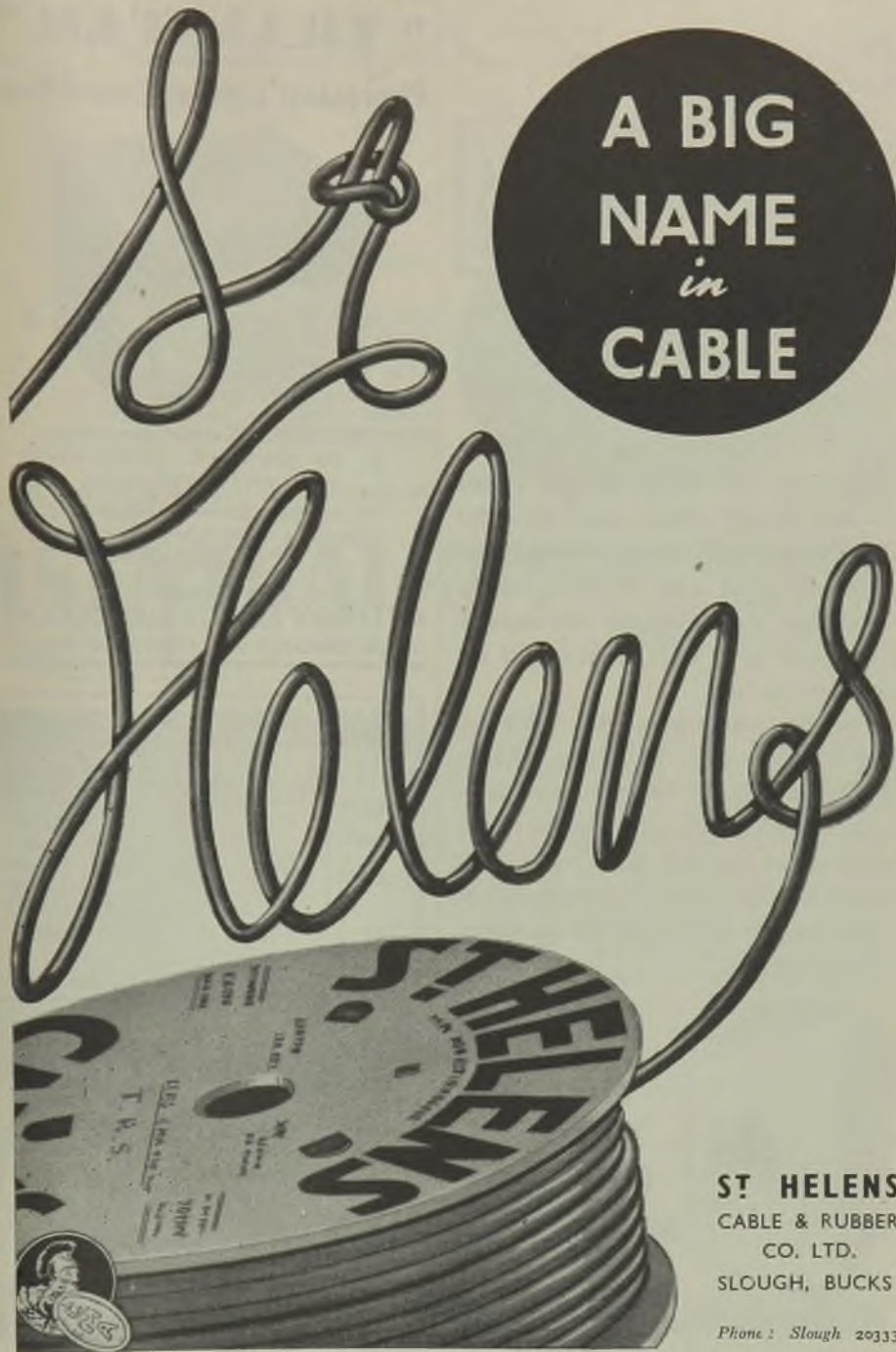
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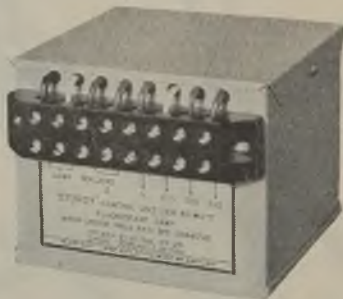
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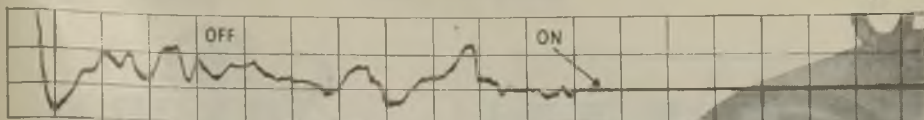
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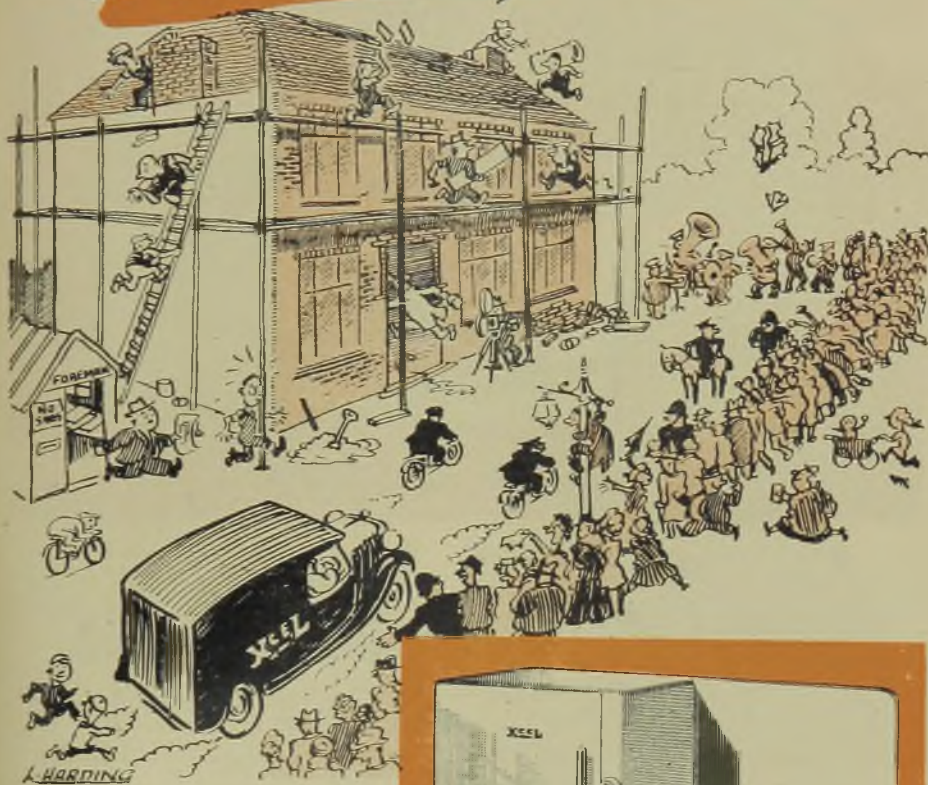
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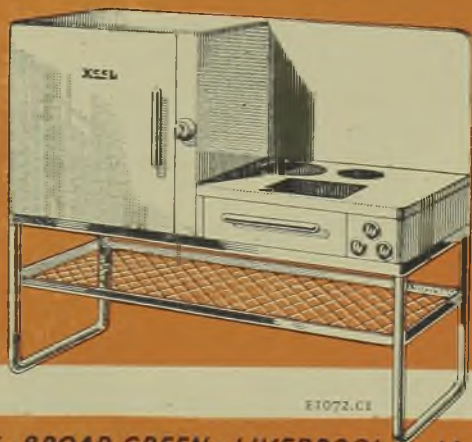
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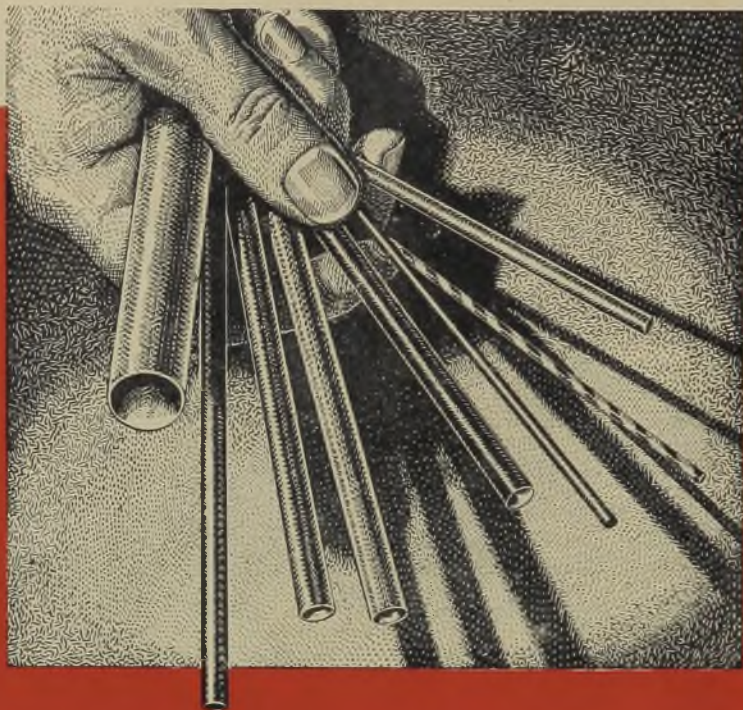


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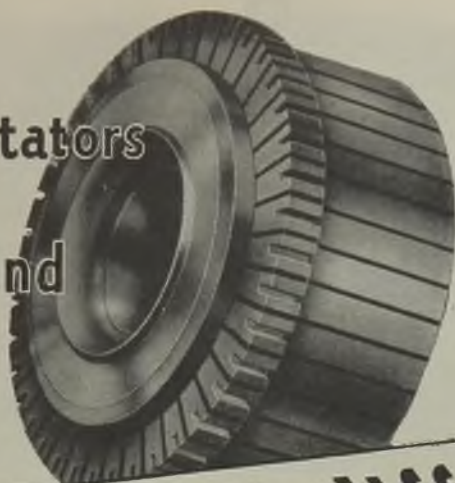
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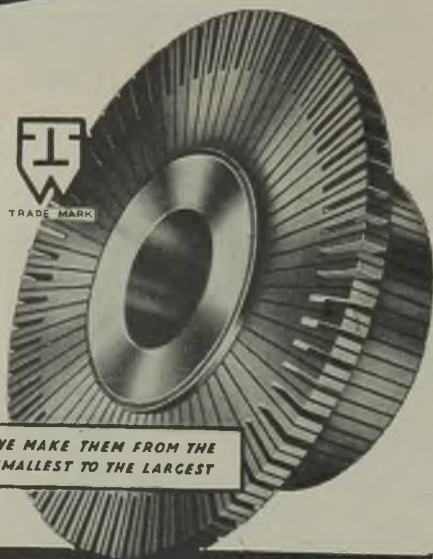
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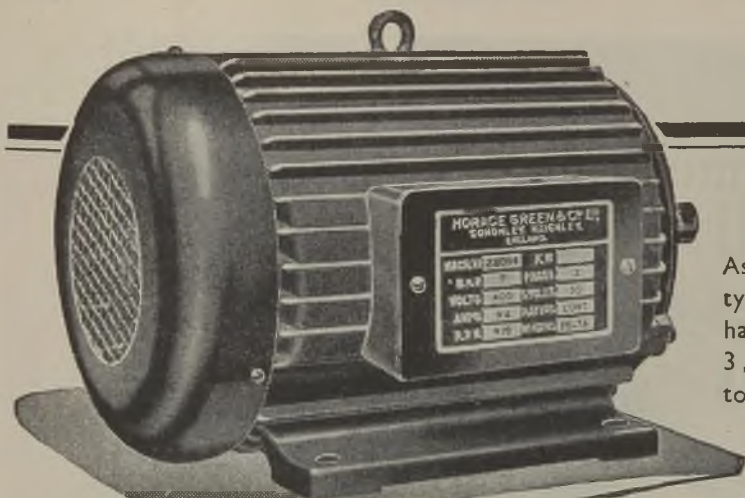
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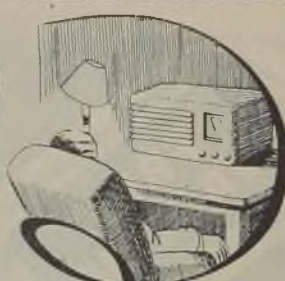
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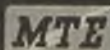
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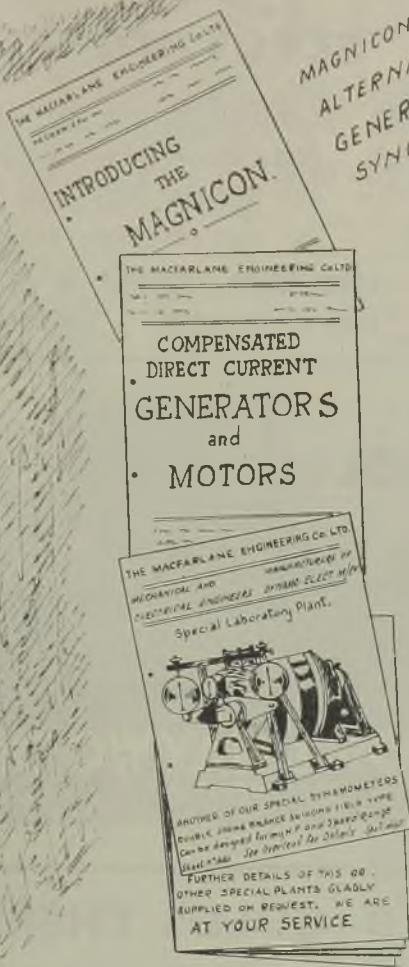
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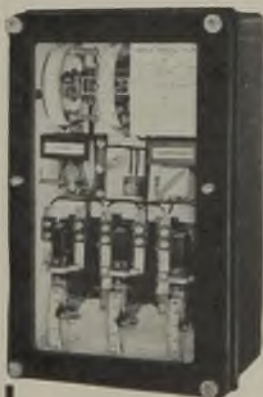
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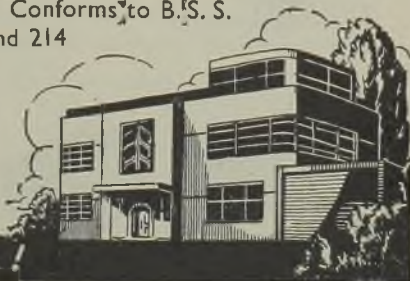
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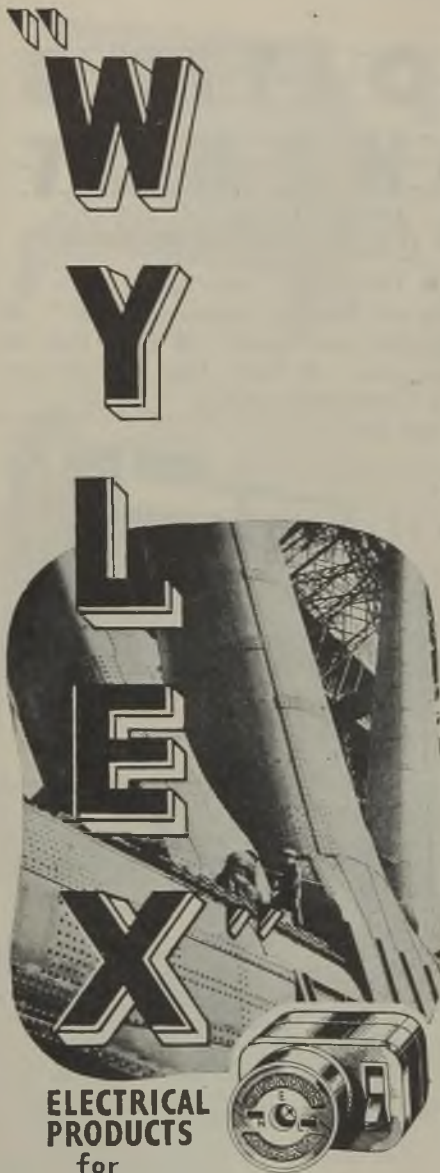
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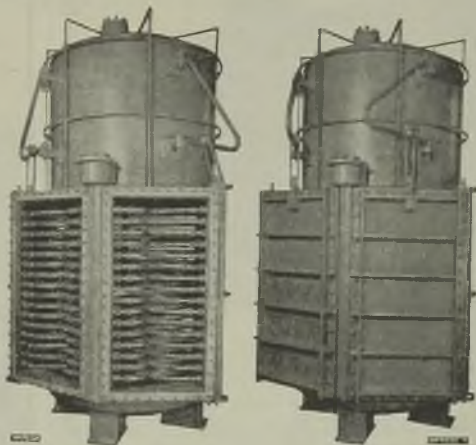
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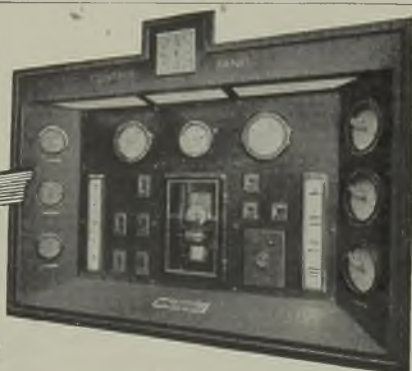
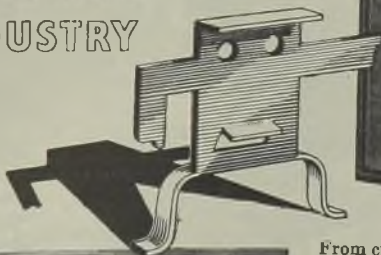
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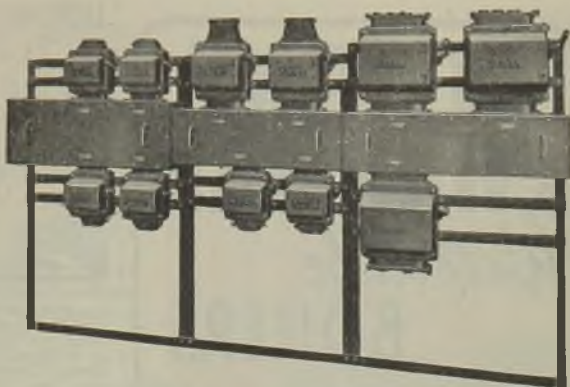
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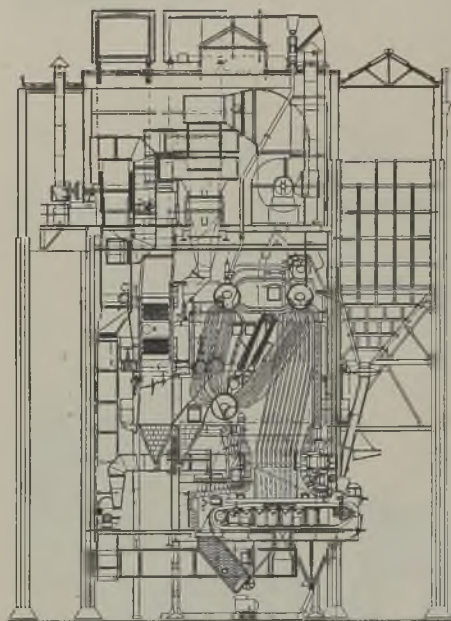
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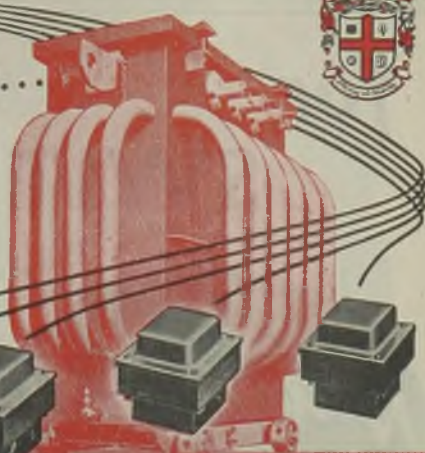
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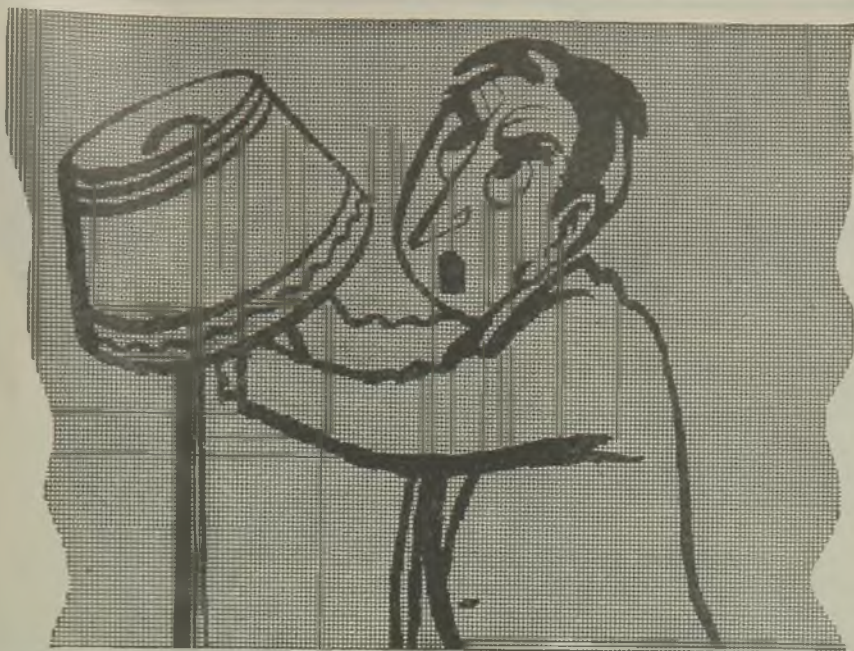
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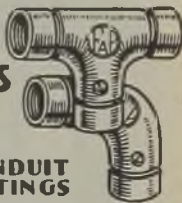
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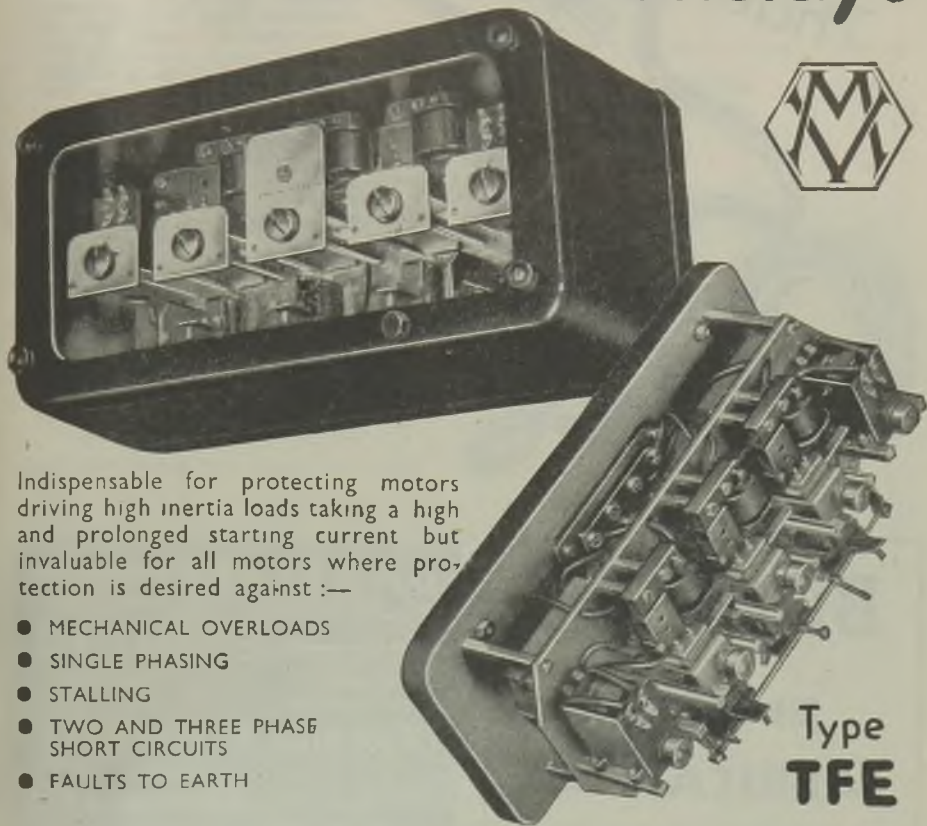
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Water		Crude	Treated	Crude	Treated	Crude	Treated
Cations							
Calcium	Ca	3.2	-	9.4	-	10.7	-
Magnesium	Mg	0.8	-	0.36	-	1.09	-
Sodium	Na	0.46	0.23	1.0	0.31	1.66	0.44
Total		4.46	0.23	10.76	0.31	13.45	0.44
Anions							
Carbonate	CO <sub>3</sub>	4.2	0.24	12.4	0.29	10.5	0.57
Chloride	Cl	1.8	0.06	2.5	0.12	2.84	0.30
Sulphate	SO <sub>4</sub>	1.35	-	3.48	0.03	11.95	-
Nitrate	NO <sub>3</sub>	-	-	-	-	1.15	-
Total		7.35	0.30	18.38	0.44	26.44	0.87
Total ions in solution		11.81	0.53	29.14	0.75	39.89	1.31
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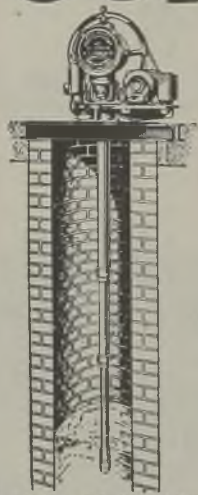


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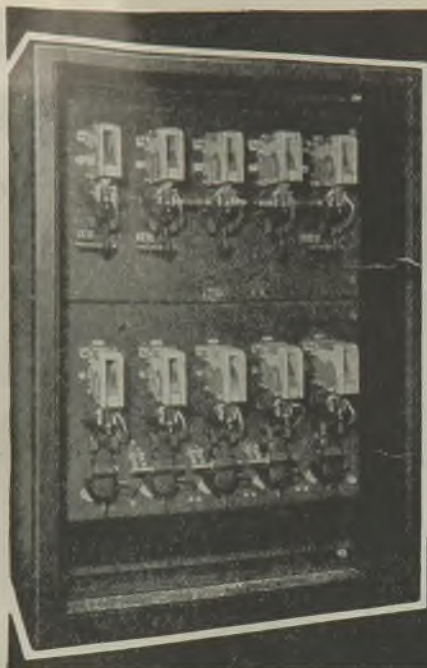
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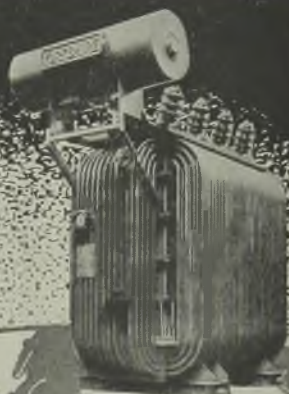
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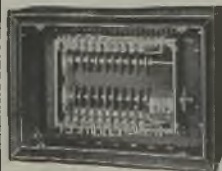
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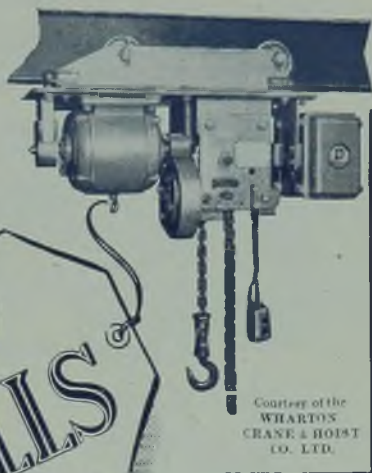
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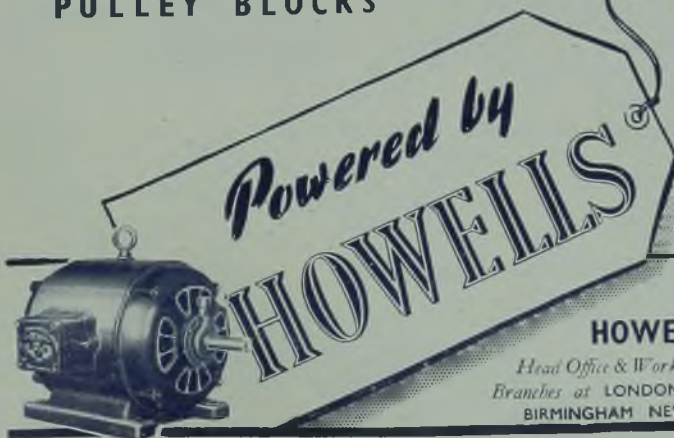
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