

ELECTRICAL REVIEW

FOUNDED
1872

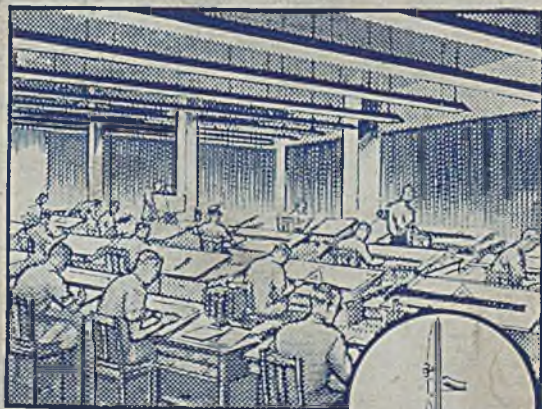
Vol. CXXXV. No. 3501

DECEMBER 29, 1944

9d. WEEKLY

RESEARCH BEHIND LIGHTING

MEANS TO AN END



TO-DAY there are thousands of factories with lighting conditions approximating to daylight: factories where perfect visibility has reduced sickness and accident to negligible proportions.

BTH Lighting Engineers have made this vital contribution to health and efficiency; but they, in their turn, have been briefed by BTH Research.

It is, perhaps, a far cry from the BTH Spectro Radiometer to the massive lighting installation of a great factory. Nevertheless, the Spectro Radiometer, in common with many other scientific instruments in the BTH Laboratories, has been a most important means to the designed end.



MAZDA
LAMPS

LIGHTING ADVISORY SERVICE

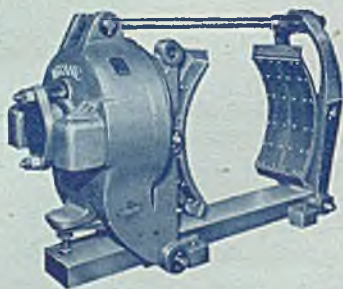


son-Houston Co. Ltd., Crown House, Aldwych, London

IGRANIC MAGNETIC DEVICES



Illustration above shows
Igranic Lifting Magnet.
Below, Igranic Type "M"
Magnetic Brake.



Igranic Magnetic Specialities have been tried and proved in some of the largest industrial plants in this country. They are built to withstand years of arduous service.

Igranic Magnetic devices include :
Magnetic Brakes
Magnetic Clutches
Lifting Magnets
Magnetic Separators
Magnetic Solenoids, etc.

*Write for
Detailed
Leaflets*

IGRANIC ELECTRIC CO. LTD
LONDON & BEDFORD

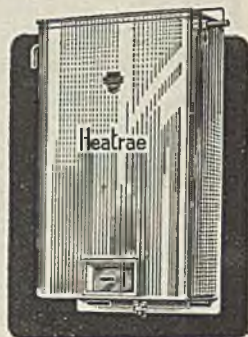
The Art of Knowing How



Just as every move in Chess is the result of careful precalculation, so should be every "move" in progressive Electric Water Heater design.

So, before Heatrae puts down anything "on the 'board,'" every possible "check" is carefully studied.

Art of the Seer? No—simply the art of precalculation, based upon a long experience.



**LEADERS IN
ELECTRIC
WATER HEATING**



HEATRAE LTD., NORWICH

PHONE : NORWICH 25131

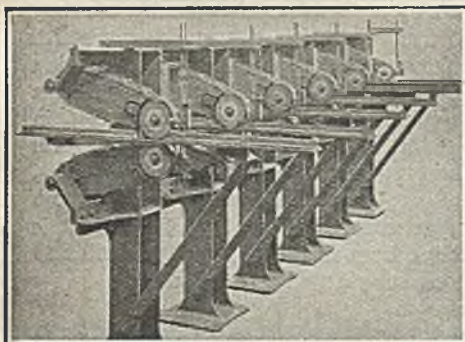
GRAMS : HEATRAE, NORWICH

The WESTMINSTER ENG. CO. Ltd.

Victoria Road, Willesden Junction, N.W.10

Telephone :
Willesden 1700-1

Telegrams :
"Regency, Phone, London"



A batch of Pedestal Type single-ended "WESTMINSTER" PATENT SCALING MACHINES

For removing the scale from 2 surfaces on one edge of plate simultaneously, preparatory to welding. The grinding wheels are self-adjusting for varying thickness

SOUND TERMINAL WITHOUT SOLDER



Suitable for Telephone Lines

FOR CABLES
AND WIRES
OF ALL KINDS



SIZES FROM
1" to 2"
HOLE

ROSS COURTNEY & Co. Ltd.

ASHBROOK ROAD, LONDON, N.19

TURNED WHEELS

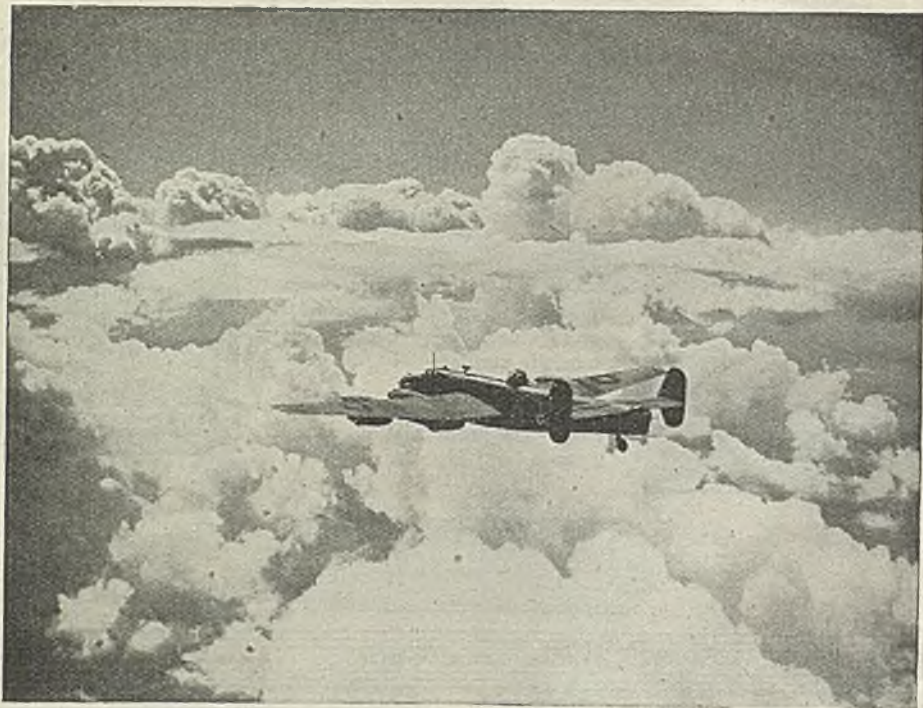


to the specific
requirements of
our customers

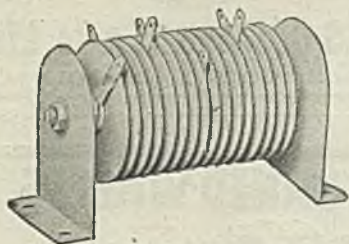
Makers of all types
of repetition
products from
the bar in all
metals



M.C.L. and REPETITION LTD.
Pool Lane - Langley - Birmingham.



Serving with the **BOMBERS**



Selenium Rectifiers

THE roar of Allied bombers over the Reich goes on, undeterred by enemy defence or adverse weather. Only the utmost reliability of crews and equipment enables this pressure not only to be maintained but constantly increased. It is not therefore surprising to learn that STC Selenium Rectifiers are serving with the bombers. At 20,000 or zero feet, in heat or below freezing, they keep on "keeping on." They are noise-free, dust-, moisture- and shock-proof, and need no maintenance. Wherever D.C. current is needed from an A.C. supply, you will find them doing a real job of work.

Rectifier Sales Department :

STANDARD TELEPHONES AND CABLES LIMITED, NEW SOUTHGATE, N.11

Are you a man ...



or a mouse?

Some parts of aircraft are so squeezed up and hard to get at that there is quite a boom in teeny-weeny men to do assembly work —boring holes, screwing in screws and so on. What a life! Makes you think of Oliver Twist being pushed through the window; or the poor little sweep in the Water Babies. If you find yourself being urged into any such industrial strait-jacket you can save the situation by murmuring to your manager the magic word "Desoutter". If he thinks it's just a rude word write to us and we will forward a complete explanation with pictures and full instructions on how to pronounce. Who knows? This may be the first step toward your being offered a partnership; for a proper appreciation of Portable Power Tools is widely accepted as a main requirement in efficient Works Management!

DESOUTTER

*Specialists in Lightweight, Pneumatic
& Electric Portable Tools*

DESOUTTER BROS. LTD. (DEPT. R.), THE HYDE, HENDON, LONDON, N.W.9
TELEPHONE: COLINDALE 6346-7-8-9. TELEGRAMS: DESPNUCO, HYDE, LONDON

They Shall Stand



VULCANISED FIBRE LTD



Broadford Mills.

GUILDFORD ENGLAND



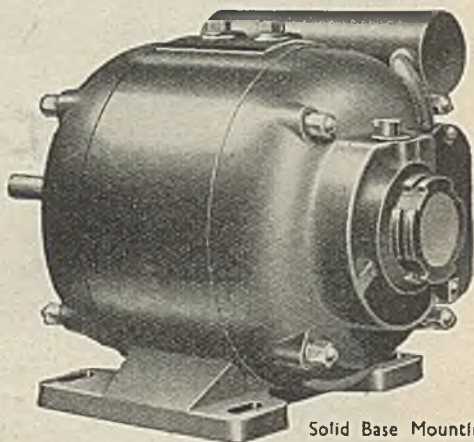
FRACTIONAL HORSEPOWER MOTORS

The most popular in the country

CAPACITOR MOTORS

$\frac{1}{8}$ H.P. to 1 H.P.
Up to 250 volts.

**BALL OR
SLEEVE BEARINGS**



Solid Base Mounting

Motors are available for :—

Solid Base Mounting

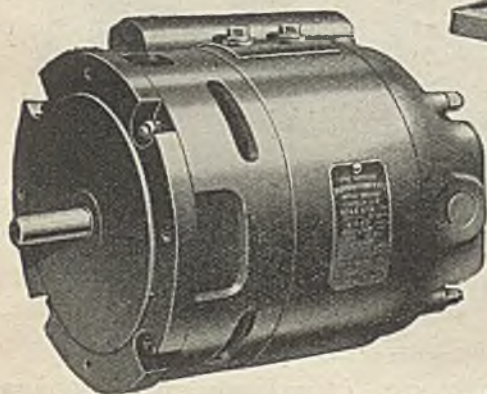
Cradle Mounting

Resilient Mounting

**Resilient Mounting
fitted with**

Automatic Belt-tension Adjuster

Spigot Mounting



Spigot Mounting
(Vertical, Horizontal,
or Inclined Positions)

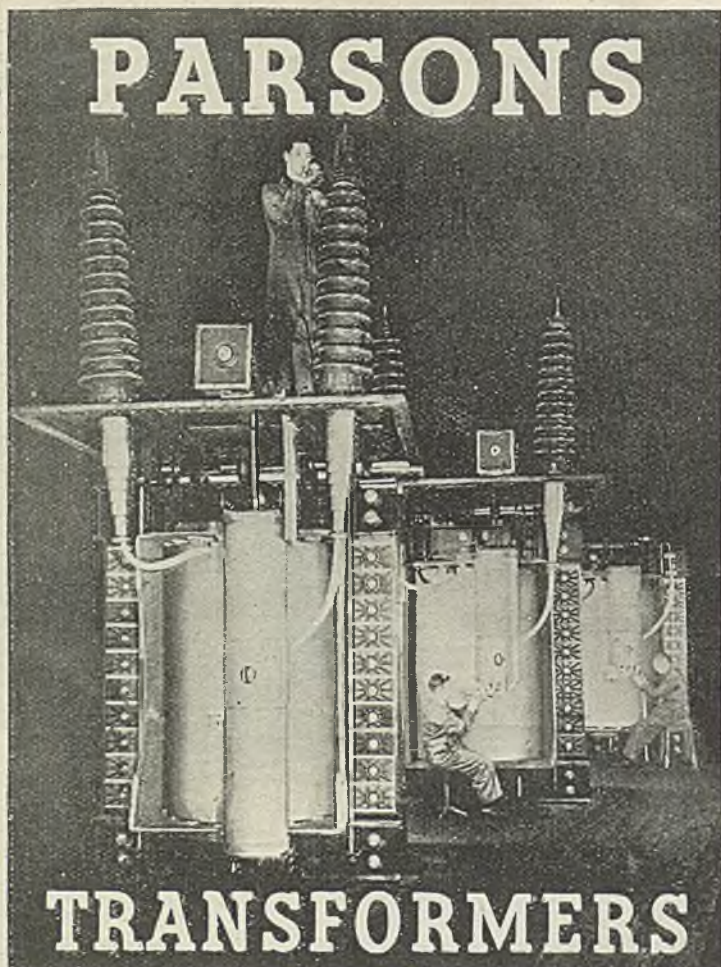
**The most compact machines
obtainable compatible with
reliability, quiet running, and
proved performance.**

BTH

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



A3256



Single Phase Transformers for 31.5 mVA 3-phase 115/10.5 Kv 50 cycles each fitted with fully insulated off current tapping switch

Also manufacturers of:—

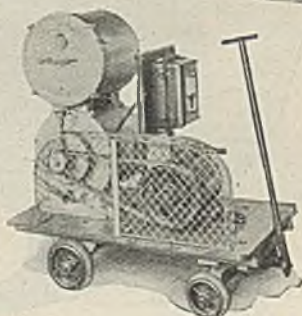
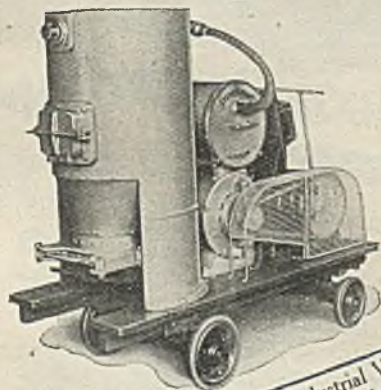
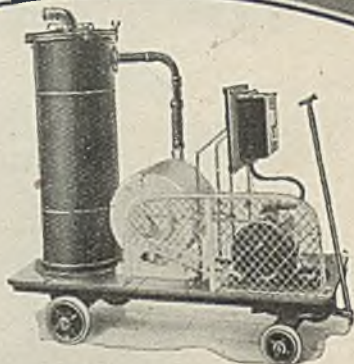
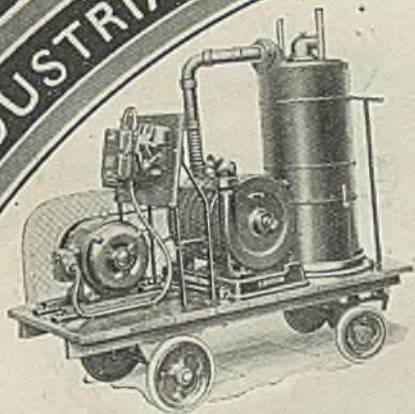
STEAM TURBINES, TURBO-ALTERNATORS, D.C. GENERATORS, TURBO-BLOWERS, TURBO-COMPRESSORS, SURFACE CONDENSING PLANT, GEARING SEARCHLIGHT REFLECTORS, ETC., ETC.

C.A. PARSONS
& COMPANY LTD

NEWCASTLE-ON-TYNE, 6

London Office: 56 VICTORIA STREET, S.W.1

STURTEVANT INDUSTRIAL VACUUM CLEANING



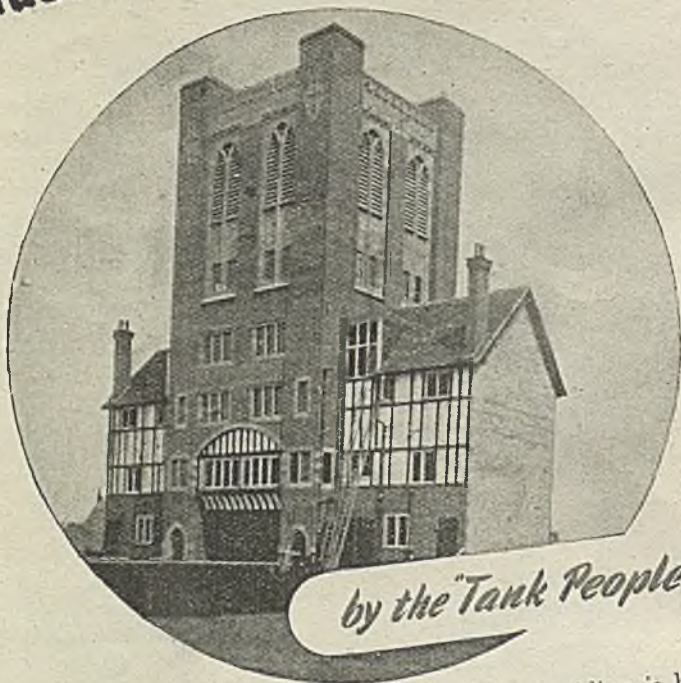
THE extensive range of Sturtevant Industrial Vacuum Cleaners includes machines specially built for applications where heavy cleaning capacity and substantial construction are the main essentials. Large numbers of machines are successfully operating in all kinds of factories in all parts of the world and, like other Sturtevant Cleaners, they give continuous service and maintain the highest efficiency under the most exacting conditions. Wherever there is dust and dirt there is a need for a Sturtevant Cleaner for, whatever the nature of the dust and the conditions, experience shows that the systematic and regular use of a Sturtevant Cleaner overcomes dust problems, effects a reduction in maintenance costs, and increases the efficiency of all cleaning operations.

Full particulars of Sturtevant Industrial Vacuum Cleaners are given in our post-free publication U.1391. May we send you a copy?

STURTEVANT ENGINEERING CO. LTD.
25. WORCESTER ROAD, SUTTON, SURREY.

TELEPHONE: VIGILANT 2275

Unusual Undertakings



FEW indeed would guess that this picturesque building is but clever camouflage for a Braithwaite Pressed Steel Tank. The Tank in question is of 43,000 gallons capacity and provides the water supply to one of Britain's garden cities. This is yet another of many interesting and unusual installations by Braithwaites. Storage tanks for all purposes are fully described in a special brochure. You are invited to apply for a copy.

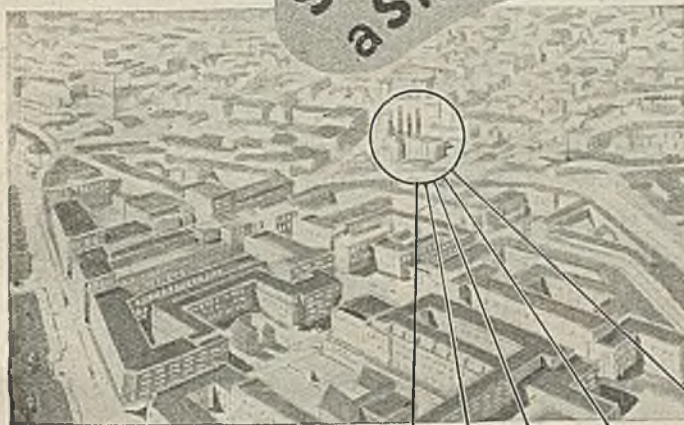
BRAITHWAITE PRESSED STEEL TANKS



BRAITHWAITE & CO. ENGINEERS LTD.
45 KINGS HOUSE, HAYMARKET, LONDON, S.W.1 • Tel: WHItchall 3993



**SELECT CONTROL from
a SINGLE SOURCE**

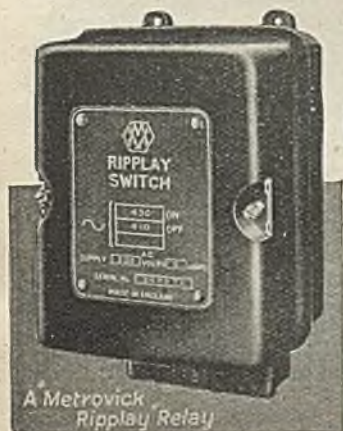


NO ALTERATION
TO EXISTING
NETWORKS

FLEXIBLE
APPLICATIONS

RELIABLE RELAYS
AT LOW COST
(standard type)

METROVICK RIPLAY SYSTEM



A Metrovick
Ripplay Relay

LIGHTING
of STREETS

WATER
HEATERS
(off peak
periods)

SPACE
HEATING
(off peak
periods)

KIOSK
& SHOP
LIGHTING

EMERGENCY
CALLS

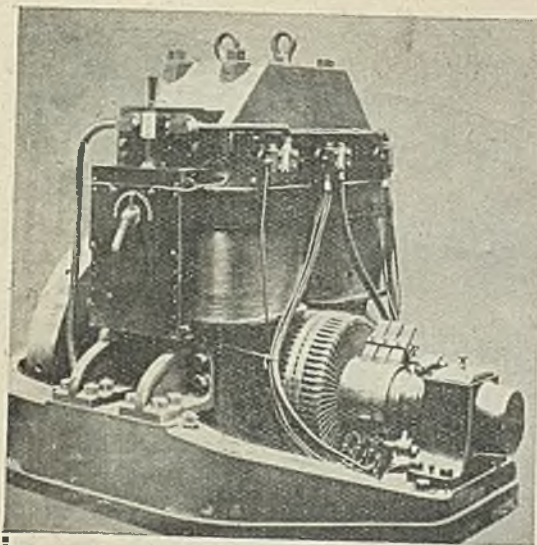
In the post-war world, the Metrovick RIPLAY centralized system of control will be in great demand by Supply Authorities.

This method of select control embodies a Metrovick RIPLAY injection equipment by which H.F. impulses are injected into the E.H.V. network, which in turn, actuate suitably tuned Metrovick relays installed at desired points on the L.V. supply system.

METROPOLITAN Vickers



ELECTRICAL CO. LTD.
TRAFFORD PARK ... MANCHESTER



153 kW Dynamo. Photo by courtesy of Laurence, Scott and Electromotors Ltd.

**THE
STERLING
VARNISH CO.
LTD.**

**TRAFFORD PARK
MANCHESTER**

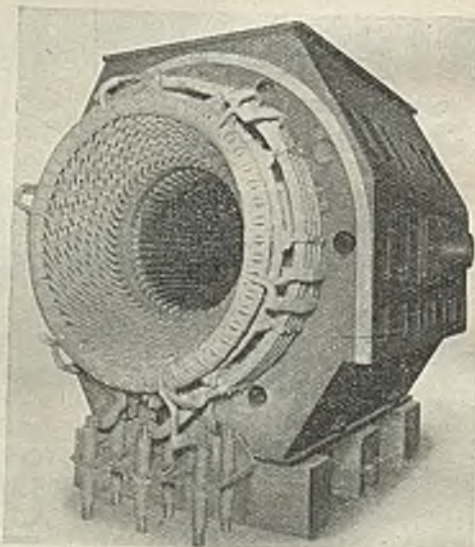
Tel.: TRAFFORD PARK 2231

Cable : DIELECTRIC, MANCHESTER

1894

**FIFTY YEARS SERVING THE
ELECTRICAL INDUSTRY
THROUGHOUT THE WORLD**

*Specialists
in
Insulating
Varnish*



1944

Stator for 25,000 kW Turbo Alternator.
Photo by courtesy of The English Electric Co. Ltd.

GOOD MANAGEMENT *demands*



GOOD MEASUREMENT

Good management means the best utilization
of your electricity supplies. Accurate and
reliable measurement helps to secure this,
so always specify—

FERRANTI

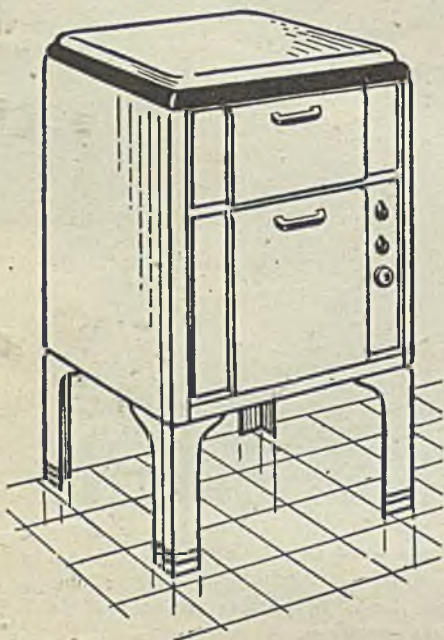
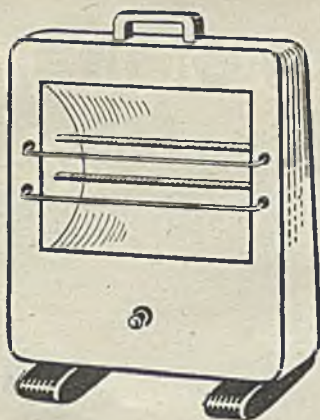
Instruments

P151

FERRANTI LTD., Hollinwood, Lancs. London Office: Kern House, Kingsway, W.C.2

Belling

**ELECTRIC FIRES
AND COOKERS**



These are typical examples of the electric fires and cookers that we will be making as soon as the war permits.

*

**“YOU CAN’T BEAT
A BELLING”**

*

BELLING & COMPANY LTD

BRIDGE WORKS . ENFIELD . MIDDX . TELEphone: HOWARD 1212

Established over 30 years

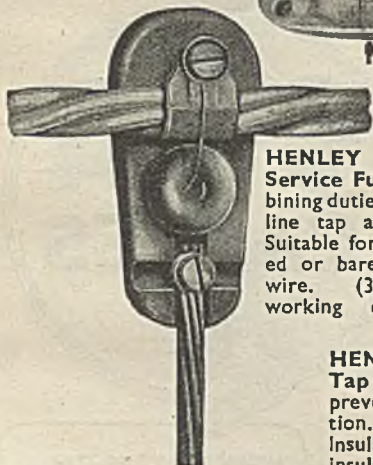
Overhead Service Accessories

Representative items from the very comprehensive range of HENLEY Overhead Service Accessories.

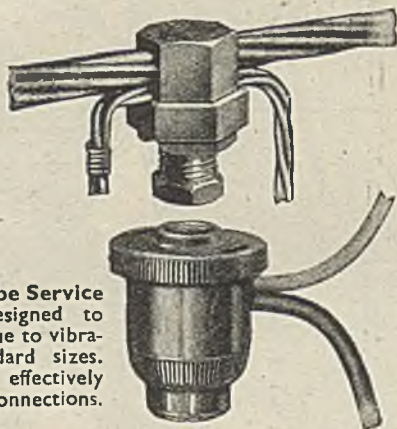
May we send you further details?



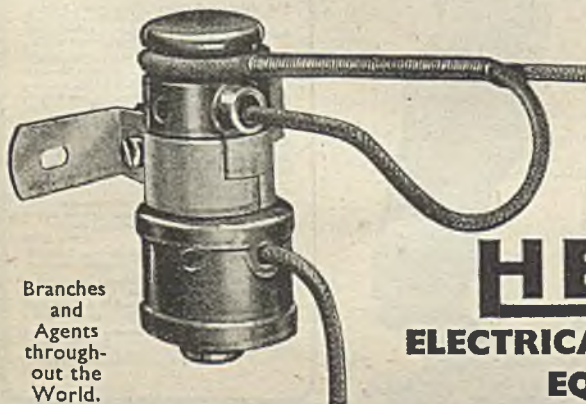
HENLEY Aerial Service Fuse. The withdrawable fuse carrier can be sealed. Line wires interlock if porcelain is broken. (30 and 60 amp. working current).



HENLEY Aerial Service Fuse combining duties of both line tap and fuse. Suitable for insulated or bare service wire. (30 amp. working current).



HENLEY Nut type Service Tap specially designed to prevent trouble due to vibration. Four standard sizes. Insulating shroud effectively insulates service connections.



Outdoor Service Fuse. Fuse holder replaceable from ground level. No pole climbing. Suitable for mounting on exterior walls or overhead line poles. (30 amp. working current). 100 amp. model also available — this is suitable also for mounting with shackle insulator.

Branches and Agents throughout the World.

HENLEY

ELECTRICAL DISTRIBUTION EQUIPMENT

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

ENERGY FOR THE NATION'S FACTORIES, WORKS & PUBLIC SERVICES

Uninterrupted transmission of electrical energy by C.M.A. Cables in quantity greater than ever before in our history is playing a most vital part in Britain's supreme effort for victory.



C.M.A. CABLES



Appl.
Trade Mark
Nos. 886, 887, 8-1

MEMBERS OF THE C.M.A.

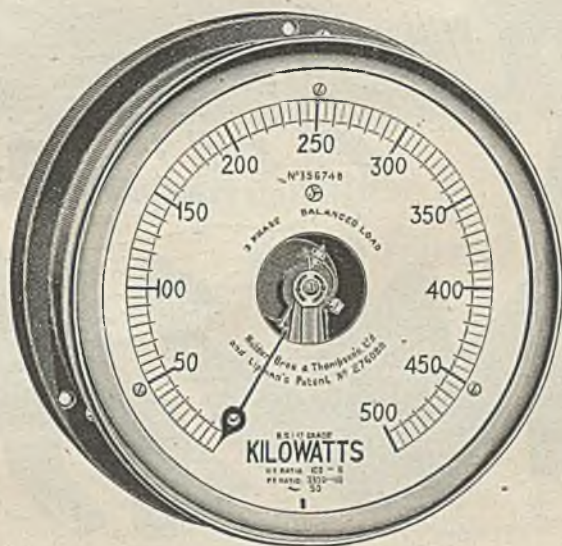
The Anchor Cable Co. Ltd.	The India Rubber, Gutta-Percha & Telegraph Works Co. Ltd. (The Silverstone Co.)
British Insulated Cables Ltd.	Liverpool Electric Cable Co. Ltd.
Callender's Cable & Construction Co. Ltd.	The London Electric Wire Co. and Smiths Ltd.
Cannalys (Blackley) Ltd.	The Macintosh Cable Co. Ltd.
The Grayspark Electric Cable Co. Ltd.	The Metropolitan Electric Cable & Construction Co. Ltd.
Grompton Parkinsan Ltd. (Derby Cables Ltd.)	Pirelli-General Cable Works Ltd (General Electric Co. Ltd.)
The Salford Cable Works Ltd.	St. Helens Cable & Rubber Co. Ltd.
Edison Swan Cables Ltd.	Siemens Brothers & Co. Ltd. (Siemens Electric Lamps and Supplies Ltd.)
W. T. Glover & Co. Ltd.	Standard Telephone & Cables Ltd.
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Advt. of the Cable Makers' Association, High Holborn House, 52-54 High Holborn, W.C.1. Phone: Holborn 7633

NALDERS



LONG-SCALE INSTRUMENTS



The Wattmeter shown is typical of N.C.S. Long Scale Induction Instruments for the measurement of alternating currents, Ammeters and Voltmeters being sold at the same prices as moving iron types for equivalent scale lengths. Sizes range from 2½" to 20" diameter dials, every instrument being strong, accurate, efficient and well finished, its performance fully guaranteed by Nalders' experience and reputation.

Write for details and prices

NALDER BROS. & THOMPSON LTD.
DALSTON LANE WORKS, LONDON, E.8

Telephone : CLIssold 2365 (3 lines)

Telegrams : "Occlude, Hack, London"

Don't be caught napping



When you are offered stock of unknown lamps, think twice before ordering. Any lamps will sell now, but Kye sell always. That means after the war too, when your customers can pick and choose for quality and reliability. The stockist who keeps to Kye keeps his goodwill intact. That is a point well worth remembering when you are looking ahead to the building of bigger sales after the war.



KYE

FOR GOODWILL AND SALES



... as the wave of a hand

People are apt to take it for granted that all mechanism must make some kind of a noise.

Yet consider the complexity of the mechanism in a human hand, and its extraordinary adaptability to different tasks, from playing the piano to lifting heavy loads. Nevertheless it is silent; why?

Because Nature—in whose footsteps we humbly follow—does not use metal-to-metal joints with clearances, but welds muscle on to bone, providing an ideal construction, flexible, yet without backlash.

Here at Metalastik we are constantly engaged in the design and manufacture of devices which, made of metal parts welded to rubber, are used to permit or restrict movement, or to damp vibrations of various kinds. We can use natural or synthetic rubber, our rubber-to-metal weld can be used with various metals, and we know exactly how to design in metal and rubber to meet any desired conditions.

Our services are at your disposal.

Metalastik Ltd., Leicester.

METALASTIK



*"It Pays to
Standardise"*

DRILL BUSHES
(Made to B.S. 4098)
DIE SET BUSHES
DIE SET PILLARS
DOWEL PINS

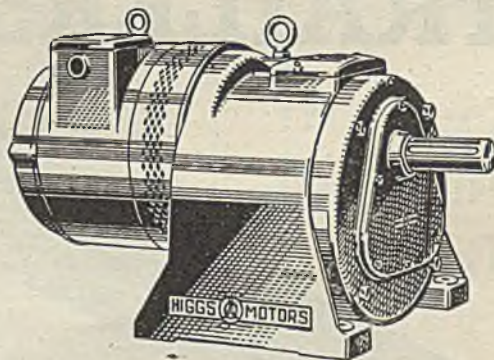


British Aero Components Ltd.
HINCKLEY

Tel. Hinckley 695-6

Grams: Aeroports, Hinckley.

Cogent



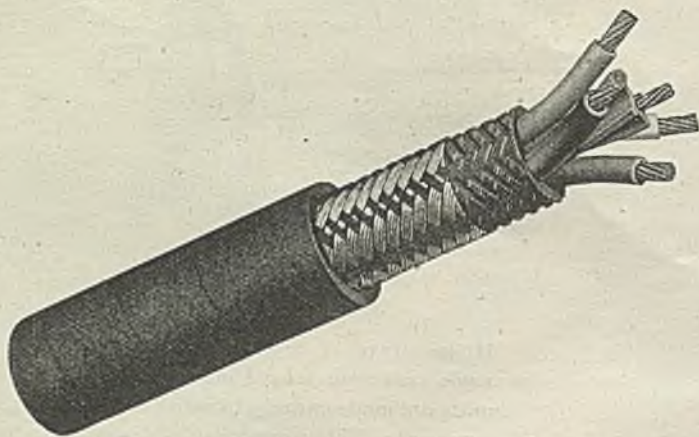
Higgs range of double and triple reduction geared motor units are made entirely in our own works. Thus are we able to accept individual responsibility for their efficient and dependable performance with consequent assurance of complete satisfaction to our customers.

Birmingham, Bristol, Dundee, Glasgow, London, Manchester,
Nottingham, Peterborough, Sheffield, Wolverhampton.

GLOVERS

SCREENED

TRAILERS



Assure SAFETY by using
Grovers Screened Trailers
with
Earth Leakage Protection

Cord and Copper Braided Type,
British Patent No. 339,104
(B.S.S. 708. No. 3)

W. T. GLOVER & Co. LTD.

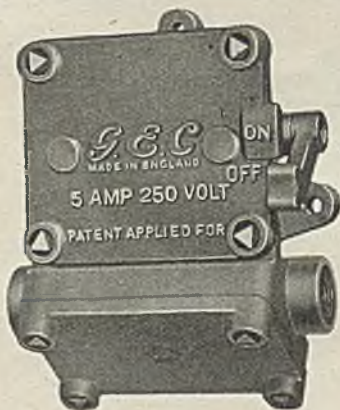
TRAFFORD PARK

MANCHESTER, 17

G.E.C.

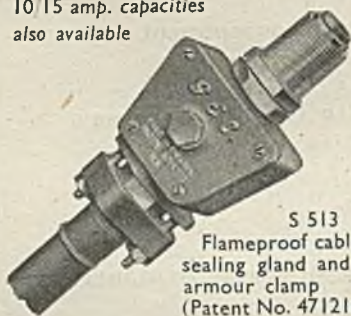
Flameproof SWITCHES and SWITCH FUSES

British Standard 542



S 510 Patent No. 457209
5 amps. 250 volts.

10/15 amp. capacities
also available



S 513
Flameproof cable
sealing gland and
armour clamp
(Patent No. 471210)

S 515 Key for cover bolts

Designed for
use in all places
where there is
risk of
inflammable
atmospheres

Certified by H.M. Mines Dept.
and the Home Office.

Certificate No. FLP825
Groups I and II.

Tested and approved for
Group III. Test report No. P36.

Full information will
be sent on request.

"AT LAST"

*a mining box combining
all the desirable features...*



- ★ 1 Unbreakable non-ferrous construction.
- ★ 2 "Streamline"—no projecting bolts and lugs.
- ★ 3 Absolute minimum number of component parts.
- ★ 4 Armour bonded directly to the box carcass
(No external bonding).
- ★ 5 Extra large filling hole.
- ★ 6 Suitable for any type of Wire Armoured Cable.

B.P. No. 528311



THE LIVERPOOL ELECTRIC CABLE COMPANY LTD
LINACRE LANE • BOOTLE • LIVERPOOL • 20



IT'S ABOUT TIME

*"Keep time! How sour
sweet music is when
time is broke and no
proportion kept!"*

Shakespeare.

The orchestra without
its conductor would be
just chaotic. Upon
him depends the "fre-
quency" which governs
the whole performance

Time is the ruling factor

The Ferranti Clock, actuated
by the frequency of the cur-
rent supply, gives correct
time without variation from
year-end to year-end. It is
everywhere recognised as the
clock of reliable performance.

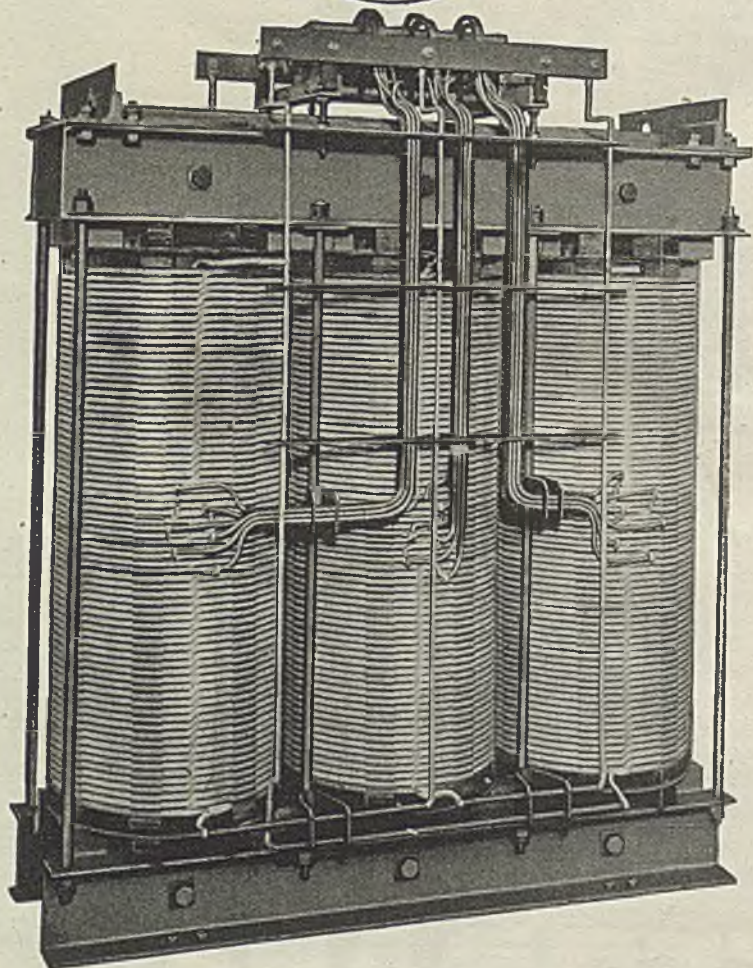
FERRANTI Clocks

FERRANTI LTD Hollinwood Lancs London: Kern House Kingsway W.C.2.

**MANUFACTURED
BY**



**TRANSFORMER
CO. LTD.**



1,000-kVA Power Transformer for a Dominion Government

Phone : Howard 1492

PLEASE ADDRESS ENQUIRIES TO :

QUEENSWAY, PONDER'S END, MIDDX.

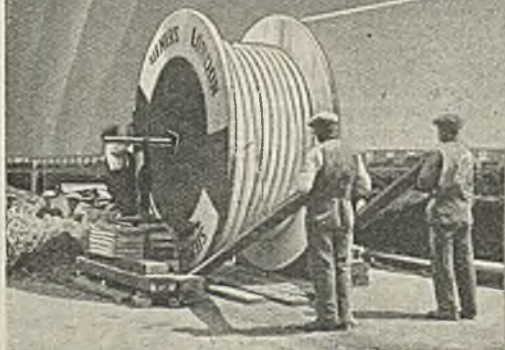
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(T.3)

SIEMENS

CONTRACTORS FOR THE
MANUFACTURE & LAYING
OF ALL TYPES OF
**ELECTRIC
CABLES**
FOR
POWER SUPPLY MAINS

C A B L E S



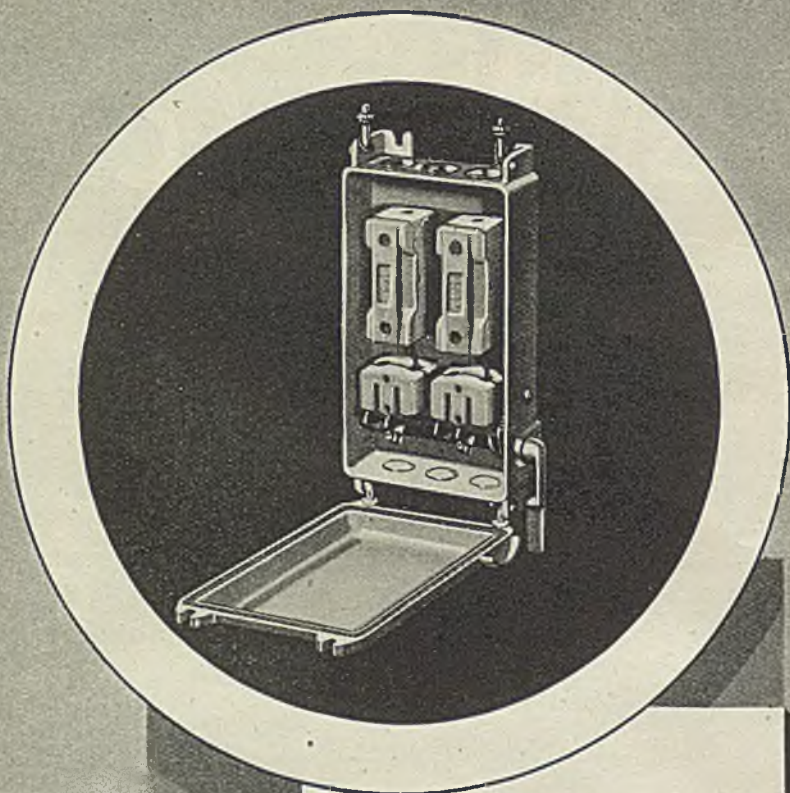
SIEMENS BROTHERS & CO., LTD

WOOLWICH, LONDON, S. E. 18

ESTABLISHED 1858

Telephone : WOOLWICH 2020

THE SANDAMAX

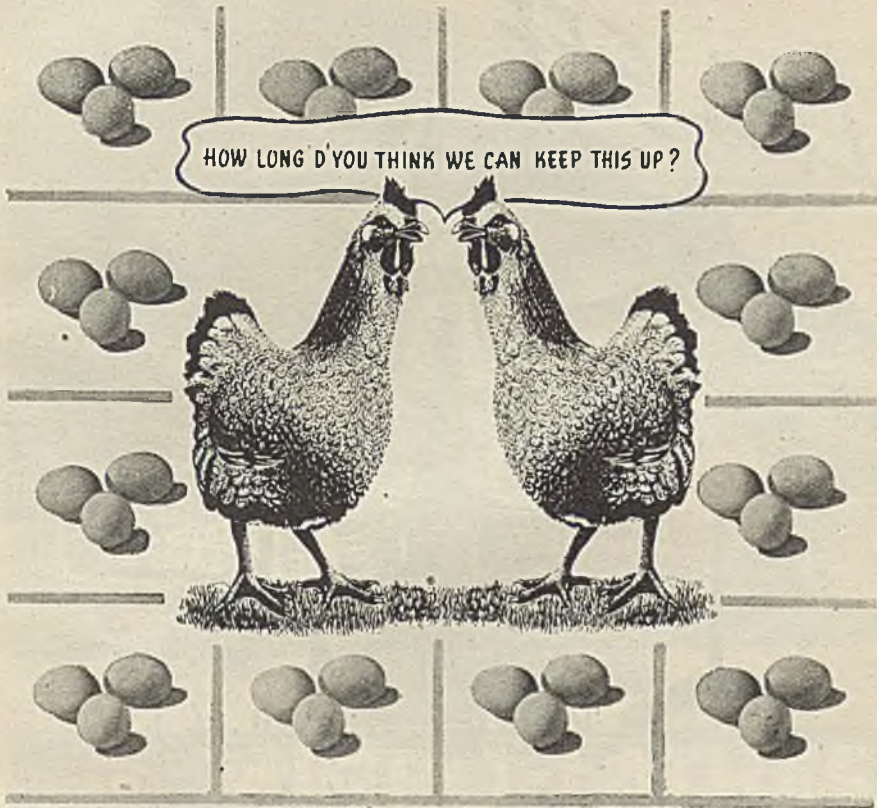


Built to B.S. 124 and Home Office Regulations, these switches and switch-fuses while compact, provide abundant cable room and any wiring combination. Die-cast handle rigidly fixed, adjustable weatherproof hinged lid. Alternative carriers for H.R.C. or ordinary duty. Available 2, 3 and 4-poles, 15 to 100 amps. 500 volts rating.

SANDERS

WEDNESBURY

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



It may be a problem to the hens, but it's no problem to us. The same identical photograph reproduced again and again does the trick. We are in that line of business—turning out the same thing by the hundred, by the thousand, by the million, in accordance with your instructions. At Tube Products Ltd. we mass-produce Tru-Wel electrically welded steel tubes at great speed, and apply rigorous tests to see that they never vary. Tru-Wel Tubes can be expanded, tapered, flattened, bent—in fact they lend themselves to manipulation for any required purpose

and are proving the solution to scores of industrial “stepping-up” problems. We will process them for you if you wish.



T.151

MADE BY
TUBE PRODUCTS LTD
 OLDBURY • BIRMINGHAM

A MEMBER OF THE TUBE INVESTMENTS GROUP



Let's SEE



PICCADILLY READY!



The 'lights of Piccadilly Circus' being prepared for the brighter days of peace.

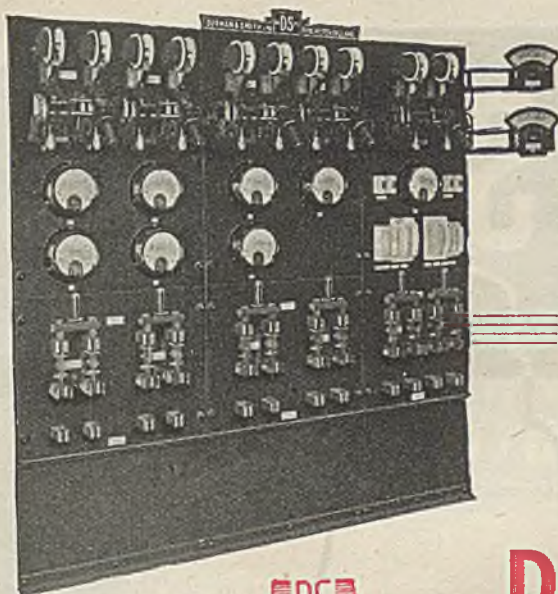
*a brighter
future with*

ROYAL
"EDISWAN"
LAMPS



THE EDISON SWAN ELECTRIC CO. LTD.

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



It's Sixty Years Ago

... since we built our first switchboard and the skill and experience gained over the years, the painstaking research and experiment we have made through the generations, are built into our products of to-day—reliable, efficient, distinctive... worthy products in the renowned Dorman tradition.



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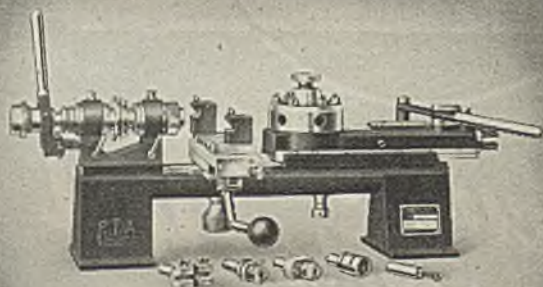
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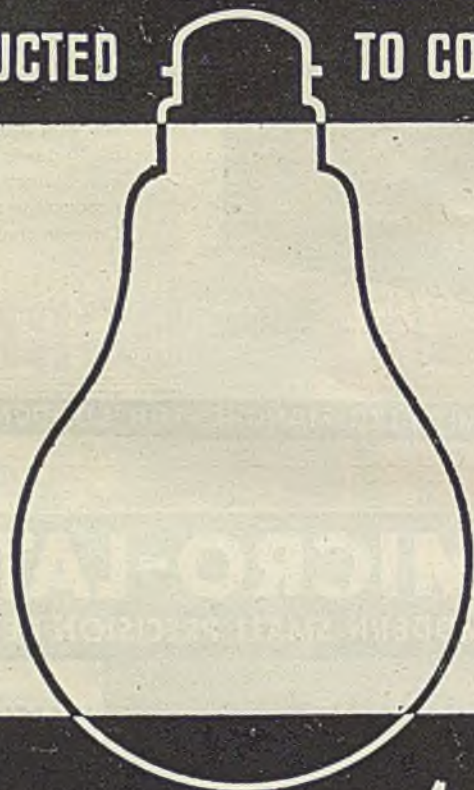
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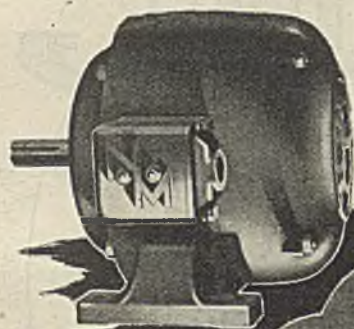
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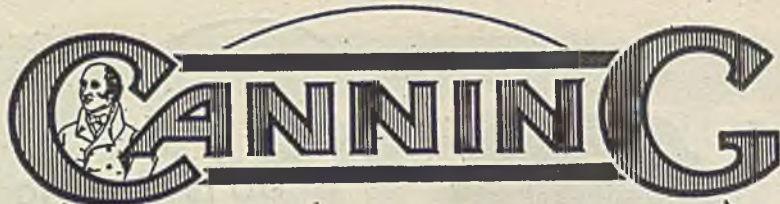
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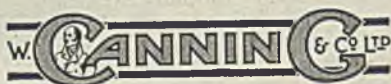
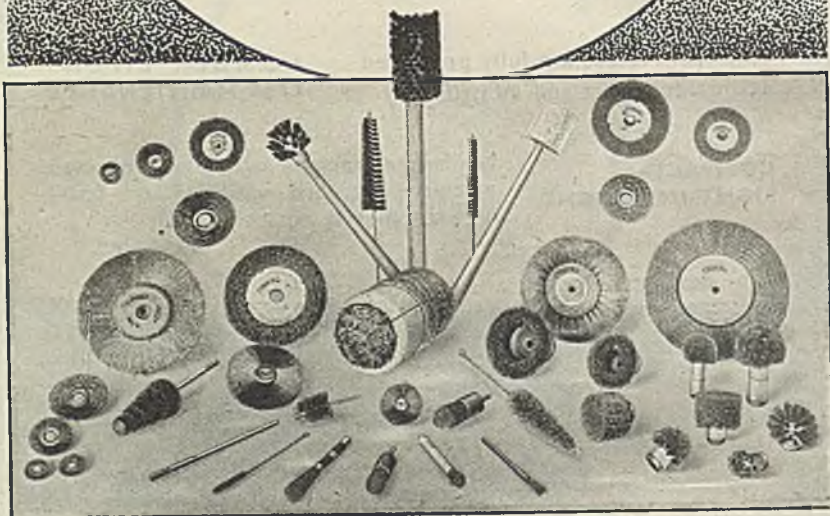
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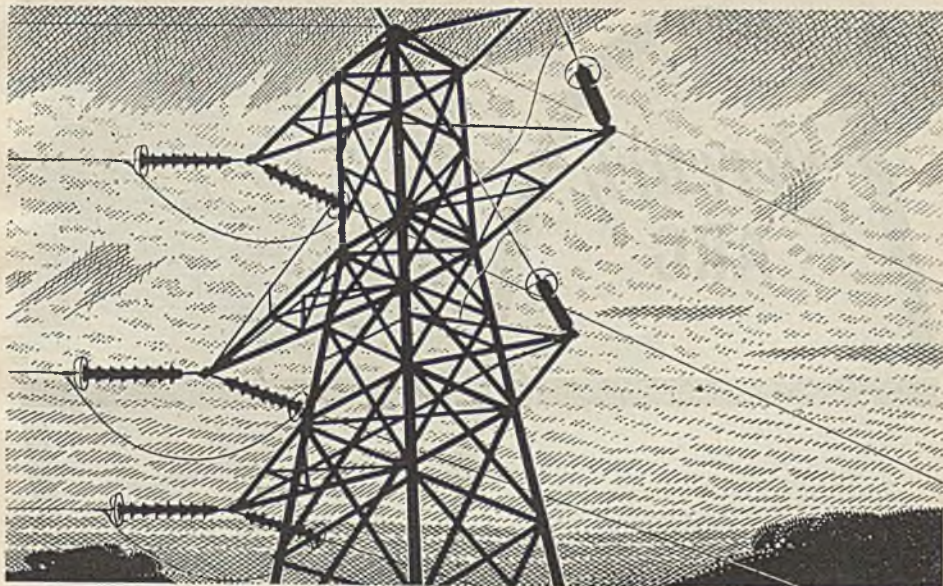
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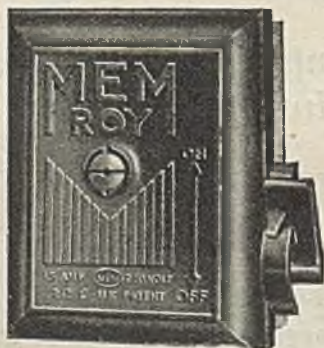


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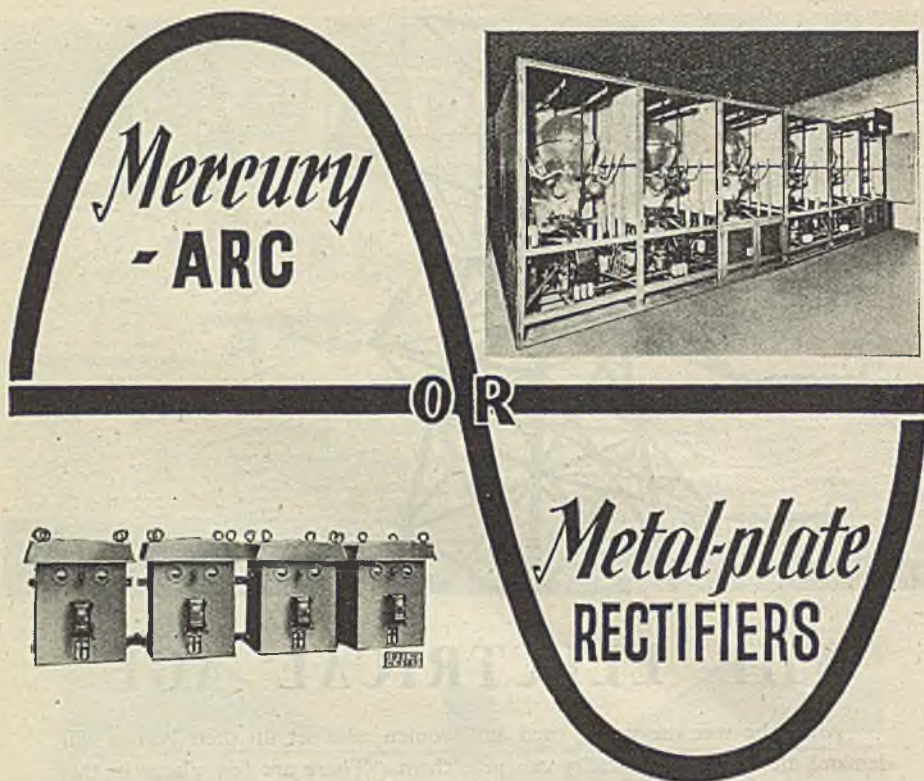


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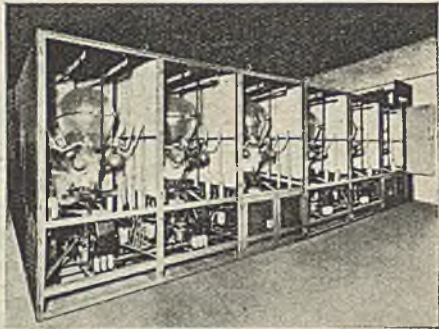


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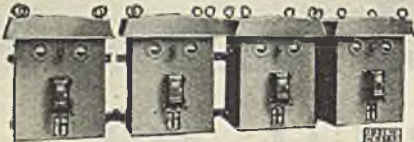
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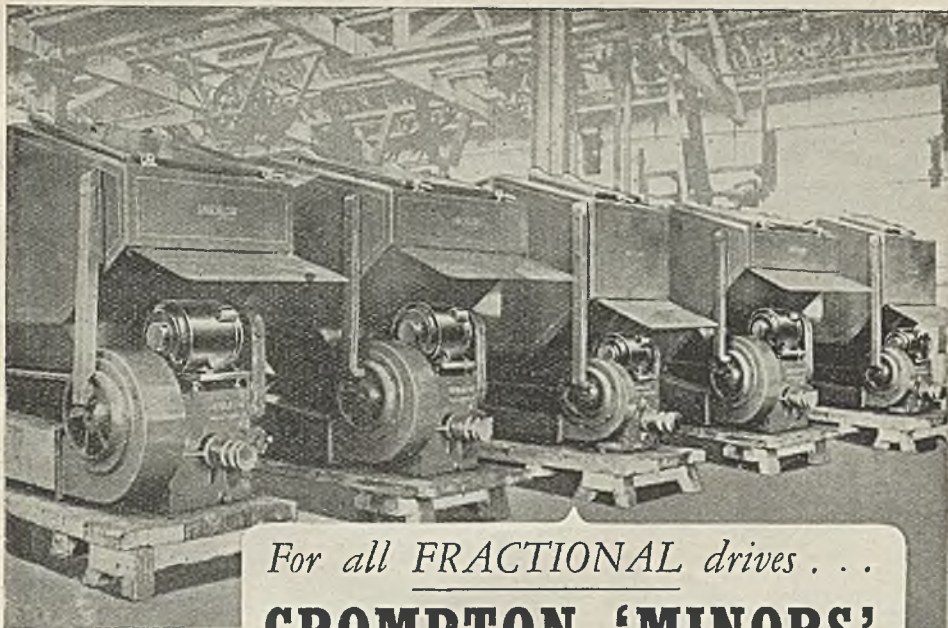
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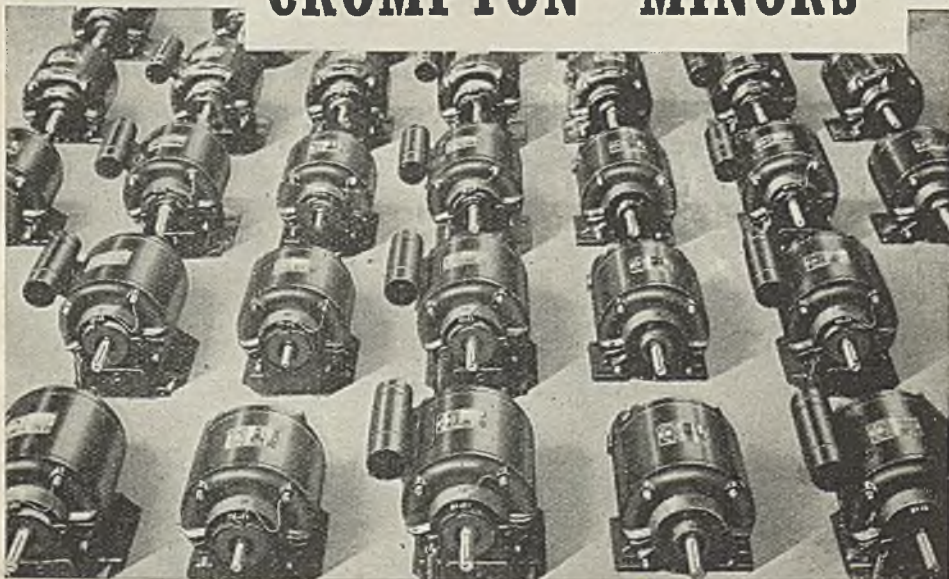
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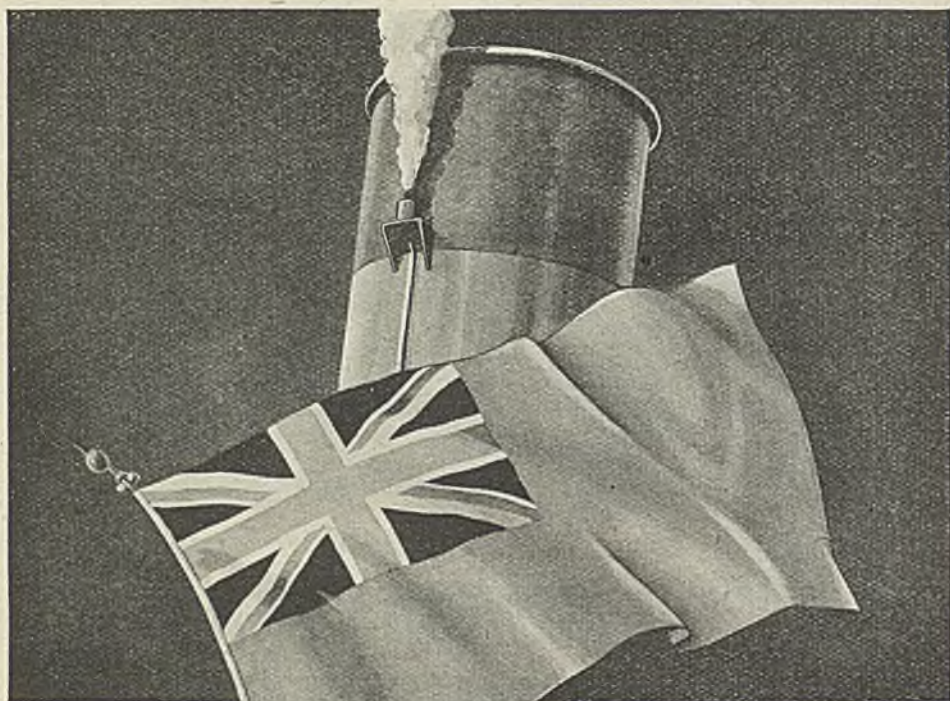
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December 29, 1944

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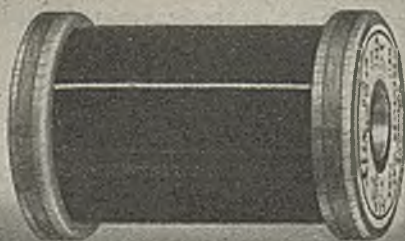
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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872



Vol. CXXXV. No. 3501.

DECEMBER 29, 1944

9d. WEEKLY

The Past Year

Progress in Spite of Unsettled Problems

ALL phases of national and international life have been profoundly influenced by the United Nations' invasion of Europe which began on June 6th, 1944. The rapid progress made through France and Belgium raised prospects of an early end to the war and if hopes have not been entirely fulfilled, confidence in the inevitability of ultimate victory has been confirmed.

The effect upon the electrical industry of the events of the past seven months has been to invest long-discussed problems with a greater immediacy. This has been most evident in the matter of reorganising electricity supply—a matter which affects all other branches of the industry.

Many Reports

During the year we have had proposals from the Joint Committee of Electricity Supply Organisations, the I.M.E.A., the Labour Party, and the Association of Municipal Corporations (the power companies' report was issued towards the end of 1943). All of these have been coloured by the political views and self-preservative desires of the parties concerned, but none, not even the Joint Committee's compromise, can be said to have provided a solution. In spite of this the electricity supply industry continues to grow in stature and to improve its service to the public, which tends to make discussions on reorganisation somewhat academic.

Indications of that progress are provided by the Central Electricity Board's directions for the extension of generating capacity

by about 3,000,000 kW, representing an expenditure of £90 million, and the five-year programmes drawn up by the individual undertakings at the request of the Electricity Commissioners.

Much attention has been devoted to the future of domestic electrical installations both for temporary and permanent homes. Reports from all areas demonstrate the growing public demand that electricity shall be available even if other services are omitted. In this connection there has been a great deal of discussion of installation methods and standardisation of systems. Talks are now proceeding between the Electricity Commissioners and the supply authorities on voltage standardisation, a subject of great importance to consumers and manufacturers alike.

Wrapped up with installation methods is the question of reliability and safety which has again resuscitated advocacy of compulsory wiring rules and the registration of contractors and operatives.

Reconversion of Industry

Other important issues which have been the subjects of reports and discussion during the year have included rural electrification, district heating, expenditure upon research, the education and training of engineers (on which subject we published a series of articles from some well-known authorities), the Severn Barrage (a report on which has been presented by the Donkin Committee), and induction heating methods. Above all the reconversion of industry has been prominent. It is thought that the problems which face the electrical industry in this

connection are generally not so formidable as those of some other industries. There is a steady assured home market and the recently-disclosed export figures give reason for hoping that overseas trade will be recoverable. The electrical industry can look forward confidently to the coming year, which should see the end of the war in Europe.

Coal Surveys THE present fuel shortage has brought home to industrial users that coal is not "just coal" but a generic name for a number of combustible components found in various combinations, each type having its own sphere of usefulness. From the national fuel standpoint electricity generation has the great merit of offering a large market for fuel that would not otherwise be economically utilised, although there are limits to the calorific value and type of coal that are suitable for the boiler-house equipment installed. Of greatest importance is the maintenance of consistency in quality during the economic life of the combustion plant and the coalfield surveys now being made by the Department of Scientific and Industrial Research should make a substantial contribution to our knowledge of this side of the question.

Suggestions for Papers THE Sections of the Institution of Electrical Engineers were set up in order to meet the wishes of members for fuller opportunities to discuss certain ranges of subjects, but their committees, although representative as far as possible of all major interests, lay no claim to omniscience. Presiding over the Installations Section recently, Mr. Forbes Jackson asked for the aid of members in making recommendations for subjects of papers. If they can also suggest suitable authors, it would be a further help.

Possible Surplus THE pre-war world demand for copper was never greater than 2,000,000 long tons per annum; to-day the annual production is in the neighbourhood of 2,750,000 tons. Retained imports of copper into this country have been about two and a third times the peacetime figure of 200,000 tons per annum and it is thought that in spite of increased use there must be very substantial stocks of the metal here. Nevertheless the immense demand which must come with the resumption of electrical

development, involving about 3,000,000 kW of generating plant as only one item, should help to absorb any stocks on hand and still necessitate further supplies.

Appliance Design **THOUGH** efficiency plays its part, price and appearance are probably the most potent influences

affecting export sales, particularly with regard to initial orders. In the electrical market, while this is true to some extent of the heavier equipment, it is specially applicable to domestic appliances. Manufacturers, preoccupied with war work, now have five years' leeway to make up in the matter of design, and will accordingly welcome any assistance which can be given by the new Council of Industrial Design and the design centres that are to be established. It is very desirable that electrical apparatus should be designed specifically as electrical apparatus, taking full advantage of its special features of simplicity, cleanliness, ease of control, etc.

DC Transmission IN Australia, where water power is scarce and the coalfields are predominantly centred in New South Wales, the transmission of electrical energy over several hundreds of miles seems likely to come to the fore. As a result of a survey of what has been or could be done in this way, Mr. A. H. Altman in the *Journal of the Institution of Engineers, Australia*, foresees limits to the use of AC for transmission. Although DC is not yet advanced enough technically or economically for the purpose, he comes to the conclusion that it will be so in the not too distant future. The use of DC would presumably be restricted in the earlier stages, in view of the relatively low maximum capacity of mutators, to transmitting relatively small amounts of energy for long distances as distinct from large blocks of power over distances now regarded as practicable.

Tailpiece THE following strange report appears in the *Electrical World* :—

"Dropping to his knees and praying were part of the tactics used by George Brandenburg in winning a \$5,000 judgment recently against the Pacific Gas & Electric Co. in a personal injury suit tried in the Superior Court at Sacramento, Calif. The judge denied a defense motion for a retrial because of the prayer incident."

Brass Plating

Automatic Plant for Treating Steel Components

THE electrodeposition of alloys presents certain problems which do not arise in the deposition of single metals. It is not always easy to mix an electrolyte from which the two desired metals can be deposited simultaneously. Although it is possible, for example, to deposit zinc from a zinc sulphate solution and copper from a copper sulphate solution, if the solutions are mixed the deposit will not be brass, but practically pure copper. The electrodeposition of brass is possible, however, and has been done for many years from

By Alan Smart

essential that the deposit should be of the correct colour and composition. The specification called for a brass containing 70 per cent. copper and 30 per cent. zinc.

The development of the solution has been referred to elsewhere* and it will be sufficient to state that the solution finally adopted contained zinc, 30 gm. per litre; copper, 15 gm. per litre; sodium carbonate, 20 gm. per litre; free cyanide, 4 to 8 gm. per litre; and pH (tropæolin) O, 12.6 to 12.8.

In designing an automatic plant it is necessary to consider not only the plating process, but also the requisite treatment before and after.

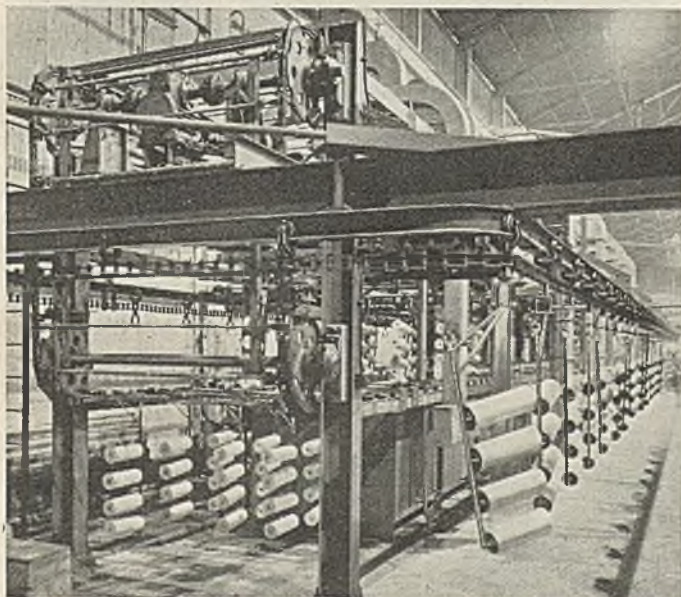
The process schedule ultimately determined upon was, in the following order, alkaline electro cleaner; rinsing in cold running water; anodic sulphuric acid etching; rinsing in cold running water; immersion in a solution containing 30 gm. per litre sodium cyanide and 30 gm. per litre sodium hydroxide; plating in brassplating solution; rinsing in cold running water; dipping in passivating 5 per cent. sodium dichromate; rinsing in hot running water; and, finally, drying in air.

The weight of components to be treated each hour was 1,800 lb.

and, as they have to be transferred ten times, the total weight to be lifted in and out of the tanks each hour was 18,000 lb. Only by the use of automatic plant can the process times be accurately controlled.

The plant constructed has a line of process tanks surmounted by the steel structure carrying the traversing mechanism, which lifts a set of jigs carrying the components from the end of one process tank and deposits it at the beginning of the next one. While they are in the tanks, the jigs rest on a con-

* John Kronsbein and Alan Smart, "A New Development in Electrodeposition of Brass," *Journal of Electrodepositors' Tech. Soc.*, 1944, 19, 107-122.



Discharge end of automatic brass plating plant

a solution containing essentially a mixture of the cyanides of zinc and copper, but until recently brass plating was only done on a small scale. Its two principal applications are decorative work and the treatment of parts prior to rubber covering. In both cases the thickness of the brass deposited has generally been less than 0.0001 inch. The current density has been low and the rate of deposition correspondingly slow.

When the need arose to apply brass to steel for protective purposes, in a thickness of not less than 0.0003 inch, the required output of 600 sq. ft. of plated surface per hour necessitated deposition at much higher rates than had previously been employed. It was

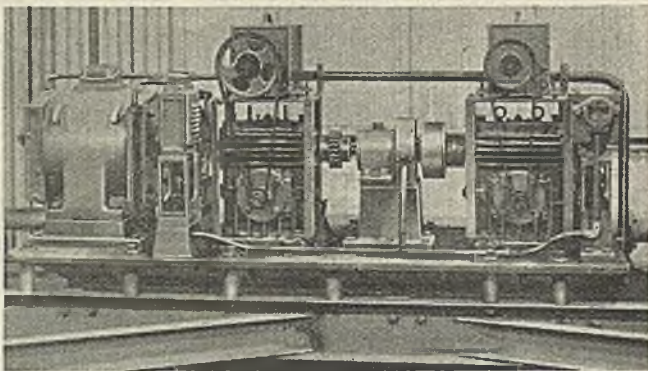
veyor chain and are moved forward one stage for each cycle of the plant. Different process-times are arranged by increasing the length of the tanks in multiples of the unit length, which is that of one jig.

One of the important aspects of the plant design is the simplicity of the mechanism involved. Essentially it consists of two movable carriages mounted one above the other on a steel structure. Chains are attached to the upper carriage and pass over pulleys fixed to the lower carriage. The ends of the chains are fixed to one or more frames carrying hooks designed to engage with the work bars to be transferred. During lifting and dropping motions the lower carriage is held in a stationary position while the upper carriage is moved. Traversing operations are obtained by moving both carriages together. A single motor drive is used with the motor directly coupled to a gear box driving the upper carriage, which moves on all the plant operations. Another gear box drives the lower carriage, being connected to the first by means of a magnetic clutch which is engaged only for traversing operations.

In one cycle of the plant there is a sequence of nine operations. They are: (1) The hooks

direction. (2) The jigs, which are now lifted clear of the tanks, are moved forward until each jig is above the next tank in the process line. This movement is obtained by engaging the clutch with the motor running in the forward direction.

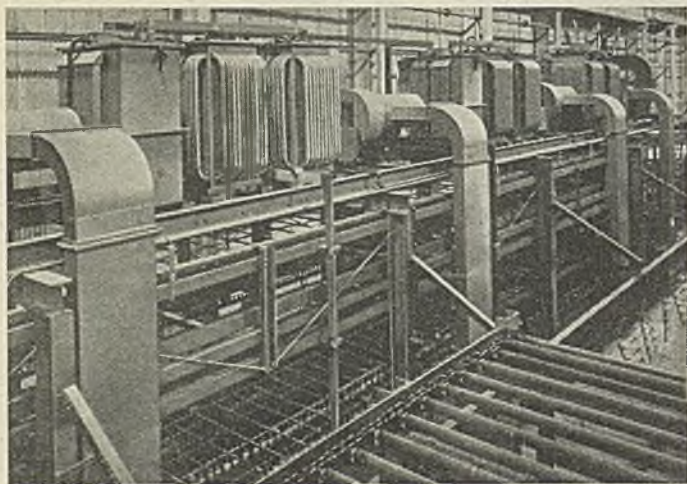
Next (3) the jigs are lowered into their new positions. This movement is obtained by disengaging the clutch and running the motor



Bedplate motor driving gear

in the reverse direction. The traversing operation is now complete and it is necessary to return the hooks to the starting position. They are first disengaged (4) by engaging the clutch and driving the motor in the forward direction. (5) The hooks are then lifted clear of the jigs, by disengaging the clutch and moving the upper carriage only, with the motor running in the forward direction. (6) The hooks are then returned towards the feed end of the plant by engaging the clutch and running the motor in the reverse direction.

At the end of the return operation (7) while the hooks are still raised, the conveyor chain moves forward one space and a time switch for controlling the interval between cycles comes into operation. At the end of the time interval (8) the hooks are lowered again by running the motor in the reverse direction with the clutch disengaged. The



Top view of plant showing rectifiers

lift vertically carrying the jigs, an operation that is obtained by driving the upper carriage only, with the motor running in the forward

hooks are (9) finally reset for the next cycle by engaging the clutch and running the motor in reverse.

The operation of the plant is automatically controlled throughout. The principle underlying the design of the control circuits is the selection of the forward, or reverse, motor contactors and the clutch contactor when required at appropriate stages in the cycle. The design of suitable controlling circuits presents several interesting problems, alternative methods which might be adopted being (a) by the use of a motor driven drum controller, or (b) limit switches working with contactors. Both methods have disadvantages. The simple drum controller is not interlocked with each of the plant movements. If the drum controller does not run exactly in synchronism with the plant, the latter will stop at the end of the first cycle, say $\frac{1}{8}$ inch out of position. After sixteen cycles it would be an inch out and the hoods would fail to engage.

A difficulty which arises with limit switches is that some may close four times in one cycle, whereas they are only required to operate once. It is therefore essential to provide interlocks maintained by contactors with retaining circuits. This system has the disadvantage that if the supply is interrupted while the plant is operating, the contactors must be reclosed manually when the supply has been restored.

The solution to the problem was obtained by using a motor driven cam-operated controller, working in conjunction with limit switches. At the end of each operation the plant is stopped by a limit switch and the controller moves on to the next operation and stops; the plant then continues with the next operation. By this means limit switch control is retained and complicated contactor interlock circuits are avoided. If the supply is switched off at any stage of the cycle, the plant will restart automatically as soon as the supply is restored. The control gear also incorporates exhaust fan contactors as well as the necessary switchgear for the thermostatically controlled electrically operated heating valves.

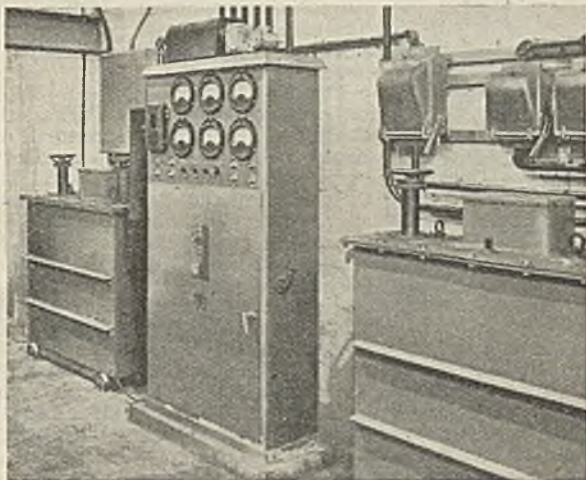
There are three electrolytic processes in the sequence, alkaline cleaning, acid etching and plating. "Westalite" rectifiers supply the current; two are used to deliver 1,500 A at 8 V for the cleaner and 1,000 A at 10 V for the acid etch with two rectifiers each 4,000 A at 8 V for the brass plating.

To economise in heavy current DC bus-bars, the rectifiers are mounted on the structure above the plant. They can be mounted in that position with safety, as they are of the selenium compound type and the elements

are mounted in a tank and immersed in oil.

Primary on-load tappings are provided on both plating rectifiers. They are normally only changed during the loading and unloading periods. On-load tappings are also provided on the acid etch rectifier to allow the current to be adjusted to compensate for some dilution of the acid which occurs in time by the carry-over of small quantities of water.

The cleaner current rectifier is supplied with off-load tappings as only initial adjustment is necessary in that case. The positive bus-bars from the plating rectifiers are connected to rods carrying brass anodes in the plating tank, and the negative bars are connected to



Control panel with auto-transformer and plating current regulator

V-section copper rails along the sides of the tanks. The jigs carrying the components are deposited on those rails.

Glasgow Transport Finances

A Ministry of Transport inquiry was held recently in Glasgow into tram and bus fare increases proposed by the Corporation. On behalf of the Town Council it was stated that for the year ending May last there was a deficit of £173,194, and the current year's loss was estimated at £576,000. Out of the £3,170,000 revenue, after paying out-of-pocket running expenses, there was only £97,000 to meet all other charges. A warning that £1,500,000 would have to be spent after the war to make good wartime neglect, was given by Mr. E. R. L. Fitzpayne, transport manager. No allowance for the expenditure spread over five years had been made in the accounts.

Objectors claimed that the deficits were very much exaggerated and were due to methods of administration. A Glasgow chartered accountant maintained that the capital value of the undertaking had increased from May, 1937, to May, 1944, by approximately £3,250,000.

Leicester Jubilee

Development of Electricity Service

ON December 19th the jubilee of the Leicester electricity undertaking was celebrated at a luncheon, presided over by Alderman John Minto, Lord Mayor and chairman of the Electricity Committee.

In 1890 the Corporation secured a Provisional Order to supply electricity for lighting and although a canvass of shops, offices and business premises showed that only forty-

five wished to adopt the new service, the Corporation sanctioned a scheme for supplying electricity for 7,250 lamps.



Alderman J. Minto, the chairman of the Electricity Committee, is this year's Lord Mayor

sq. in. to three 200-kW engine-driven alternators generating at 2,000 V, 100 cycles. Later four 250-kW single-phase Ganz alternators and four 1,000-kW, single-phase Brush alternators, all driven by Hick Hargreaves engines, were installed, the boiler plant being further extended by the addition of hand-fired Lancashire boilers.

Electrification of Transport System

About 1900 it was decided to electrify the public transport system and the Lero power station, built for that purpose, came into operation in 1904, supplying energy at 500 volts DC. Owing to increasing industrial demand it soon became necessary to connect a number of private consumers to the traction mains, and the advisability of placing the two stations under one control became manifest. As a consequence a Tramways and Electricity Committee was formed in 1911, and the late Mr. T. R. Smith was appointed to the position of chief engineer and manager. A further change was made in 1920 when the administration of the tramways was again placed under separate control. Soon the two generating stations became inadequate to meet the demand and the present Freeman's Meadow station was opened in 1922, the two old stations ceasing to generate in 1930. The Freeman's Meadow station was originally

planned to hold five main generators, two of 10,000 kW and three of 15,000 kW. The capacities of the machines at present installed are 10,000 kW (date of installation 1922), 14,000 kW (installed 1924, rebuilt 1931), 18,750 kW (1927), 25,000 kW (1929), and 30,000 kW (1939). There are also two house-service sets of 500 kW and 1,500 kW respectively. Recently a direction has been issued by the Central Electricity Board to extend the station by the addition of one 31,500-kW turbo-alternator set and two 175,000 lb. per sq. in. boilers.

Linking-up of Stations

In 1894, power was generated at 2,000 V, which at that time was considered the most economic and reliable for the transmission of energy in bulk, the distribution voltage being 100 and later 200. The 500-V DC system was separate from the single-phase system, and the Aylestone and Lero stations each operated separately on its own network. In 1911, however, the stations were linked, through special trunk mains and converting plant.

Towards the end of the last war, drastic reorganisation of the mains system became imperative, and in 1919 a scheme was adopted for a 6,600 V, three-phase, 50-cycle, AC system. Generation is now carried out at 33,000 V and 6,600 V, the higher voltage being adopted in 1939 to supply the eastern area. The 415-V, three-phase, 4-wire, 50-cycle distribution network was begun in 1919 and is gradually superseding the 100-V and 200-V single-phase system.



Mr. J. Mould, city electrical engineer

The present area of supply comprises 31,655 acres and to give supplies 1,100 miles of cable have been provided. Showrooms were opened in April, 1923, and special tariffs were instituted, a hiring scheme for apparatus introduced, and provision made for demonstrating appliances. Since the introduction of the hiring scheme 23,400 domestic electric cookers, 7,500 water heaters and 2,200 wash-boilers have been connected to the supply. Mr. John Mould has been city electrical engineer and general manager since the death of Mr. T. R. Smith in 1928.

A report of the luncheon appears on page 923 of this issue.

The Domestic Load

Its Statistical Aspect

IF scientific method means "to analyse the causes of events and build up a system of general laws," it is obvious how wide a field this method still has as applied to the domestic load.

One of the reasons why supply engineers have sometimes been baffled by apparent complexities was failure to appreciate the statistical background of the phenomena involved. The domestic load is a reflection of mass behaviour and, as such, is subject to the realisation that although the individuals of a mass of human beings show no end of variation in actions and reactions, as a mass they exhibit statistical regularities.

If a specific cause of variation is analysed it is usually found that in sub-dividing the range of variation and plotting number of individuals against corresponding sub-division, a bell-shaped curve obtains, similar in form to the well-known *Gaussian** probability curve (Fig. 1), with a concentration of frequencies in what is known as a "modal" region, and rapid falling off towards the two extremities. The modal region often embraces the value of the arithmetic mean (for the sake of simplicity referred to as the average), and these two concepts are well descriptive of mass behaviour.

It is, of course, impossible to draft a frequency distribution from a single observed value, and equally futile have been the attempts of individual supply engineers to throw light on the characteristics of the domestic load by recording and analysing the load on their own service connection or by generalising their own habits and peculiarities; all the more so since their place in the appropriate frequency distribution is usually far away from both mode and average, usually in the upper region of low frequencies or probabilities.

Another insight statistical theory affords arises from the distinction between such independent causes of variation as affect only a definitely limited number of individuals and causes to which any of the individuals has

By P. Schiller

a chance of being subjected, and from the realisation that only the latter causes are apt to produce statistical uniformity or regularity. Foremost among the independent factors causing circumscribed variation in domestic demand and consumption is the electrical equipment installed by the individual consumer. It is useless to compare groups of consumers unless the composition of the electrical equipment in the various groups is comparable. Special consideration must also be given to economic status. But within a group of consumers of homogeneous composition as to electrical equipment and economic status, variation will be caused by numerous minor factors, such as size of family, occupation and, particularly, personal habits, resulting in statistical regularity of mass behaviour. Corresponding measures, e.g. an average, then become really significant.

The average is perhaps the most important statistical measure. If $x_1, x_2, x_3, \dots, x_n$ represent a series of n individual observed values, say annual consumptions in kWh, the average is $(x_1 + x_2 + x_3 + \dots + x_n)/n$. This can also be written $x_1/n + x_2/n + x_3/n + \dots + x_n/n$, i.e. the average of n

values is the sum of the n th fractions of the individual values. In other words, each value contributes to the average in inverse proportion to the total number of values concerned, or the influence of the individual is reduced to $1/n$ th, n being the total number—an explanation of the stabilising effect of large numbers.

Statistical theory is instrumental in elucidating the influence of group size still further. Take a mass—or, in

statistical parlance "population"—of homogeneous domestic consumers, say, 1,000. The corresponding frequency distribution in respect of annual consumption will resemble a Gaussian distribution; suppose it is practically Gaussian with an average \bar{X} and a standard deviation of σ (see note at end). If now by some random process the population is sub-divided into a number, k , of equal groups or samples, each containing n individuals, then the distribution of the averages ($\bar{x}_1, \bar{x}_2, \dots, \bar{x}_k$) of the various samples about the central value of the

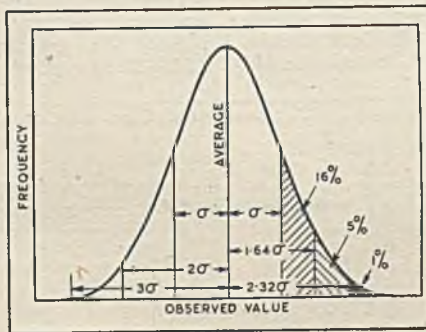


Fig. 1.—Gaussian frequency curve (see note at end of article)

* The knowledge of statistical mathematics presupposed here does not exceed the scope of Section 5 of B.S.600R, 1942.

population average \bar{X} will tend to be Gaussian. In other words, if a frequency curve were made of the sample averages, it would have the general shape of the Gaussian curve, and a certain standard deviation. The latter is termed the standard error in

annual consumption of a group of consumers and the corresponding after-diversity demand values*, i.e., the average demand per consumer during consecutive half-hours. After-diversity demand (A.D.D.) per consumer possesses all the advantages of an

average, especially the diminishing influence of the individual as the size of the group increases.

Fig. 2 shows hypothetical after-diversity-demand curves for two days out of the 365 of a year, and the corresponding annual mean value, equivalent to the corresponding average annual consumption. For each of the A.D.D. values a frequency distribution can be built up just as it can about the central type form of the average annual consumption.

Looking upon Fig. 2 as a time series of values of average demand, one can discern the effect of two principal independent sources of variation affecting all individuals simultaneously in the same direction: Time of day and position of the day in the week. If, however, a series of comparable values is picked out, say, the average demand at 12.00-12.30 p.m. of the fifty-two Sundays of

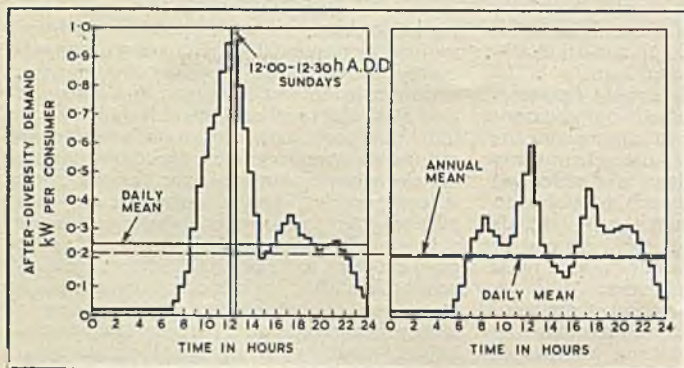


Fig. 2.—Hypothetical curves of average demand (after-diversity demand) per consumer of an infinite homogeneous group of consumers equipped with cookers and no other heavy appliances

sample averages, and means that there exists a 68 per cent. probability (roughly 2 in 3) of a sample average not differing from the population average by more than plus or minus the standard error.

Now, statistical mathematics reveal that with Gaussian frequency distributions, arising out of statistically uniform populations, there exists a definite relationship between the standard deviation, σ , in respect of the population and the standard error in sample averages, s , the latter being directly proportional to the former and inversely proportional to the square root of the number in the sample, i.e. $s = \sigma/\sqrt{n}$. This supplies another explanation of the stabilising effect of increased numbers on average values.

Reverting to the domestic load, reference has been made above to the annual consumptions within a homogeneous group of consumers with electric cookers. Annual consumption in kWh is equivalent to annual mean load in kW times 8,760 hours, i.e. it can be represented by annual mean load, which, in turn, can be expressed as the average of the corresponding daily mean loads or of the corresponding half-hourly mean loads, i.e., half-hour demands. Thus a link can be established between the average

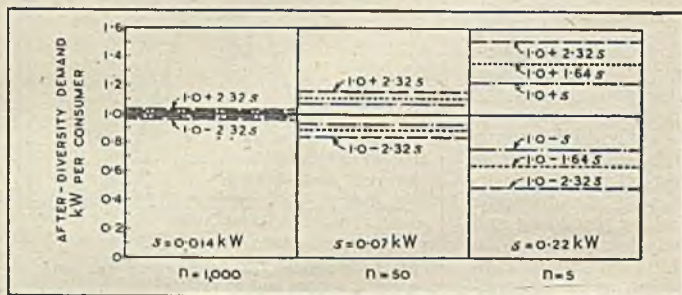


Fig. 3.—Probable limits of variation of the 12.00-12.30 p.m. A.D.D. for Sundays (Fig. 2) as affected by size of group, n

the year, they can be visualised as fifty-two sample averages from a population constituted by $52 \times n$ individual demand values, n representing the number of consumers involved. In other words, it may be assumed that the $52n$ demand values form a statistical population, and that the 52 combinations of n values occurring on successive Sundays represent random samples to which the above-

* P. Schiller, "After-Diversity Demand," *Electrical Review*, April 9th, 1943, p. 475.

mentioned statistical law applies. Hence, if the standard deviation of the $52n$ values is σ , the standard error in respect of the 52 sample averages or A.D.D. values will be σ/\sqrt{n} , i.e., with growing n the dispersion of these A.D.D. values will become smaller and smaller—the phenomenon of stabilisation behind the popular expression “complete diversification.” If, however, n is small, the A.D.D. values of a series of the kind under consideration will be comparatively erratic, with relatively much higher peaks than in the other case.

Suppose, now, the half-hour period considered is that at which groups of consumers of the type in question are apt to make their annual maximum demand, the corresponding A.D.D. value being the after-diversity maximum demand (A.D.M.D.), i.e., the highest peak of the series under consideration. The theoretical maximum of this value is represented by the average of the theoretically possible individual maximum demands, that is, it would occur if by some freak of chance all consumers in the group were to make their individual maximum demands simultaneously. The actual A.D.M.D. is governed by the laws of probability, which are among the bases of statistical mathematics.

Variation in Sample Averages

Fig. 3 will serve as a further illustration. It is based on the assumption that for an infinite number of consumers of a certain economic status using electric cookers but no other heavy electrical appliances, the A.D.D. at 12.00–12.30 p.m. on Sundays, i.e. the A.D.M.D., is 1 kW per consumer, and that the standard deviation, σ , is 0.5 kW. The latter may be supposed to be approximately the same as would result if a series of 52 sets of individual demand values were taken for a finite number, n , of consumers, as referred to above. The measure of probable variation in sample averages, i.e., in the corresponding A.D.D.'s of random groups of n consumers, is given by the standard error $s = 0.5/\sqrt{n}$ kW = $1/(2\sqrt{n})$ kW; the interpretation being in this case that for a group of n consumers of the type in question, 68 per cent. of the 12.00–12.30 p.m. A.D.D. values obtaining in the course of a series of Sundays are likely to be within $\pm 1/(2\sqrt{n})$ of 1 kW, 32 per cent. are likely to fall outside these limits, of which 16 per cent. are likely to be positive excess values. The last statement can also be expressed thus: In the circumstances described there exists a likelihood that on sixteen Sundays out of 100, i.e. on an average about every sixth Sunday, the 12.00–12.30 p.m. A.D.D. will exceed $1 + 1/(2\sqrt{n})$ kW.

In Fig. 3 the conditions are illustrated for groups of 1,000, 50 and 5 consumers, i.e., $n = 1,000, 50$ and 5 . In addition to the standard error, limits for 5 per cent. and 1

per cent. probability of excess are indicated. Further details are given in the accompanying table.

Thus, under conditions of statistical uniformity a group of 1,000 consumers could be expected every twenty Sundays in the long run to produce an A.D.D. in excess of 1.023 kW per consumer, whereas the corresponding value for a group of 5 would be 1.36 kW. But while with the former group the maximum that may reasonably be anticipated (1 per cent. probability) is 1.032 kW per consumer, in the case of the latter it is 1.51 kW. This shows also that, strictly speaking, it is incorrect to state an A.D.M.D.

	n			Probability of excess, per cent.	Excess recurrence period, Sundays
	1,000	50	5		
$s = 0.5/\sqrt{n}$, kW	0.014	0.07	0.22	16	6
1.64s, kW	0.023	0.11	0.36	5	20
2.32s, kW	0.032	0.16	0.51	1	100

figure without reference to a probability or recurrence value. The correct way would be to give a series of figures with associated probability values, so that the engineer determining the size of distribution plant could choose on the basis of a certain assumption, say, that a maximum voltage-drop of y per cent. might be exceeded if, on an average, this did not recur more often than every z days.

To sum up: In dealing with the domestic load, one has to bear in mind its statistical aspect, in which only groups and mass behaviour count, whereas the individual matters little. Therefore, it is the methods of statistics that have to be applied. Strict account must be taken of the factors causing variation, distinguishing between such as are not and such as are likely to affect all individuals in a random manner; only then can specific factors be isolated for investigation. Frequency distributions, based on observed values and interpreted as schedules of probabilities; statistical measures, such as average demand per load unit or consumer; formulæ elucidating the influence of group size; and various other elementary statistical instruments can then be applied with benefit. If a growing familiarity with statistical theory did no more than put an end to such absurdities as comparing undertakings on the basis of kWh sold per consumer—industrial, domestic and others combined—some good would have been achieved.

Gaussian frequency curve (Fig. 1):—If a multiplicity of causes operate by chance to effect variation of a characteristic, and number, or frequency, of observations is plotted against corresponding observed values, a curve will result similar in shape to the mathematically defined probability curve shown in Fig. 1. Under conditions of statistical regularity a frequency distribution in respect of the past

may also be regarded as an expression of future probability, *i.e.*, if during a given period a definite value of the characteristic concerned was observed f times, it may be expected that in a future period of same duration it will again occur f times. This frequency or probability may also be expressed as a percentage.

The equation of the Gaussian curve is defined by two parameters, *viz.* the arithmetic mean (simplified "average") and the standard deviation (usually designated σ), being a measure of the dispersion of the individual observations in respect of the average, and representing the

square root of the average of the squares of the deviations of the observed values from the latter's average.

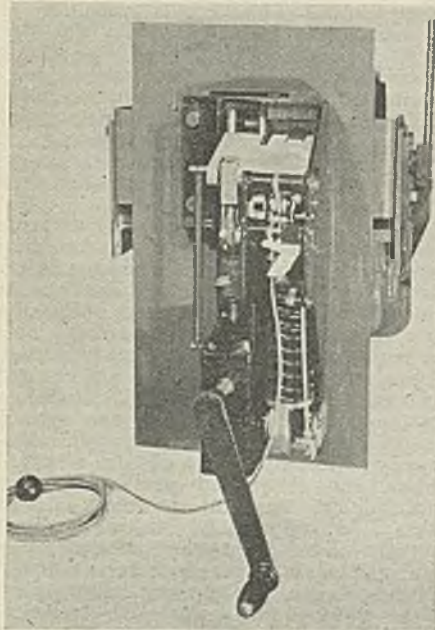
If ordinates are erected at both sides of the average at a distance of $\pm \sigma$, the corresponding area under the curve comprises approximately 68 per cent. of the total observed values, leaving approximately 16 per cent. in excess of average plus σ . Similar relations can be established for any other portion of the curve; *e.g.*, ordinates erected at distances of $+1.64 \sigma$ and $+2.32 \sigma$ from the average will leave 5 and 1 per cent., respectively, of excess values.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Switch-closing Mechanism

SPRING-LOADED closing devices for circuit-breakers of the small oil content, single break type, are being made by COOKE & FERGUSON, LTD., Victoria Street, Openshaw, Manchester, 11. The spring is loaded by a hand crank and



Spring loaded circuit-breaker closing device

enables a single reclosure to be made after short-circuit tripping; twin springs permit two reclosures without reloading the springs, while motor loading can be provided for fully remote operation. This gear is normally released from a distance by lanyard, or electrical coils; each spring of the twin type may be released independently, or electrical operation in conjunction with a special relay will permit auto-reclosure with predetermined time intervals.

The gear illustrated has proved to be satisfactory up to ratings of 350 MVA at 11 kV,

250 MVA at 6.6 kV, and 150 MVA at 3.3 kV. Oscillograms of comparative performance when closing against a three-phase fault with a peak inrush of 86 kA (when actuated by solenoid and spring) show the breaker to have been easily latched home fully in both cases; but approximately 50 per cent. quicker closing time was attained with the spring gear, thus materially reducing the burning of contacts. Since the speed of solenoid actuation is a function of the kW rating of the closing coil, the latter would need to be of excessive power in order to equal the closing speed of the spring mechanism.

Small Bench Drill

A miniature bench-type drilling machine suitable for manufacturers of instruments and optical devices, watch makers, or general experimental work is announced by RUNBAKEN PRODUCTS, 71, Oxford Road, Manchester, 1.

This "midget," which weighs 8.5 lb., is belt driven by an AC-DC motor of 1/20 HP at an on-load speed of 3,000 RPM. A toggle switch is provided in the base of the stand, or a foot switch may be fitted if preferred. The table is adjustable vertically and radially as well as for travel, while collets are interchangeable to take drill shanks of from 1/64 to 1/2 in. The top end of the drill shaft is fitted with a small grinding wheel.

Paint Drying Apparatus

Infra-red heating apparatus for paint drying is offered by the ERGON ELECTRICAL MFG. CO., LTD., Vencourt Place, King Street, London, W.6. The radiating "units" are said to be constructed in a way that enables them to be assembled in drying tunnels of any length and shape. Any direction of radiating beam can be arranged for, thus providing facilities for altering shape, length and angle when articles treated are changed. The reflectors are semi-parabolic.

Watertight Lighting Fittings

The range of non-corrodible watertight fittings for industrial lighting made by ROWLANDS ELECTRICAL ACCESSORIES, LTD., Hockley Hill, Birmingham, 18, now includes various sizes and types for accommodating 60, 100 and 200 W lamps. In addition to the screwed glass fitting, reflector models of the dispersive, angle and concentrating patterns are available. The 200 W fitting is supplied as standard for the reception of Edison screwcap lamps, but is also obtainable with two or three slot bayonet-cap holders.

Metadynes

Operation Principles and Examples of Application

DEVELOPED early in 1932 by the Metropolitan-Vickers Electrical Co., Ltd., and built before the war, the "Metadyne" has been applied extensively to the requirements of the Services under arduous conditions. Its purpose is to amplify greatly input power, thus providing close control or variation of speed, torque, current and voltage with inherent quickness of response.

In principle, the Metadyne is derived from a DC generator in the following way. In the

normal two-pole type machine shown diagrammatically in Fig. 1 with the brushes against their armature conductors for simplicity, the field current I_1 produces the exciting flux ϕ_1 . The rotation of the armature in this field generates a voltage V_2 across the brushes A and C, resulting in a load current I_2 . The latter in passing through the armature conductors produces the armature reaction flux ϕ_2 at right angles to ϕ_1 and of the same order of magnitude. If the load is replaced by a short-circuit and I_2 is reduced sufficiently to limit the short-circuit current to the value of I_1 , a minute current in the field coils results in a full cross-flux ϕ_2 . This flux can now be utilised as the main excitation flux, in which case the armature will develop its full voltage V_3 between points B and D (Fig. 2). If an extra set of brushes be applied at those points, the load current I_3 can be drawn from that set. Since I_3 may have 100 times the value of I_1 and power varies as the square of the current, the amplification of the signal power would be 10,000 to 1.

On account of the introduction of the extra set of brushes, the poles are interrupted as shown in Fig. 2. For that reason the machine is described in terms of cycles rather than of poles. The simplest case, that under consideration, with four pole-pieces, four brush arms and a two-pole armature, is known as a "one-cycle" Metadyne. Armature reaction has been usefully harnessed to produce the excitation ϕ_2 , but the flow of the load current I_3 produces in its turn a cross-flux ϕ_3 . The reason for this can be seen from the directions of the current in the

armature conductors: there are the original set of indications for I_2 for producing ϕ_2 and an additional set similar but rotated clockwise through a right angle.

Instead of armature reaction being neutralised in one of the usual ways, a "compensator" is applied to the Metadyne in the form of a field winding in series with the load. Compensation may be "under," "full" or "over." The fully compensated machine has been popularised by the General Electric

Co. of America, where it was introduced as the "Amplidyne" in 1938.

Any desired number of separate signal or "control" windings can be accommodated to enable the Metadyne to act on the resultants of signals from more than one source. The control winding, in addition to providing the initiating flux, is required to overcome the uncompensated portion of the armature reaction. An increase in

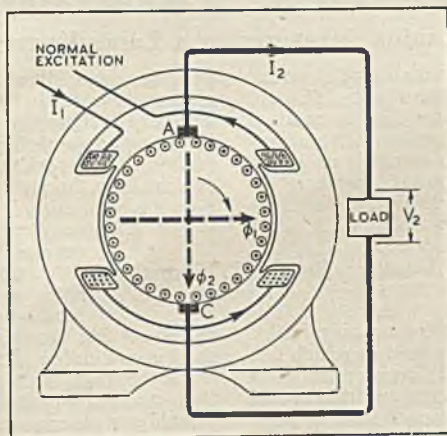


Fig. 1. — Fundamental DC generator circuits

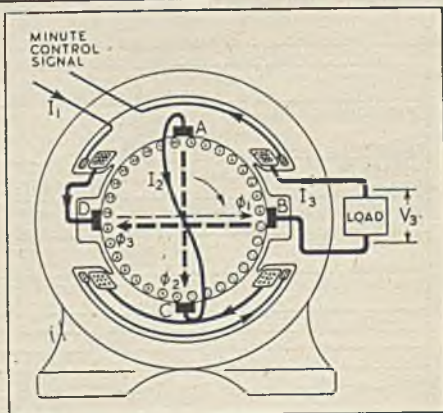


Fig. 2. — Basic Metadyne connections

control-winding current produces momentarily a resultant flux far in excess of that required for immediate excitation, the effect being a sudden increase in V_3 causing the load current to build up quickly to the value corresponding to the increased excitation.

The Metadyne can be used sometimes as

an alternative to and at others as a refinement for Ward-Leonard equipment. Rolling mills furnish a number of illustrations of the application of this form of control. One is in correcting the effect of the change in reel inertia between the empty and full stages when winding strip. The reel-motor current is utilised as a signal to a small amplifying Metadyne which excites another connected in series with the field of the main reel motor, the armature of which is fed from a constant-voltage supply. As the amount of material on the reel increases, the reel-motor field is increased, thereby reducing speed and in-

creasing torque or *vice versa* for unwinding. In order to provide the wide speed range needed to take care of variations in mill speed as well, a booster can be connected in the reel-motor armature circuit and excited from the buck-boost Metadyne, so that constant HP input and strip tension are achieved. Acceleration of the mill from rest through threading speed up to full mill speed and subsequent deceleration can be effected by Metadyne control, which takes care of such incidental occurrences as breaking of the strip and applies full field for dynamic braking.

Substation Maintenance

Routine Measures in a Large Factory

THE satisfactory performance of electrical equipment is dependent upon efficient maintenance; breakdowns can be reduced by a regular system of inspection. The factory referred to below receives a supply at 33 kV by means of two main substations where the voltage is stepped down to feed eleven substations at 11 kV, from which it is again transformed to 440/230 V to supply the factory shops. Visual examinations of essential items of plant are made weekly with detailed inspections and tests every six months. A concise record system is kept in which one type of printed card (Fig. 1), giving particulars of the equipment with its serial numbers and its maintenance, is allotted to each item of plant as follows:—High-voltage switchgear; trans-

person, who has previously made the apparatus safe by isolating and earthing. The card is signed by both parties and is held by the employee doing the work who, on completion of the work, again signs the card and returns it to the authorised person, who also adds his signature.

The maintenance schedule for switchgear covers the following items.

By D. T. Evans,
A.M.I.E.E.

Operating mechanism: see that links and levers move freely, lubricating where necessary, and

close and trip breaker by hand to see that there is no binding. Auxiliary switches: lightly smear contacts with petroleum jelly and see that operating rods and links are secure. Bushings: clean porcelain or other insulating surfaces and examine for cracks, tracking or other damage. Contacts: examine with particular attention to arcing contacts which protect the main contacts, smoothing the arcing tips with a fine file if they are pitted and replacing them if they are badly burned. Mains connections and secondary wiring: ensure that all nuts are tight and that good contact is maintained. Oil: test clean sample according to B.S.S. 148 and if breakdown occurs below 22 kV purify (oil is purified annually). Isolators:

ELECTRICAL PLANT RECORD CARD					No.
TRANSFORMER				SPARES REF.	
FACTORY No.		LOCATION			
MAKERS No.		MAKER			
K.V.A.		VOLTS H.T.		L.T.	
ON LOAD	TAPPIINGS	%	+	-	
OFF LOAD					
DATE	OIL TEST	BREATHER	REMARKS		

Fig. 1.—Typical record card as used for transformer inspections

formers: transformer tap changers; protective relays; medium-voltage switchgear.

Great importance is attached to the strict observance of safety regulations. Before work is carried out on any part of the equipment, a "permit-to-work" card is issued to the man engaged on it by an authorised

make inspections as for circuit-breakers.

For transformers the routine is as follows. Oil: test sample taken from bottom of tank for breakdown value in accordance with B.S.S. 148 (oil is purified annually). External insulators and oil-filled bushings: inspect and test oil sample. Explosion diaphragm:

inspect (a fractured diaphragm results in free breathing). Insulation : test and compare results with previous readings. Breathers : inspect and replace charge if necessary. Tap-

relay operating whilst testing overload relays, the coil may be short-circuited. The test set incorporates an ammeter in the secondary side for measuring the current taken by the relay. To avoid making heavy currents on relay contacts when testing, the trip links may be removed and a test lamp connected across the contacts.

Report sheets are issued to the electricians on which details of all inspections and tests are entered. Charts are used in order to check that maintenance is carried out at the required intervals.

Water Tank Corrosion

Causes and Prevention of Failure

THE premature failure of tanks forming part of cold and hot water systems has been investigated by the British Non-ferrous Metals Research Association. The results obtained with tanks made of zinc as well as galvanised mild steel with both hard and soft waters are recorded in a paper by MR. L. KENWORTHY and Miss M. D. SMITH presented to the Institute of Metals in London.

It is generally accepted that the deposition of a calcium carbonate scale on the inside surface may have a considerable effect in prolonging the life of the tank. The present investigation was undertaken to determine how variation of the hardness content of free carbon dioxide, and temperature of water affects the rate of corrosion.

The practical considerations are that the ability of a zinc coating to withstand cold water action depends mainly upon adequate thickness, at least 2 oz. per sq. ft. of surface on each side, as well as upon its soundness, good adhesion, freedom from discontinuities, bare spots, etc. All things considered, a hot-dipped coating of approximately equal proportions of outer zinc and alloy layer would appear most nearly to fulfil the requirements. Electroalgalvanised coatings (or others containing little alloy, irrespective of their method of formation) and all alloy coatings, although advantageous in certain circumstances, do not provide the same all-round degree of protection.

Electrochemical protection of bare steel by zinc ceases in soft cold waters in from 8 to 18 days and in hot water in from 3 to 4 days. Whereas in harder cold waters such protection may be maintained for many months (until all the zinc coating has been removed) in hot waters as much as 50 to 80 per cent. of the original coating may remain when failure occurs by pitting causing rust spots. The important influence of gas bubbles on the initiation of pitting in hot tanks is discussed.

Reduction of the free carbon dioxide content of the water and maintenance of a reasonable degree of hardness of cold water supplies are of great value in prolonging the life of zinc coatings in contact with the water. The free carbon dioxide content should be kept below 0.5 part per million, which can be done most easily in hard waters by cascade aeration; in soft waters the addition of lime is preferable, since it will serve to induce hardness, which should not be less than 10 parts per million. Further investigation is necessary before recommendations can be made regarding the prevention of corrosion of galvanised tanks for hot water.

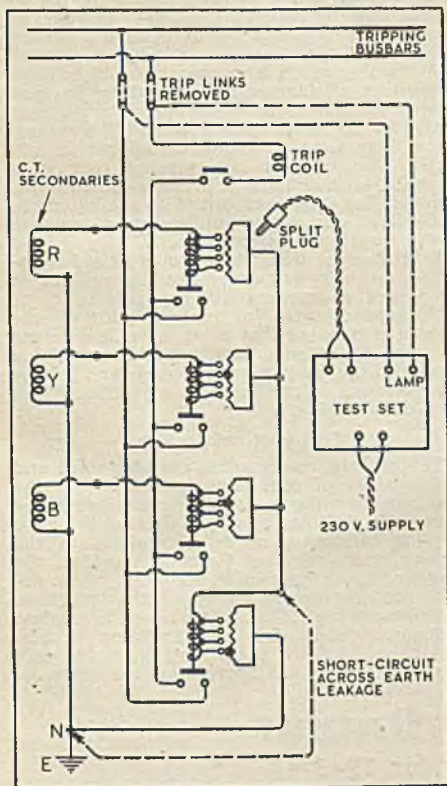


Fig. 2.—Connections for secondary injection test

changing unit : overhaul control gear, auxiliary switches, operating contactors and remote indicators and test oil sample. Miscellaneous : attend to any leaks, valves, etc., check oil levels and test temperature alarms.

With regard to the maintenance of protective gear, the operation of relays should be checked at normal settings by using them to open circuit-breakers ; it is preferable not to clean relay contacts as a routine operation. Tripping and alarm circuits of Buchholz protection on transformers should be tested.

A method of connection when testing relays by secondary injection is shown in Fig. 2. In order to simplify connecting the supply to the relay, the current-setting plug is replaced by a split plug of the same dimensions but made in two halves with an insulating layer in the centre. This plug enables the supply from the test set to be connected to the current-setting bridge and hence through the relay coil. To prevent the earth-leakage

I.M.E.A. Notes

Postponement of Purchase Rights

THE Council of the Incorporated Municipal Electrical Association has been asked by the South-West England and South Wales Centre of the Association to urge upon local authorities who do not at present own or operate the local electricity supply undertakings the importance of safeguarding their purchase rights.

It is pointed out in the December *I.M.E.A. Journal* that the Electricity Commissioners have informed authorities who wished to exercise these rights that it is unlikely that the necessary consents would be given in war-time without special justification. Authorities are therefore advised to make sure that they preserve their rights by applying for an extension of the period under the Special Enactments (Extension of Time) Act, 1940.

It is estimated that between 40 and 45 per cent. of the statutory purchase rights of public authorities are exercisable within the next five years and 50 per cent. within the next ten years.

Grid Tariffs

The Council has received an invitation from the Central Electricity Board to nominate three representatives to attend a meeting with other associations in the industry to discuss matters in connection with the fixing of new grid tariffs to operate from December, 1945.

War Damage Payments

In its circular H.L.I. the War Damage Commission states that where a public utility undertaking finds it necessary to excavate beyond the limits of a bomb crater the cost

of reinstating the highway may be treated as expenditure in making good war damage to the highway provided the excavation is within 100 yards of the crater.

A member refers to a case in which a large proportion of damage was caused by fire and it was necessary to open up highways and footpaths to disconnect "blitzed" premises when there were no bomb craters within 100 yards. The opinion is expressed that it is doubtful whether the cost of the work could be claimed but the authority was advised to include the cost in its notification of damage to the Electricity Commissioners.

It is thought that when the promised legislation on war damage to public utilities is introduced endeavours will be made to cover such expenditure. In another part of the *Journal* it is noted that there are still no signs of this legislation. Drafting has proved a very intricate matter and there have recently been changes in the Treasury personnel which have caused delay.

Coal Cost and Quality

Representations regarding the high price and poor quality of coal have been made to the Government without success by members of the Association. It has now been decided to set up a joint committee of representatives of the Mining Association of Great Britain and the Conjoint Conference of Public Utility Associations to thoroughly explore the position. Members of the I.M.E.A. are asked to address complaints, with full substantiating details, to the secretary of the Association who will transmit them to the appropriate committee.

Electricity Output

Advance Statistics for 1943-44

WE have received from the Electricity Commissioners the following advance statistics of the output and revenue of all authorised electricity undertakings in Great Britain for the last completed year, i.e., up to December 31st, 1943, for company undertakings, to March 31st, 1944, for public authorities in England and Wales and to May 15th for Scottish public authorities:—

Class of Supply	KWH SOLD		REVENUE	
	Millions	Percentage of total	Amount (£ million)	Average per kWh sold (pence)
Lighting, heating and cooking ..	9,721.3	30.5	66.05	1.631
Power ..	20,950.4	65.8	64.45	0.738
Public lighting ..	20.1	0.1	.33	3.885
Traction ..	1,139.9	3.6	3.57	0.753
TOTALS ..	31,831.7	100.0	134.40	1.013

In 1942-43 the total output was 30,061 million kWh divided as follows:—Lighting, heating and cooking, 9,353 million (31 per cent. of the total); power, 19,517 million (65 per cent.); public lighting, 21 million (0.1 per cent.); and traction, 1,170 million (4 per cent.).

The total revenue was £126.5 million, i.e., 1.01d. per kWh and the average prices for each class were:—Lighting, heating and cooking, 1.647d.; power, 0.718d.; public lighting, 3.927d.; and traction 0.738d. per kWh.

It will thus be seen that during the year the average price for the slightly increased output (the rise was under 6 per cent.) was advanced by less than 0.3 per cent. The average price per kWh for lighting, cooking and heating actually fell by about 0.96 per cent., while that of power (accounting for two-thirds of the total output) rose by about 2.8 per cent., probably on account of the operation of coal clauses in power consumers' contracts.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AMONGST the awards in the "Home Guard Honours" List, announced in the *London Gazette*, is the name of Major J. W. G. Bird, assistant general manager of the South Wales Electric Power Co., who receives the M.B.E. Major Bird is second-in-command of the 4th Mon. (Risca) Bn., Home Guard.

Mr. S. Hartland, consumers' engineer to the West Gloucestershire Power Co., Ltd., has been awarded the M.B.E. for his services as battalion signals officer (lieutenant) in the 5th Battalion Gloucestershire Home Guard.

Mr. J. H. Appleby, A.M.I.E.E., A.M.I.Mech.E., who is distribution superintendent and mains superintendent at the First Garden City Electricity Works, Letchworth, has been appointed deputy borough electrical engineer at Colchester and will take up his duties on January 11th. Educated at Bedford Technological Institute, Mr. Appleby received his technical training while serving as a student at the works of W. H. Allen, Sons & Co., Ltd. After a period at sea as engineer in the Bibby Line, he joined the Letchworth undertaking as district engineer in 1926 when the company extended its supply area by about 40 sq. miles, his principal duties for some years being the development of this area. He was appointed mains superintendent in 1933 and since then an important part of his work has been the preparation of 11-kV transmission and l.v. distribution schemes and the design of substations, particularly for factory supplies.



Mr. J. H. Appleby

Mr. A. W. Ladner is retiring from the position of principal of the Marconi Company's School of Wireless Communication at the end of the year, after thirty-two years' service with the company, and twenty-four years as superintendent of instruction. Mr. Ladner will continue to act in an advisory capacity. His place as college principal has been taken by Mr. N. C. Stamford, who was previously with the company and has since been on the electrical engineering teaching staff of Manchester University.

The Sanwest Dramatic Society, which was formed a few months ago by employees of Sangamo Weston, Ltd., has recently presented as its first play the three-act comedy "Quiet Wedding," by Esther McCracken. Three public performances were given in the works canteen and there was also a special performance for the benefit of wounded soldiers, the audience of some 400 people including nurses, soldiers and A.T.S. from local camps, Y.M.C.A. personnel and members of the W.V.S. The acting was of a very high standard, in spite of the fact that most of the cast had had little experience.

To mark the retirement of Mr. E. B. Wedmore from the office of director and secretary of the British Electrical and Allied Research Association, a position which he has held since the formation of the Association in 1920, a presentation in the form of a wrist watch, a pair of binoculars and an illuminated address, was made to him by the E.R.A. staff in the lecture theatre of the Institution of Electrical Engineers on December 22nd. Presiding over the proceedings, Mr. H. C. Silver said that the E.R.A. would forever remain a monument of Mr. Wedmore's work. Dr. Whitley said that since 1897 scarcely a year had passed without Mr. Wedmore's contributing some invention or other to its history, and the Association under his guidance had grown from small beginnings to be one of the major factors in the success of the industry. Dr. Whitley called upon Miss Evelyn Todd, the latest member of the staff, to make the presentation.

A number of other members of the staff paid tribute to their chief, including Dr. Whitehead, who has been assistant director of the laboratories and will take over the duties of acting director of the Association for the time being. In giving thanks, Mr. Wedmore said that whatever the Association had achieved had been the result of co-operation.

Mr. V. B. Twiss, M.A., has been appointed education officer to W. T. Henley's Telegraph Works Co., Ltd. Mr. F. H. Batten, A.M.I.E.E., becomes assistant contract manager and Mr. E. Bickley, A.M.I.E.E., has been appointed chief testing engineer of the contract department, all as from January 1st.

The Birmingham Electric Club is holding a children's party on January 13th at the Grosvenor Room of the Grand Hotel. It will be open to all members, their wives, children, and grandchildren. Tickets (5s. each) are obtainable from the hon. social secretary, Mr. W. J. Bird.

Mr. B. S. Gylee, assistant power station superintendent, to the West Gloucestershire Power Co., has been recommended by the Swansea Electricity Committee for the position of boiler house superintendent at Tir John.

Capt. H. Vivian has been elected a director of Associated Electrical Industries, Ltd.

Alderman J. Minto, Lord Mayor of Leicester and chairman of the Electricity Committee, presided at the luncheon held to mark the Electricity Department's jubilee (see page 914). Responding to the toast of "The Electricity Undertaking," proposed by Lieut.-Col. Sir R. E. Martin, chairman of Leicestershire County Council, the Lord Mayor said that, great as had been the development during the past fifty years, it was nothing to the development likely to take place in the next fifty years.

Regarding finance, the department had been looked upon as one that might be "rooked" for other purposes. The Committee had stood against its profits being used to subsidise other municipal enterprises, and the result was that, while coal costs had increased 120 per cent., the price of electricity had not risen.

Councillor J. W. Wale, vice-chairman of the

Electricity Committee, proposed the toast of "The Guests," and Capt. Charles Waterhouse, M.P. for South Leicester, responding, said that, while electricity had outstripped gas, they were both great industries and should be complementary and not rivals.

On December 15th about 130 colleagues and friends of Mr. A. E. Noakes, of the chief accountant's office, held a social evening at the "English Electric" Association Hall, Stychfields, to mark his retirement at the end of the year after 44 years' continuous service with the English Electric Co. and its predecessor Dick, Kerr & Co., Ltd., and presentations were made

to him. The chair was taken by Mr. R. E. Henderson (chief accountant's office) who also was a former member of the head office staff of Dick, Kerr. Mr. Henderson read a number of apologies for absence, and referred to the absence, due to illness, of Mr. J. Taffs (manager, Publicity Department), who was to have made one of the presentations; Mr. H. Dingle had consented to take Mr. Taffs' place. Mr. A. G. Brown, chief accountant, presented Mr. Noakes with the company's long service testimonial. Mr. Dingle then presented a wallet of notes, subscribed by Mr. Noakes's friends and colleagues. Mr. Noakes expressed his thanks.

CORRESPONDENCE

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

I.E.E. Examinations

I AM very glad that Dr. Hughes has drawn attention to the new regulations for the examination for associate membership of the I.E.E. Like most teachers in technical colleges I am concerned with the training of part-time students for the National Certificates (Ordinary and Higher) which are at present accepted by the Institution of Electrical Engineers in lieu of its own examinations. A student taking the National Certificate examinations has to do certain work, such as machine drawing, which does not appear in the Institution scheme, and providing he passes his examinations at the end of each session will obtain his Higher National Certificate at the end of five years.

The Institution has now introduced a regulation that it will, in future, only accept the National Certificates in lieu of its own examinations, *subject by subject*. This, together with the overloading of the Institution's syllabus will make it difficult, if not impossible for us to formulate a satisfactory educational scheme and carry it out in a five-year part-time course, and I am strongly against the idea of extending the course beyond this period. It appears as if most of the trouble has arisen owing to endeavouring to make syllabuses for Section A, common to both civil and electrical engineers, to the disadvantage of the former.

I agree that it is essential that the Council of the Institution of Electrical Engineers should call for a high standard of attainment for associate membership, but I consider that it is most unfortunate that the new regulations should have been issued so soon. Owing to war conditions, many of the young people coming on to us are below the pre-war standard of attainment and we shall have to make good their deficiencies, in addition to doing everything which is possible to raise the final standard of attainment.

In view of the explanation given by Mr. Brasher of the large choice of questions in

the Applied Heat (with Light and Sound, etc.) paper, it would seem more satisfactory to subdivide the syllabus and give the candidate the choice of either subsection according to the branch of electrical engineering in which he would ultimately be most interested. Despite Mr. Brasher's statement there is a distinct feeling amongst those who are responsible for the training of electrical engineers in technical colleges that the difficulties of part-time teaching are not fully appreciated.

W. C. S. PHILLIPS,
Borough Polytechnic, B.Sc., M.I.E.E., F.Inst.P.,
London, S.E.1. *Head of Department of
Electrical Engineering and
Physics.*

Educational Opportunities

HAVING regard to what has been said about the need for greater educational facilities for the technical engineers of tomorrow, should not opportunities be provided for those who have already achieved qualification under the present educational system? This usually necessitates years of attendance at night school, in addition to practical training during the day.

My employers have six technically qualified men doing journeymen's work without chance of advancement. During our apprenticeship, we were urged by this firm to study, but on completion of our theoretical training, we were refused technical positions. Is this an isolated case or the general practice of firms who incessantly plead for more technicians?

GRADUATE I.E.E.

Compulsory Registration

REFERRING to Mr. Moss's letter in your last issue, bad installation work is not uncommon in the factories which produce electrical equipment. Probably this is due to the fact that the electrical engineers there are specialists who do not know sufficient about installation work. Such people often regard installation work as perfectly easy and something below them.

Compulsory registration of contractors may imply that all registered contractors are competent and that all others are suspected of being incompetent. To refuse to allow contractors to work unless they are registered may produce a shortage of installation contractors. Furthermore, should not maintenance electricians be similarly registered, as they often make additions to electrical installations?

In my opinion all electricians should be under the supervision of an A.M.I.E.E. who thoroughly understands installation and maintenance work. (Many A.M.I.E.E.'s are specialists in some other branch.) He would not necessarily be a full-time employee but should act in the capacity of consulting engineer. This arrangement would often be of advantage to the firms and would often reduce installation and maintenance costs.

Bradford.

A. R. CURETON,
Graduate I.E.E.

Supply in Cardiganshire

I WAS very interested in the article "A Wholly Rural Area" in your issue of December 15th, but I would like to make one small correction.

In the second paragraph it is stated that the three companies supply the whole of Pembrokeshire, Cardiganshire and Carmarthenshire as far as the Llanelli and South Wales Power Co.'s boundaries, with a few exceptions which are mentioned.

In addition to these exceptions, there is another statutory undertaking operated by myself—the Borth and Ynyslas Electric Supply Co., Ltd.—and several other non-statutory undertakings at Llandre, Bow Street, Talybont, and elsewhere; all these are in Cardiganshire.

Stroud, Glos.

J. M. C. FIELD,
F/Lt.

District Heating

WITH reference to the letter of Mr. B. S. Gyles in your issue of December 8th, I would ask him to consider what is the value of a BThU in steam at atmospheric temperature (a) for power purposes and (b) for heating purposes.

Mr. J. P. S. Pillans appears to agree that there is something "phoney" about this pseudo-efficiency, but accuses me of an incorrect conclusion, he himself giving up the argument without any conclusion at all. The problem here is analogous to comparing the efficiencies of differential drives with one wheel whirling in the air, or, again, of transformers with varying degrees of linkage.

My reply to his pertinent question "From what source other than turbines could low-grade heat be obtained?" is "Who is going to worry if he is led to believe that district heating gives near perfection?" The following exemplifies my contention:—The thermodynamic efficiency of 30 per cent. attained by

a modern high-pressure power station is required by the Ministry of Fuel to be increased and the plant is therefore converted into an electric heat station at 50 per cent. efficiency. As this is still unsatisfactory to the naïve M. of F., the crafty engineer removes his ultra-modern plant and installs low-pressure boilers with Savery's engines, bringing up his efficiency to the highest in the land.

Particulars of a typical station with its performance stated as the orthodox efficiency in percentage heat units and also in terms of power are as follows:—Steam conditions, 600 lb. per sq. in. (abs.) and 850 deg. F. Net availability 500 BThU exhausting to heat exchanger at 100 lb. per sq. in. (abs.) and 328 deg. F. Net availability 295 BThU. Feed-water temperature 328 deg. F.; heat to exchanger 935 BThU. Assuming for simplicity perfect isentropic heat drop, the statements of performance are: (a) Orthodox efficiency, 100 per cent., which tells nothing; (b) thermo-dynamic efficiency, 41 per cent. heat drop at 44 per cent. efficiency, 59 per cent. heat drop at 3.2 per cent. performance factor, which tells everything. A boiler efficiency of 75 per cent. would make these figures 75, 33 and 2.4 per cent. respectively.

The performance factor lines up with the work of the refrigerating engineer. It may be, by a systematic pairing, cheaper for a consumer if heat is recovered with a refrigerating plant rather than conserved in the station, as for instance in baths-cum-icerink, iceworks-cum-factory, space heating in winter with cooling in summer. The examples are easy and interesting exercises to trace on a temperature entropy chart, which gives a physical picture lacking in the heat-entropy chart.

Newport, Mon.

B. LLOYD PRICE.

Glasgow Cable Contracts

IN the "Commerce and Industry" notes in the current issue of the *Electrical Review* you incorrectly report a decision of the Glasgow Corporation. Under the heading "Glasgow Cable Contracts" you say that the proposal to renew the existing contract with the Cable Makers' Association was referred back to the Committee. This is not so. The Council has merely continued the matter till next meeting, a different thing altogether.

Had the decision been as you suggest the whole matter would be reopened for fresh discussion as though the Electricity Committee had made no decision on it. As it is the decision of the Electricity Committee still stands and it has to be considered by the general Council at its next meeting.

There is no "Scotland versus England" issue involved in the matter. It is a problem of simple business.

Glasgow.

J. DAVIS, Convener,
Electricity Committee.

COMMERCE and INDUSTRY

Indian Copper Products.

Improvement of Industrial Design.

Fluorescent Lamp Price Reduced

THE Electric Lamp Manufacturers' Association announces a 20 per cent. reduction in the price of the 5-ft. 80-W fluorescent tube. Reseller agreement holders and supply authorities are to be recompensed in respect of lamps in stock upon notification being given to the Association by January 8th. It will be recalled that we reported last week the revocation of the Discharge Lamp Lighting Control Order.

Engineering Works Lighting

The accompanying photograph shows a section of an inspection department at a Birmingham engineering works lighted by means of "Mazda" 80-W fluorescent lamps in

the Mayor (Mr. Wykeham Price) said that notice had been taken of the statement that the purchaser would be reimbursed the excess amount paid.

Indian Rolling Mills

Completion of a new non-ferrous hot rod rolling mill near Calcutta was reported in our issue of October 27th last. These works of the National Rolling Mills, Ltd., can handle copper and other billets of 4 in. by 4 in. by 54 in. Material from the roughing or breaking down mill can be rolled on the finishing mill into rods of from 1 in. to $\frac{1}{4}$ in. diameter, ultimately being coiled in an automatic coiler. The mill plant, it is stated, can cater for all indigenous demands for electrolytic copper rods.

At the opening ceremony the Hon. Sir A. Ramaswami Mudaliar, K.C.S.I., Supply Member of the Executive Council of the Governor-General, said that the success of industrialisation of the country after the war would depend upon the co-operative efforts of the people themselves. On going through the names of the directors of the company he found a Muslim, a Hindu, and also an Englishman who had given his technical assistance. Here they had an example of the fruits of the efforts of various communities. Sir A. H. Ghuznavi, chairman of the company, stated that the industrialists looked for help and assistance for any industrial project. Mr. G. K. Khemka, senior member of the managing agents, declared that India would now import only copper bars; rods and cables would



Fluorescent lighting in an engineering works

"Mazdalux" open top reflectors. In this department close inspection, both visual and by the use of gauges, is carried out on very bright parts. Good low brightness lighting is essential to accuracy of inspection and the installation, carried out by Arthur Ellis (Electrical), Ltd., Birmingham, has achieved this. The photograph shows how well the "tunnel" effect has been avoided.

be manufactured in their country. The company was particularly grateful to Mr. C. B. Page, the managing director, who originated the scheme of cable and rod manufacture and who would now see the fulfilment of his ideas.

Council of Industrial Design

The President of the Board of Trade has set up a central Council of Industrial Design, with a Scottish Committee, to encourage by all practical means the adoption of good design in British industry. Furthermore, industries will be encouraged to set up design centres of their own, and the Government proposes to make financial grants for this purpose. The new Council will co-operate in the setting up of such centres. It will provide a national display of well-designed British goods, co-operate with the education authorities in matters affecting the training of designers, advise at the request of Government Departments and other public bodies on the design of articles to be purchased by them, and

Overcharge for Second-hand Cooker

At Guildford magistrates' court on December 11th William Herbert Herbertson and Spencer Burge, trading as Hills' Depositories, Commercial Road, Guildford, were summoned for selling a small electric cooker above the maximum price of £9 14s. 3d., £15 being charged. For the defence it was stated that Burge bought the cooker for his wife but it was too small, and he took it to his shop to sell it. He had never sold a cooker before. Dismissing the case on payment of £5 5s. costs

approve the selection of articles to be shown in United Kingdom pavilions in international exhibitions.

The functions of a design centre will be to study the problems of design in relation to products of its own industry and to collect information about design and make it available to the industry. Grants to design centres will be made by the Board of Trade after consulting the Council, on a similar basis to that adopted by the Department of Scientific and Industrial Research for research associations. Sir Thomas Barlow has consented to become chairman of the Council and Sir Steven Bilsland chairman of the Scottish Committee. Mr. Leslie Gamage, vice-chairman and joint managing director of the General Electric Co., Ltd., is one of the members of the Council, which will be unpaid and will arrange its own procedure and organisation, engaging a paid staff to assist it in carrying out its functions.

It may be recalled that the establishment of such a Council was suggested in a memorandum of the Federation of British Industries to the Board of Trade (*Electrical Review*, September 29th, 1944).

Gauge and Tool Makers

The annual general meeting of the Gauge and Tool Makers' Association was held at the Savoy Hotel, London, on December 14th, following a luncheon at which the principal guest was Sir Percy H. Mills, late Controller-General of Machine Tools at the Ministry of Supply and now Chief of the Economics Division of the Control Commission for Germany (British Element). Over 150 members and guests were present at the luncheon which was presided over by Mr. H. H. Harley, C.B.E., president.

At the annual meeting the chairman's report was approved. By adopting it, the meeting gave the Council a mandate to proceed with the establishment of a research association in collaboration with the National Federation of Engineers' Tool Manufacturers, the Institution of Production Engineers, and the Machine Tool Trades Association; to endeavour to negotiate an overall agreement on behalf of the members of the Association with the Ministry of Supply for the regulation of prices and profits; and to consider the desirability of reducing the annual subscriptions in order to facilitate the admission of the smaller firms.

Lectures on Lighting

Recently there has been an increased demand for lighting information in provincial centres, particularly fluorescent lamps and discharge lighting generally. This was demonstrated by the attendance at a series of lectures by Mr. A. D. S. Atkinson (Lighting Service Bureau) at Cambridge, Great Yarmouth and Lowestoft at the beginning of the month. At Cambridge the lecture was held under the auspices of the Engineering Society of the Cambridge Technical College and the room in which it was given, normally supposed to seat eighty, was somehow made to hold over twice that number.

These meetings were originally inspired by Mr. K. Rayment, director of the Lowestoft Electrical Co., and his example in linking up the local education activities with those of the Lighting Service Bureau is one that might well

be emulated by the electrical industry in other parts of the country. A series of meetings arranged in the same vicinity ensures a maximum economy of time. The Bureau has a number of commitments for 1945 but if early notice is given, arrangements can be made to co-operate with local centres in spreading a knowledge of the part the lighting industry will play in the post-war life of the community.

A Freak Lamp

The General Electric Co., Ltd., recently received a 200-W "Osram" lamp which had been through a serious fire, with the extraordinary result shown in the accompanying illustration. What happened was that the surrounding temperature, probably near roof level, reached the softening point of the glass and stayed there for some time, so that the combined effect of



Freak elongation of a 200-W "Osram" lamp resulting from a fire

gravity and the expansion of the gas inside the bulb produced an effect almost exactly similar to that which a skilled glass worker can obtain by blowing into and swinging a blob of fluid glass. After that the temperature seems to have fallen comparatively slowly so that the tube has hardly collapsed at all, as it might have done had the source of heat been suddenly removed.

Damages Settlement

A settlement for £1,750 damages was reached at Birmingham Assizes on December 14th in an action brought by Mrs. E. Perry whose husband received a fatal electric shock in August, 1942, while in the employ of the West Midlands Joint Electricity Authority.

New Canadian Organisation

Mr. R. D. Kerby, of Toronto, has been appointed general manager of the newly-formed Canadian Electrical Manufacturers' Association which will act as a central agency for the entire electrical manufacturing industry. The new Canadian organisation is on the lines of the National Electrical Manufacturers' Association in the United States, and the British Electrical and Allied Manufacturers' Association. Broadly speaking, its objects are to promote and further the interests of manufacturers of electrical products and the interests of the public in manufacturing, engineering, safety, transportation and other matters. The Association will as far as possible avoid duplicating the facilities already available through the Canadian Manufacturers' Association, the Canadian Standards Association, and similar bodies. It aims to be of assistance to the Government in its planning for post-war

reconstruction and its efforts to maintain employment. Committees have been formed to assist in the disposal of war equipment surpluses, farm electrification, etc. Provisional officers of the Association include Mr. A. B. Cooper (Ferranti, Ltd.), who is president.

Combined Street Lighting System

The Northmet Power Company has provided Enfield with the first street lighting installation to combine the advantages of the central control standard of 0.2 ft.-candle, and the "moonlight" standard of 0.02 ft.-candle, which can remain permanently in circuit. When a warning is received the lighting is reduced to the "moonlight" level by means of a transformer and change-over switch. Only a limited part of the town is lighted to the higher standard, and a small 415/240-V transformer, with suitable tapplings, is found quite suitable for the purpose. Using 60-W lamps at 23 ft. mounting height, the "moonlight" lighting is achieved by reducing the voltage from 240 V to approximately 135 V. In addition to preventing the streets from being plunged into sudden darkness, the arrangement makes it possible to connect traffic bollards and signs to the street lighting circuit.

Domestic Appliance Dimensions

For the guidance of those engaged in kitchen or house planning the British Standards Institution has issued a specification defining the space required for the accommodation of domestic electric cookers, refrigerators, wash boilers, wash machines and water heaters. In some cases the actual dimensions are given, but in general the dimensions specified are intended to define the space to be allowed for rather than the actual dimensions of the appliance. Additional data, such as the cabinet capacity of refrigerators, is given in order to assist in the selection of the most suitable appliance for any particular house or kitchen: the electrical loading is given as a guide to the size of wiring required. It is to be noted that the particulars given refer (except where otherwise stated) to the models obtainable up to 1939, as the new post-war models will not be obtainable until a year or two after the cessation of hostilities. It is to be expected, however, that the spaces indicated in the specification will be sufficient to accommodate the post-war models. Copies of this specification (B.S. 1183, 1944) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. post free.

Heating and Ventilating Engineers

The address of the Institution of Heating and Ventilating Engineers is now 72-74, Victoria Street, London, S.W.1 (telephone: Victoria 0146-7).

Trade Publications

Quasi-Arc Co., Ltd., Bilston, Staffs.—Technical circular (TC.557) containing information about the properties of "Radian" electrodes for welding mild steel and high tensile structural steels according to BS.968.

Milne & Longbottom, Ltd., Mere Lane, Rochdale, Lancs.—Priced 20-page catalogue of automatic motor starting switchgear of the "Elm" self-acting type up to 150 HP, air-

break AC contactors up to 300 A, spare parts, relays and accessories.

Londex, Ltd., 207 Anerley Road, London, S.E.20.—Illustrated catalogue (No. 205/44) containing technical particulars of relays of many kinds, also leaflet (No. 104) dealing with the remote control of street lighting by relays actuated by a master (or time) switch.

Bakelite, Ltd., 18, Grosvenor Gardens, London, S.W.1.—Illustrated booklet, recently revised, on the properties and uses of resins, cements, varnishes and lacquers.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds, 2.—Priced register of surplus new and second-hand plant and materials.

David Brown & Sons, Ltd., Huddersfield, Yorks.—Leaflet (E. 387.45) describing "Radicon" worm gear for small motors.

Copies can be obtained from the companies concerned by bona fide applicants.

Scottish Water Power

First Distribution Scheme

A Distribution Scheme (No. 1), prepared by the North of Scotland Hydro-Electric Board under Section 6 of the Hydro-Electric Development (Scotland) Act, 1943, and approved by the Electricity Commissioners on December 6th, has now been published. It defines the Distribution Area which covers so much of the parishes of Lochalsh, Kintail and Glenshiel in the County of Ross and Cromarty as lie within confines indicated on maps which can be inspected at Scottish Home Department, 10, Great College Street, London, S.W.1.

Mr. A. E. MacColl, deputy chairman of the Board, referring to this scheme recently, said that the power station, which was already provided for in the Board's first constructional scheme, was to be at Nostie Bridge, and it would harness the power of the Allt Udalain. The main distribution line would run from the power station westwards to Kyle of Lochalsh and Plockton and eastwards to Dornie and Invershiel. Within the limits of what was reasonably economic a free connection would be provided to every house within reasonable distance of the distribution mains, provided application was made while the works were being carried out. In the case of consumers who were situated at too great a distance from distributing mains, alternative means of supply were being investigated. The installation would be by overhead wires and, subject to war and labour conditions, should be available within two years of the commencement of work, which might begin next spring. Other distribution schemes would be published in the coming months. The Morar scheme, covering the area from Mallaig to Kinlochallort, had already been submitted to the Electricity Commissioners.

No revenue the Board could hope to draw from the area of the Lochalsh distribution scheme would balance the cost and none of the distribution schemes so far surveyed by the Board was economic. It was therefore necessary to make profits in other directions, and this would be done by the development of schemes for the sale of electricity to the Lowlands.

It was reported in the *Electrical Review* of July 7th last that the Lochalsh station, near Nostie Bridge, was to have an ultimate capacity of 4,000 kW, with a first instalment of 1,000 kW.

Planned Kitchens

The Part Electricity Can Play in Middle-class Homes

By Ernest R. Gilbert

IN many towns electrical engineers have shown what the artisan's wife may reasonably expect to see in her post-war kitchen. A careful study of post-war kitchen requirements, however, emphasises an equal need for planned kitchens for homes in the higher income categories. The war has merely accelerated this need. For twenty-five years the domestic servant problem has been acute and as it is unlikely that the position will become any easier, the average middle-class household will be compelled in future to rely almost entirely upon its own efforts.

Mechanisation of the kitchen, as in the factory, enables countless jobs to be done much better, more quickly and also more conveniently; and mechanisation means electrification for only by electricity is it possible to supply the necessary power. On a strictly economic basis too the housewife will quickly realise that it is cheaper to pay $\frac{1}{4}$ d. per hour as the cost of running an electric motor than 1s. 6d. or more per hour for a "daily" woman.

Before the ideal kitchen can be planned the functions of the home must be studied afresh. In America, where the servant-less house is the rule rather than the exception, architects have stripped out useless walls and replaced two or three small rooms by one spacious all-purpose room. The kitchen of this type of house has been enlarged to include an alcove or recess where meals can be served, thus eliminating the carrying of food and table-ware between kitchen and dining-room. Our own women-folk are to-day faced with these same problems and ultimately they will be solved in much the same way.

In the design of the kitchen illustrated

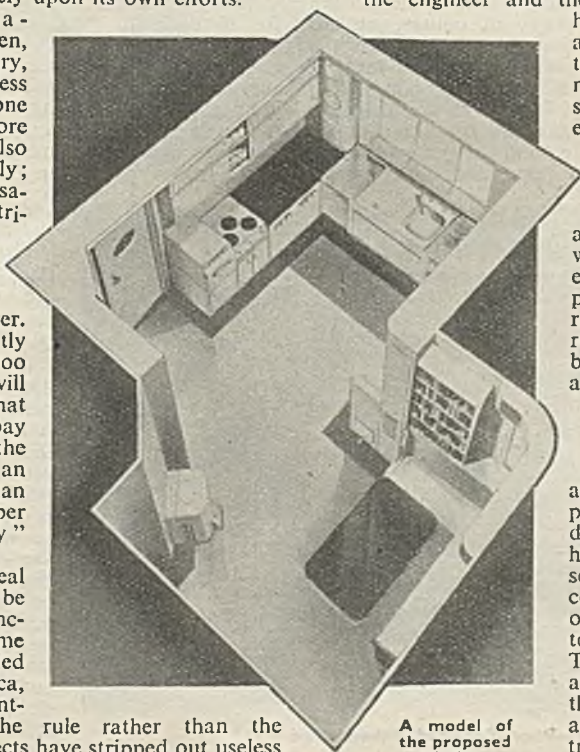
considerable thought has been given to the materials from which it should be built, bearing in mind that the ultimate aim is prefabrication, since this would permit large-scale production with substantial economies in labour and material: experience has already shown that built-in equipment is considerably cheaper to produce than mobile equipment.

For a variety of reasons the choice is aluminium and its alloys. Housewives are already familiar with its many advantages for kitchen utensils, but to the architect, the engineer and the manufacturer it

has the added attraction that it is the easiest of all metals for pressing, stamping and extruding. Tool charges and operational costs are in consequence considerably lower than with steel. No expensive vitreous processing is required to prevent rust. Instead it can be cheaply anodised after fabrication and colour-treated in a variety of attractive shades. This anodic treatment produces a very durable surface, highly resistant to scratches and non-corrosive, requiring only a damp cloth to keep it clean. The lightness of aluminium is a further considerable advantage when transportation costs must be faced.

Before the war, aluminium was regarded as an expensive material, but the seven-fold expansion of the industry in recent years, the fall in the price of the virgin metal, the improvements in fabrication techniques and the development of new alloys for specific purposes, all contribute to the certainty that future prices will be keenly competitive.

In arranging the various items of equip-



A model of the proposed kitchen

ment around this kitchen, care has been taken to eliminate all unnecessary movement on the part of the housewife. As one enters the kitchen from the hall the equipment (left to right) includes a two-unit electric cooker, clothes-washing machine, sink unit incorporating an electrically operated dishwasher and waste-disposal unit with draining board on each side. The main work bench, for food preparation, has a spacious refrigerator alongside. At the left of the window, within a built-in recess, is the mains intake with main and house fuse system, the electricity meters and a synchronous clock. Below, in the corner, is an electrically heated storage tank for use in the summer when the solid-fuel boiler (which I should include as being a more economical proposition than an electric water heater for providing constant hot water, besides warming the kitchen in the winter, though, of course, not so clean or labour saving) is not required, while at the right is an extension loudspeaker.

On the far side of the room is a solid fuel boiler. Next to it is a large vertical cupboard, in two sections, the one for brooms, vacuum cleaner, etc., and the other for table linen, etc. Behind one door is mounted

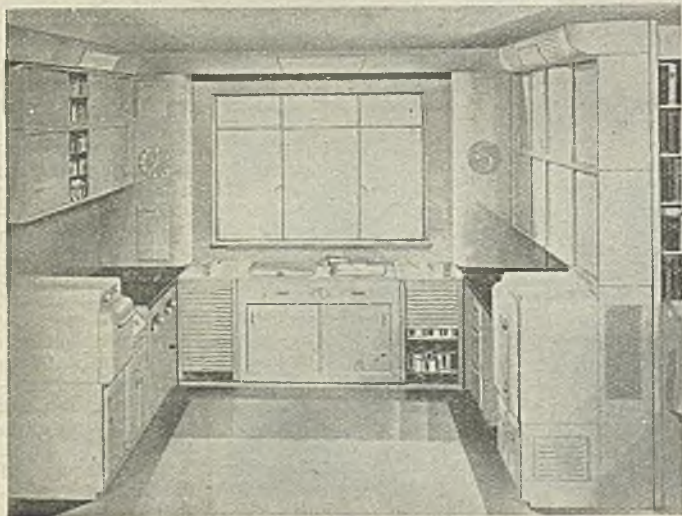
duct runs the electric wiring which provides three additional lighting points projecting downwards and situated immediately above the sink, the main work bench and the cooker. In this way an evenly distributed light is provided throughout the kitchen and all dark corners are eliminated. A comprehensive system of wall-cupboard units is provided on two sides of the room extending practically up to the ceiling.

Many of the ideas embodied in the equipment installed in this kitchen appear to conflict with present-day manufacturing practice. The difficulties of manufacturers are, however, fully recognised—difficulties mainly due to the fact that such items as cookers, washing machines, etc., have been bought hitherto by supply undertakings either for resale or rental. The hiring policy virtually limits the design of electric cookers, for instance, to "battleship construction" and this policy of designing a cooker with a ten- or even twenty-year life may produce a very strong cooker, but not necessarily a good one. This restricting influence has also been felt in other directions. As each new domestic appliance came along too often it was assessed purely on its load value and not on the service it would render to the community.

In this servantless house of the future one of the most popular features will be the automatic dishwasher, with a sink disposal unit for getting rid of waste food, etc. As both these units are not in use at the same time a single $\frac{1}{4}$ -HP motor could operate either at will by means of vee-belt drives and clutches. The indirect belt-drive is an added advantage with the waste disposal unit since, if a piece of cutlery is dropped down the orifice, no serious damage will be done to the blades

or to the motor. The hot and cold water supply to the sink, besides having a simple mixer union, has a swinging telescopic arm, thus permitting water of the desired temperature to be directed either into the dishwasher, sink or buckets, etc.

To save the meter reader many fruitless journeys the meter is mounted in the outside wall of the kitchen in such a way that he can open a small door outside the house, rotate the meter on its axis, note the reading,



View of one end of the kitchen

the ironing board and nearby is a plug socket for an iron. Alongside is a drying cupboard with an electric heating unit in its base.

Between the ceiling and the upper section of the cupboards and around three sides of the room is a simple continuous ducting system through which foul air is withdrawn by an extractor fan. One end of this ducting system is also extended into the top of the drying cupboard. Within this ventilation

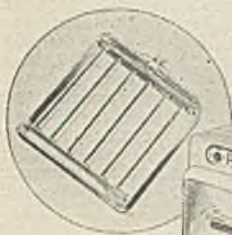
and relock the door, all without disturbing the occupant.

Many refrigerators are, for installation purposes, of awkward dimensions and shape. In this kitchen the refrigerator, however, forms an integral part of a prefabricated unit, and has the actual cold storage cupboard mounted sufficiently high off the ground to render its interior easily accessible without bending down. Below are two deep drawers, one for potatoes and

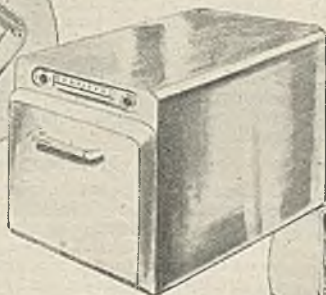
All the corners of the oven are neatly rounded, inside as well as outside. The drop-down door, by the use of concealed springs, closes at a touch without the necessity for fasteners.

The oven itself consists of an outer envelope of pressed aluminium alloy with a one-piece detachable inner lining. The heating elements, similar to those used in electric fires, are spiral wound on ceramic cores and spring mounted on their insulated metal frame for ease of replacement. The element frame is fitted with a pair of insulated prongs for insertion into the projecting socket mounted at the rear of the oven. Clipped to either side of the oven—and instantly detachable—are the pressed side frames which carry the adjustable wire racks. These side frames also incorporate the grooves supporting the heating element assembly unit. The thermostat mechanism is mounted behind with its tube projecting into the oven through the inner lining. The temperature control scale, which is illuminated, is arranged horizontally almost the full width of the oven.

Hitherto in this country the griller has always been a separate unit. By setting the horizontal element three-quarters of the way down the oven, it is possible to use it conveniently and economically for grilling as well as baking. An added convenience is



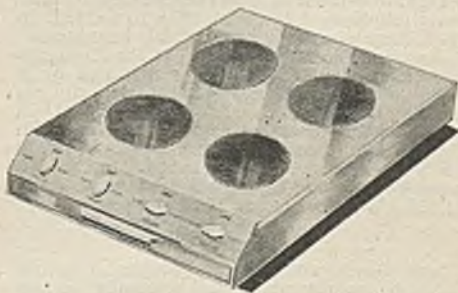
The electric cooker, showing the interior arrangement (right) and the elements (left)



the other for green vegetables. This arrangement makes it necessary to use a vertical narrow layout for the motor and compressor unit situated at the rear.

The washing machine should be readily accessible for use without time wasted in preparation. Whilst it is probable that the centrifugal type of machine may prove ultimately to be the most popular, there are still problems connected with its design to be solved. Provision, therefore, has been made in this kitchen for a washing machine with an independently motorised wringer. Twin tanks are incorporated, the wringer being conveniently mounted between them so that the housewife can pass wet clothes in either direction. A recess between the tanks houses the wringer when not in use. In the kitchen of the future the wash-day will be abolished and the housewife will use her electric washing machine as a routine matter each day and thus avoid an accumulation.

The cooker is planned as two separate units, one for boiling and the other for baking, both mounted on cupboard units to assure correct working heights. In order that all the pans may have their own individual hotplates, which can be set at just the right temperature, the boiler unit has no fewer than four separate hotplates arranged within a polished aluminium surround. The switches are grouped together on a panel in a row, set at an angle of 45 deg. in the line of sight. Neon indicator lamps reduce the chance of leaving hotplates on when not in use.



No fewer than four hotplates are provided on the separate hob unit

a duplicate socket, at the bottom of the oven, into which the heating element frame can be inserted when the whole of the oven is required for roasting or baking purposes.

After the war a wide range of small portable electrical equipment will be available. These could be permanently wired in circuit, each separately mounted on a hinged flap at the back of the work bench so as to be out of sight when not required.

Municipal Reports

Electricity Undertakings' Wartime Finances

Sunderland

THE Sunderland electricity undertaking is among those which have suffered from enemy action. Nevertheless, the war years have witnessed a considerable expansion of its activities, including an increase in the capacity of the generating plant.

Information contained in recent reports of the engineer and manager (Mr. W. A. Royle), which can now be published, shows that since 1939 sales of electricity have risen from 67,376,000 to 93,699,000 kWh, an increase of 39 per cent. Supplies for lighting have, as in most towns, decreased, and domestic consumption remains at about the same level, but power sales have greatly expanded and in the year ended March 31st last represented two-thirds of the total kWh sold.

In 1943-44, the forty-ninth year of the undertaking, revenue from the sale of electricity amounted to £365,059 (against £340,939 in the previous year), in addition to which there was other income of £32,204. Working costs were £272,219 (£247,229), the increase of £24,990 being wholly due to the cost of energy purchased, and after payment of interest charges, etc., there was a net trading surplus of £42,276 (£21,714).

The average price received per kWh sold last year was 0.937d. (0.923d.), the cost being 0.848d. (0.889d.). A table analysing average costs in recent years shows that since 1939 the figure for electricity generated and purchased has increased from 0.406d. to 0.565d., while distribution costs have fallen from 0.056d. to 0.040d., management expenses from 0.070d. to 0.057d., rent and rates from 0.072d. to 0.035d. and interest, debt redemption, etc., from 0.192d. to 0.151d. Within the past decade, total costs fell from 1.209d. in 1934 to 0.742d. in 1938, since when they have steadily increased.

An addition of 40,000 kW to the Council's generating plant in 1942-43 is indicated by a table which gives the present capacity as 66,000 kW (m.c.r.). From 39,427,000 in 1941-42 kWh generated rose to 140,413,000 in the following year (maximum demand, 41,570 kW; load factor 35.92 per cent.). In the past year 94,146,000 kWh was generated (m.d. 41,520 kW; load factor 23.82 per cent.).

Dover

The Dover undertaking occupies a special position by reason of its proximity to the enemy from 1940 until last October. Some details of the considerable damage caused by enemy shelling and bombing have recently been published. In spite of the extent to which it has suffered and the loss of a large number of consumers through evacuation, the undertaking's finances have remained sound. The accounts for the past four years which we have just received from the secretary, Mr. W. J. Broad, show that, after 1940-41, when there was a loss of £5,626, each year has closed with a balance in hand, and in the twelve months to March 31st last this amounted to £13,845, the highest for many years and considerably

more than had been anticipated. This enabled the Council to halve the 10 per cent. war addition to charges.

A statement of electricity purchased and sold submitted by the borough electrical engineer (Mr. R. G. Widgey) shows that sales last year amounted to 13,339,000 kWh. This compares with 11,118,000 kWh in 1942-43 and 8,067,000 kWh in the last pre-war year, 1938-39, and represents an increase of 65 per cent. over the latter figure. Last year's kWh sales are analysed as follows, with comparative figures for 1942-43 in parentheses: Commercial power, 4,731,000 (3,846,000); lighting, 3,149,000 (2,440,000); all-in rates, 3,036,000 (2,565,000); domestic power and heating, 2,423,000 (2,267,000) and public lighting nil.

Mountain Ash

Remarking that sales of electricity reached a new high figure in 1943-44, Mr. E. W. Jones, electrical engineer to the Mountain Ash U.D.C., says that this no doubt is attributable to the incomparable facilities of electricity for domestic purposes and the economic advantages accruing to consumers. The undertaking, which offers a lighting flat rate of only 2d. per kWh, reduced in some quarters by special concessions to a fraction of a penny, repaid its loan debt in 1933. Last year 3,326,000 kWh was sold against 2,977,000 kWh in 1942-43. Revenue from sales of electricity was £18,490 (£17,812) and there was a net profit of £4,650, although this is actually reduced to £2,283 by bulk supply charge adjustments. Consumers number 8,308.

Bethnal Green

The Bethnal Green undertaking (engineer, Mr. E. E. Jolly) serves an area which suffered badly in the London raids. From being in a position to contribute £3,500 to the rates in the year ended March 31st, 1939, the undertaking in 1942-43 (the period covered by the latest available accounts) was faced with a net deficit of £16,049. Sales of electricity within that time had decreased from 21,098,000 kWh to 16,321,000 kWh. Total average costs per kWh sold have risen from 1.487d. to 2.039d., while income has increased from 1.622d. to 1.803d. An analysis of the cost figure, with 1938-39 comparison in parentheses, is as follows: Bulk supply, 0.839d. (0.596d.); distribution, 0.224d. (0.213d.); management, 0.409d. (0.202d.); miscellaneous, 0.101d. (0.098d.); loan repayments, interest, etc., 0.466d. (0.378d.).

Nuneaton

The accounts of the Nuneaton undertaking for the past five years which we have received from the engineer, Mr. J. Lightbown, show that revenue from the sale of electricity has substantially increased during the war years, rising from £72,173 in 1939-40 to £127,926 in 1943-44. Total income last year was £130,563 and there was a net surplus of £3,087. Energy sales aggregated 26,057,000 kWh as compared with 21,805,000 kWh in the previous year.

Registration and Inspection—II

Methods Adopted in Boston and New York

THE first part of this article* described the systems of registration and inspection in force in Quebec and Ontario. In this part some United States arrangements are covered.

In Boston, Mass., inspection and registration are under the control of the Fire Department, quite a usual procedure in the United States. The department was formerly called the Fire Department Wire Division, apparently a relic of earlier days when electric wires were considered a real fire risk. It is only recently that the title has been altered to "Electrical Inspection Division." Boston prides itself on the completeness and efficiency of this Department, and appears to be justified in doing so. The Division works under the authority of several Acts of the Legislature. The opening sentence of the official notice of liability to inspection is of interest:—"Electrical contractors doing work in this city coming under the provisions of Chapter 268 of the Acts of 1898, as amended by Ch. 339 of the Acts of 1908 and by Ch. 262 of the Special Acts of 1915, must first obtain a permit from the Fire Commissioner before commencing work . . ."

The rules of procedure and the fees are set out in much simpler and more concise form than those of the Canadian provinces already described, and occupy only two pages of foolscap. The fees payable are about 3s. per permit for any work, plus a scale charge similar to, but about half the rate of those already quoted for Quebec and Ontario. The classifications are somewhat different. Thus ordinary lighting installations are charged: 7 to 10 50-W lamps or the equivalent, 4s.; 51 to 60, 16s.; 91 to 100, 24s.; each 25 over 100 50-W lamps or equivalent, 4s. Fittings: Each 25 50-W lamps in excess of 10, 2s. Service connections, any capacity, 3s. Motors: 1 HP, 4s.; 5 HP, 8s.; 10 HP, 13s.; 25 HP, £1; over 25 HP, £2.

The National Electrical Code is adopted with sundry variations, the principal ones being differences in the wiring tables, with the object of reducing the permitted current loading. Both contractors and journeymen are licensed, registered and examined. Licences from other States are not accepted. The Department conducts the examinations of candidates, in conjunction with contractors and unions. There are two grades of examination and contractors must take the higher grade.

An interesting chart was shown me which indicated the great progress in the work of

the Department since its inception and indicated clearly how the fee per installation has increased to a very great extent.

City of New York

In the great city of New York with its huge electrical installations, inspection is a very big task. Inspection and registration come under the "Bureau of Gas and Electricity" in the City's Department of Water Supply, Gas and Electricity.

Registration has been in force for 25 years and is very smoothly operated. Only contractors are registered, it being left to the joint efforts of contractors and the unions to see that qualified men are employed, but the contractor is, of course, responsible for the result. There are over 20,000 qualified electricians in the city and their

training covers four years to qualify for a "helper's" ticket—somewhat similar to the English "mate"—and two years more to become a "mechanic" or full journeyman. The contractors and unions work in conjunction with the Department to obtain the desired results and so far as I was able to ascertain, the arrangement works quite satisfactorily.

The Department has its own version of the National Electrical Code, which differs very little from the standard one. Inspection is strict and complete. There are 25 inspectors in New York City and 85 for greater New York. In the course of a visit to the headquarters of the Inspection Department I was shown the very complete filing system in force whereby every detail of every installation, including names of owners, contractors and tenants, particulars of all tests and of every fault which has been reported and the action taken, is instantaneously at hand.

Two real surprises were in store for me here, the first and greatest being when I was informed that there are no fees. It would seem that the City authorities regard inspection as of such paramount importance to the whole body of taxpayers that it becomes their duty to carry out the work for the benefit, and at the expense therefore, of the whole city. The second and more amusing surprise was being shown a book of summons forms which every inspector carries. Each is sworn in as a kind of constable to enable him to use these forms and he has power to serve them on the spot in cases of flagrant abuse of regulations. In practice, I understand, the chief inspector is first consulted, but there is no hesitation in summoning a defaulter, whether contractor or owner, for breach of the law as regards installation or

By E. Arthur Pinto,
A.M.I.E.E., M.E.I.C.

* *Electrical Review*, December 8th (p. 825).

use. Nor is there any "beating about the bush" in the wording of the notice which is served on the owner of premises when faulty work is revealed by inspection. It reads: "You are hereby notified that the Electrical Code of the City of New York has been violated at your premises . . . in the following particulars. . . . The Department directs that you forthwith cause the aforesaid defects to be corrected and report that you have done so. Failure to comply . . . etc." On the back of the form are extracts from the Code showing the powers of the commissioner, the forbidding of any work whatsoever being done without a permit first obtained, and penalties, which include fines and/or prison.

Contractors' Co-operation

A further interesting item was an exhibition of faulty wires and other apparatus found at various times by the inspectors. Little further argument is required to show the need for inspection. There is an Association of Electrical Inspectors which holds meetings to which considerable importance is attached. Many contractors are non-voting members and attend regularly, a democratic move the like of which would be welcome in English contractor-employee circles. Matters connected with examinations for contractors are discussed at these meetings. Not much appears to have been overlooked in this very efficient department.

It is hoped that enough has been said to indicate not only the implicit belief in the United States and Canada in compulsory regulations and registration, as proved by the great efforts made to perfect the schemes described. If figures prove anything, much may be learned from the fact that in Ontario the number of inspections is about 1.8 per permit or nearly two inspections per installation or job and this is in an area where it is known that all work will be inspected.

A British Contrast

Coming nearer home, the last annual report of the N.R.E.I.C. stated that 114 out of 137 inspections disclosed faults. When it is remembered that these inspections were of jobs done by contractors who had, apparently, so much faith in their work that they *voluntarily* subjected themselves to the liability for inspection, the urgency becomes even more emphatic. Incidentally a comparison of the figures for Quebec of 70,000 or more inspections by 85 inspectors, and a population of only 3½ millions with the figures for England of 137 inspections by one man and a population of some 47 millions is a rather pathetic sidelight on the futility of the voluntary system. Fears of a "closed shop" should not be justified if a fair and impartial scheme were adopted and disinterested public opinion, if expressed at all, would never indicate anything other than approval.

There are two aspects of the financial side of the matter. The *pro bono publico* attitude of New York is the ideal to be aimed at and I see no reason other than prejudice against its adoption in England. It is fair. If, however, the Government should be unwilling to adopt a State-supported service, we would be faced with an outcry from contractors that their businesses would be ruined by the fees. The fact that in spite of the heavy fees the amount collected in the five pre-war years in Ontario rose from £38,000 to £65,000, is clear proof that such fears are groundless. Moreover, in spite of the heavy fees electricity has in many respects, though not in all, made more rapid progress across the Atlantic than in England without any fees.

My thanks are due to the officials of the inspection authorities in the various areas dealt with in this article for the ready manner in which they have placed a mass of information at my disposal and for the trouble taken to give me a true picture of the work in their respective areas; also for having provided me with numerous interesting forms as used by them. It is regretted that limitation of space prevents the reproduction of a number of these. Special thanks for their help are due to Mr. J. N. Mochon, Director and Chief Examiner, Board of Electrical Examiners, Quebec; Mr. A. G. Hall, Chief Electrical Inspector, Hydro-Electric Commission of Ontario; Miss O'Brien, who has been for twenty years with the Fire Department of the City of Boston; and Mr. Dan Greene, Chief Inspector of the Borough of Manhattan, New York.

Discharge Lighting

SOME idea why it is often difficult to separate illuminating engineering from physics is afforded by a paper presented by Mr. M. W. HIME (Scottish Lighting Service Bureau) before the Institution of Engineers and Shipbuilders in Scotland.

The paper commences with an explanation of the manner in which molecules of a conducting vapour receive energy by electron bombardment collision, it being borne in mind that the quanta of energy of an atom can be increased only by some external means, hence the addition of the fluorescent jackets to discharge lamps. The reason why such sources produce line spectra rather than bands of continuous incandescence is that the excited particles of conducting vapour generate light in discrete quanta (gushes) the wavelength depending upon the fall of potential that occurs as the atoms give up their energy in changing from an excited to a lower state.

Data of the various sizes of fluorescent lamps that have successively become available as well as about fluorescent chemicals are included in the paper, the second portion of which is concerned with the advantages to be derived from the industrial use of this type of lamp. Minimum mounting heights for various sizes of lamps and recommended values of illumination for different tasks are tabulated.

Patent Extensions

Necessity for Disclosing Foreign Profits

TO provide more equitably for extensions of patent term due to war loss, Sub-section 6 of Section 18 was incorporated in the Patent Act of 1919. Under Sub-section 6 a patentee was enabled to apply for an extension of patent term on the sole basis of loss or damage due to hostilities. Previously such action could not have been taken. By the amending Patent Act of 1942, the total extension under this sub-section was limited to ten years.

Early in the war, in the hearing relating to the Firmosec patent, the Court stated that it was incumbent on patentees applying under Section 18 (6) to make a full disclosure of profits from corresponding foreign patents. The same Court now states that no extension can be granted where, through no fault of his own, an applicant from abroad is precluded by foreign law from furnishing the required information as to foreign profits.

Let us now see how this judgment has come about. Mr. Hans Gustav Albert von Kantzow, the patentee, a Swedish national, and Aktiebolaget Kanthal, a Swedish Corporation holding a beneficial interest under British Patent No. 298408, applied for an extension of term under Section 18 (6) of the Patent Acts.

Exclusive Selling Agreements

Fire resistant alloys with high electric resistance formed the subject matter of the patent. The alloys were of advantage in the manufacture of small wires or strips forming electrical heating elements for use in domestic appliances and other apparatus. Consequently the alloy constitutes the raw material from which may be fabricated articles of potential importance in British industry. Manufacture of the alloy was concentrated in Sweden for economic reasons. Sale was developed abroad by means of exclusive selling agreements.

Hall & Pickles, Ltd., of Manchester, were in effect constituted the sole selling agents for the Swedish company for Great Britain, Northern Ireland and Eire. They agreed not to sell the patented material outside this area (subject to exception of products containing the alloy not exceeding 10 per cent. of the total weight). There were certain conditions as to payment for or return of the material delivered by Kanthal. During the period 1936-1943 sales of the patented alloy in the United Kingdom amounted in tons respectively to about 11, 18, 19, 12, 5, 2, 0.3 and 0.

It was stated that the Swedish company was always willing to grant manufacturing

rights in the various countries if this could be undertaken economically, and that in Germany in 1936 they were forced to grant a manufacturing licence to Deutsche Edelstahlwerke A.G., whilst in the United States in 1941 negotiations were commenced with the Federal Government for the acquisition of the manufacturing rights in America. As regards the German company, only small

quantities of the alloy had been manufactured under the licence so far as was ascertainable, and manufacture had now ceased. In America the negotiations were broken off.

During the war the Swedish company had made increased profits. In countries such as Germany, Turkey and Bulgaria, it had retained business. Markets had been lost in allied countries.

Although in 1941 and 1942 the company was first assessed for war taxes, these assessments were subsequently set aside by the Royal Inland Revenue Board on the ground that they were not due to the war. Under Swedish wartime legislation the company was precluded from supplying information with regard to the sales of the patented alloys in different countries. The applicants' contention was that the company's non-liability to the Swedish wartime tax was evidence that the said increased profits did not result from the war.

The Court was satisfied that the sale of the patented article was substantially interfered with by the outbreak and continuance of the war. However, it was of the opinion that very unsatisfactory features remained in the inability of the Swedish company to put before the Court any relevant particulars concerning profits since the war and in the reliance of the company upon the fact that it had not been liable to special assessments in Sweden on account of war profits.

Expiry of Swedish Patent

Referring to the fact that the exploitation of the patent in the United Kingdom had taken place through exclusive selling agents, the Court further noted that the corresponding letters patent had expired in Sweden where the material was manufactured. The first of these facts, said the Court, was not necessarily fatal when the application was under Section 18 (6), where the extension was really in the nature of a substitution, following the decision in an earlier case. Another earlier decision had stated that in such extension cases British industry should not be placed at a disadvantage in competition with the country where the invention had originated

and been manufactured. Public interest must be balanced against the provision of proper reward for the inventor.

When the application is under Sub-section 6, the extended term may be referred to as a substitutional term, but it may have quite a different effect upon the public interest, if the original would, but the new term would not, be co-terminous with foreign patents.

This may be particularly the case where the patent has been developed and manufactured abroad and has in this country been exploited only by a selling agency. Giving some weight to these facts, but much greater weight to the fact that through no fault of their own the applicants were unable to give the Court essential information, the Court refused the application for an extension.

U.S. Exports to Latin America

Substantial Decline in 1942

INTEREST in the Latin American countries as post-war markets for manufactured and semi-manufactured goods is very real. During the past few years most of them have accumulated dollar and sterling balances which will be available to purchase imported goods when such can be freely obtained. The attention of American exporters has from time to time been drawn by the Washington authorities to these possibilities and the latest reminder is a brochure showing the values of the principal groups of United States exports sent to Latin America.

From this the electrical items for 1942 have been extracted and are shown in the accompanying statement. Notes of increases or decreases compared with 1941 have been added. It will be seen that as a whole trade declined substantially although with certain special markets, notably Mexico and Brazil, there were occasional increases. The grand total of electrical machinery and apparatus exported to Latin America in 1942 was \$32,740,000 against \$51,540,000 in 1941, with Brazil taking more than a quarter and Mexico about one fifth.

Class and Destination	1942 (\$000)	Inc. or dec. on 1941 (\$000)	Class and Destination	1942 (\$000)	Inc. or dec. on 1941 (\$000)
<i>Generators</i>	1,110	— 420	<i>Parts for electrical refrigerators</i>	460	— 670
To Mexico	230	+ 40	To Brazil	102	— 178
„ Colombia	140	+ 55	„ Argentina	150	— 150
„ Brazil	487	+ 1	<i>Electric fans</i>	114	— 218
<i>Welding sets</i>	245	— 195	To Brazil	27	— 84
To Mexico	27	— 69	„ Argentina	22	— 2
„ Chile	23	— 4	<i>Electric lamps</i>	1,550	— 380
„ Brazil	57	— 68	To Mexico	165	— 35
„ Argentina	80	+ 1	„ Colombia	133	— 117
<i>Self-contained lighting outfits and generator sets</i>	860	— 190	„ Venezuela	170	— 10
To Mexico	206	— 74	„ Chile	190	— 27
„ Venezuela	112	— 18	„ Brazil	120	— 50
„ Brazil	200	— 10	„ Argentina	110	— 74
<i>Storage batteries, 6 and 12 V.</i>	496	— 474	<i>Searchlights, airport beacons and floodlights</i>	144	— 663
To Mexico	45	— 51	To Brazil	109	— 632
„ Colombia	60	— 90	<i>Household washing machines and vacuum cleaners and parts</i>	307	— 403
„ Venezuela	65	— 95	To Mexico	149	— 135
„ Chile	70	— 102	„ Venezuela	38	— 30
<i>Other storage batteries</i>	210	— 395	<i>X-ray and other therapeutic apparatus and parts</i>	694	— 496
To Mexico	44	— 5	To Mexico	174	— 82
„ Chile	53	— 379	„ Brazil	115	— 66
„ Brazil	38	+ 19	„ Argentina	62	— 121
<i>Flashlight and other dry multiple cell batteries</i>	483	— 733	<i>Radio apparatus</i>	10,360	— 2,430
To Mexico	41	— 24	To Mexico	2,370	— 560
„ Colombia	61	— 304	„ Brazil	2,930	— 60
„ Venezuela	81	— 243	„ Argentina	980	— 550
„ Brazil	54	— 59	„ Chile	880	— 440
<i>Transforming or converting ap- paratus</i>	2,270	— 190	<i>Telephone apparatus</i>	1,630	+ 336
To Mexico	483	— 162	To Brazil	925	+ 545
„ Venezuela	142	— 12	„ Argentina	150	— 100
„ Chile	456	+ 44	„ Venezuela	108	+ 7
„ Brazil	771	+ 363	<i>Electrical interior lighting fix- tures and parts</i>	1,137	— 479
<i>Transmission and distribution apparatus</i>	2,114	— 368	To Mexico	342	— 278
To Mexico	350	— 146	„ Venezuela	106	— 20
„ Chile	230	— 50	„ Chile	110	+ 43
„ Brazil	872	+ 249	„ Brazil	104	+ 3
<i>Motors, starters and controllers</i>	2,340	— 950	„ Argentina	123	+ 30
To Mexico	452	— 248	<i>Copper wire insulated</i>	2,076	— 1,034
„ Chile	341	— 139	To Mexico	495	+ 102
„ Brazil	508	— 362	„ Venezuela	147	— 163
„ Argentina	257	— 93	„ Peru	144	+ 45
<i>Electrical refrigerators</i>	1,556	— 5,074	„ Chile	280	— 92
To Mexico	376	— 1,319	„ Brazil	274	+ 64
„ Venezuela	160	— 415	„ Argentina	292	— 392
„ Brazil	356	— 1,644			

ELECTRICITY SUPPLY

Glasgow Power Station Site. Turbine Blading Repairs.

Barrow-in-Furness.—**RURAL SUPPLIES.**—The Electricity Committee is to provide a supply to nine cottages at Swarthmoor; Tarn House, Arrad Foot; Swarthedale House, Trinkeld; Rock Cottage, Finsthwaite; and premises at Hawkhead.

Cardiff.—**WAR PERIOD EXTENSIONS.**—During the war the Corporation's Roath power station has been extended by the addition of two 30,000-kW turbo-alternators and four high-pressure boilers. This information is given in the annual reports of the city electrical engineer and manager (Mr. E. Jones) for the past four years which were adopted at last week's meeting of the Electricity Committee. Congratulations were extended to the engineer and his staff, and the chairman (Alderman A. E. Gough) remarked that the undertaking had "increased in every way except in charges to the consumer."

Chester.—**FARM SUPPLIES.**—The Electricity Distribution of North Wales and District, Ltd., proposes to extend its line to supply farms at Somerford.

Glasgow.—**SITE NEGOTIATIONS.**—A letter from the Clyde Navigation Trust regarding the proposed site for a power station at Braehead (in the burgh of Renfrew west of King George V Dock) was submitted to the Electricity Committee recently. It showed the area, extending to 16.16 acres, which the Trustees were prepared to lease to the Corporation and set out conditions regarding circulating water culverts, construction of the portion of the quay wall, and the continuance of the surface water outfall drains. The Electricity Committee decided to express strong dissatisfaction with the proposals of the Trustees, particularly with reference to the liability of the Corporation for the construction of the portion of the quay wall *ex adverso* the site of the new station.

Hove.—**YEAR'S PROFIT.**—At the last meeting of the Town Council the chairman of the Electricity Committee (Councillor D. J. Gadsby) reported that there had been a profit of £8,683 on the past year's operations of the electricity undertaking. He said that the Committee would like to halve the 20 per cent. war addition to charges, but in view of the heavy expenses that would be incurred in changing over from DC to AC it was considered necessary to carry the surplus to the conversion fund.

Lancaster.—**SUPPLY TO MILLS.**—The Corporation has received sanction to borrow £2,300 to supply electricity to Low Mill, Caton.

London.—**REPAIRS TO TURBINE BLADING.**—The chief electrical engineer and manager of St. Pancras (Mr. R. Lee) recently reported that a 15,000-kW Brush Ljungström turbine at the power station was out of commission owing to the failure of the blading, which had been forwarded to the maker for repairs. The Brush Electrical Engineering Co., Ltd., has now reported that, following investigation of some recent blade failures, improvements have been made in material and manufacturing procedure, and the company advises that the opportunity should be taken while the repairs are being

carried out to replace 16 rings in the outer radial flow blading by rings of modern design and construction, at a cost of £4,612. The Electricity and Public Lighting Committee, with the concurrence of the C.E.B., has agreed to this.

PROPOSED NEW SUBSTATION.—In July last year the St. Pancras Borough Council approved the lease of a site for a new substation (Holly Lodge). It is now proposed to carry out the work at an estimated cost of £12,870.

Portsmouth.—**CONVERSION OF LIGHTING.**—The Urban District Council has decided to convert all the street lighting in its area to electricity. A proposal to carry out this work was in hand at the outbreak of war and a contract had been prepared. The Brighton firm concerned is now being asked to submit a revised tender.

Rothsay.—**CONTROL OF UNDERTAKING.**—The North of Scotland Hydro-Electric Board is negotiating with the Town Council with a view to taking over the burgh's electricity undertaking. At the last meeting of the Council it was reported that if the Board took over the undertaking the charges to consumers would be practically halved, the maximum rate being 5d. (as against 10d. at present) and the minimum 1d. (against 1½d.). The alternative would be for the burgh to purchase electricity from the Board in bulk and distribute it. The Board, stated the report, expected its Loch Striven scheme to be in operation in about two years.

Rugby.—**OVERHEAD LINE.**—The Leicester & Warwickshire Electric Power Co. has obtained permission from the Rural District Council to erect an overhead line from Willey to Muswell Leys and Newnham Fields.

Stockton-on-Tees.—**SUBSTATION RECONSTRUCTION.**—The borough electrical engineer (Mr. S. G. Marston) is to prepare plans for the reconstruction of West Road substation at a cost of £13,200 and Outram Street substation at £6,000, including equipment. It is hoped to obtain tenders for the work shortly.

Warwickshire.—**ELECTRICITY FOR SMALL HOLDINGS.**—The County War Agricultural Committee has approved a scheme for electrifying small holdings at Cherrington and Tysoe.

Overseas

New Zealand.—**DIFFICULT YEAR.**—The general manager of the Wellington Electricity Department (Mr. L. B. Hutton) describes the past year's operations as exacting, the undertaking being required to "make a greater number of bricks with a smaller ration of straw." Restrictions were in force and the Council, in common with other North Island electricity authorities, was put on a ration. It was, however, unable to keep within its allowance, due largely to heavy demands by Service camps, etc. Sales rose by 10.3 million to 145.3 million kWh, with an increase in domestic supplies from 77.8 million to 82.7 million kWh. This year the Council is rationed to a 3 per cent. increase. Revenue rose from £464,479 in 1942-43 to £498,689 last year, the net profit increasing from £9,313 to £42,535.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The General Electric Co., Ltd.—The increase of the capital of the company to £11,600,000 by the creation of 2,000,000 4½ per cent. "C" cumulative preference shares of £1 each was unanimously approved at an extraordinary general meeting held on Thursday last week. Explaining the need for the new capital, Sir Harry Railing, the chairman and managing director, said that just before the war steps were being taken to increase the capital to finance the company's expanding business at home and abroad. The outbreak of war prevented the completion of these arrangements and instead a five-year loan of £2,000,000 was negotiated with the Prudential Assurance Co. The term of this loan expired on December 1st and the directors had decided, as the capital was permanently needed, to replace it by £2,000,000 of new capital.

To keep itself in the forefront as regards the demands for electrical capital plant and consumer apparatus both at home and abroad, as well as in regard to research and development, the company must have sufficient permanent capital resources available for these purposes. It was in the stockholders', the consumers' and the nation's interest that there should be comprehensive units like the G.E.C. covering the whole field of electricity.

The directors, having regard to the capital structure of the company, the present financial regulations and future possible capital requirements, came to the conclusion that the new capital should be issued in the form of "C" preference shares. On the date of their application to the Committee on Capital Issues, their "A" preference stock showed a yield of 3.88 per cent. and the "B" preference stock 4.05 per cent. It was obvious that the "C" preference stock, ranking behind these two classes, had to be offered at a slightly higher rate of interest, i.e., at 4½ per cent. It had always been the policy to give stockholders preference in the allotment, but as an offer to them would have created a broad and active market in a new security (which was contrary to the policy of the authorities who wished to see the available funds of individuals invested in Government securities, and whose consent, of course, was vital) they had reluctantly decided to place the new stock privately.

The Sun Electrical Co., Ltd., reports a net profit of £17,857 for the year ended April 30th last (against £18,719 for 1942-43). As already reported, the ordinary dividend is unchanged at 2½ per cent. The report says that Government restrictions have continued to affect results but expenses have been reduced. In the first half of the current year there was an increased turnover.

Joseph Lucas, Ltd.—Speaking at the annual general meeting last week, the chairman, Sir Peter F. Bennett, said that the production efficiency of each of the company's factories had reached its highest level. To maintain this they must acquire or erect new buildings with the minimum of delay as soon as the war came

to an end. Much new plant had been already purchased from the Ministries for which the company worked, but some thousands of pounds' worth of special plant would be required to replace pre-war plant which was now worn out. Orders had been, or would be, placed for this as soon as war circumstances permitted. This essential expenditure on buildings and plant would make considerable inroads into their liquid resources.

Sydney S. Bird & Sons, Ltd., held their annual general meeting last week. In a statement by the chairman, Sir Ian Stewart Richardson, which was circulated with the report and accounts, it was pointed out that it was again difficult to make any useful or accurate forecast regarding the general outlook. The company was still to a great extent engaged on Government work and it was fortunate that this was similar to the normal peace-time business, so that change-over from wartime to peacetime production, which must come in the near future, should be possible with the minimum of dislocation.

Marco Refrigerators, Ltd.—Mr. A. E. Leach, presiding at the annual general meeting on December 20th in the absence of Mr. R. A. Fulford (chairman) owing to illness, stated that the production of refrigerators had continued to develop, and the company would be in an excellent position to participate substantially in the anticipated rapid post-war expansion of the refrigeration industry. Given release from restrictions, a clear-cut Government policy regarding the fulfilment of home civilian needs and the opening up of export markets, old and new, the company would be enabled to reap ample benefits as a result of the development phase through which it had passed in the years preceding the war.

Tube Investments, Ltd.—The subscription of £50,000 towards the cost of a new Mechanical and Electrical Engineering Department at the Birmingham University was mentioned at the annual general meeting on December 15th by Mr. I. A. R. Stedeford, the chairman and managing director, who also announced the endowment of three scholarships. He made brief reference to the company's electrical division and its range of "Simplex" and "Creda" products and "Mersey" cable.

Electric Furnace Co., Ltd.—Mr. D. F. Campbell (chairman) presided at the annual meeting and stressed the point made in the company's report (*Electrical Review*, December 22nd) that the war had accelerated progress in new forms of electric heating which would have important applications in peacetime.

Geo. Kent, Ltd., are maintaining their interim dividend at 3 per cent.

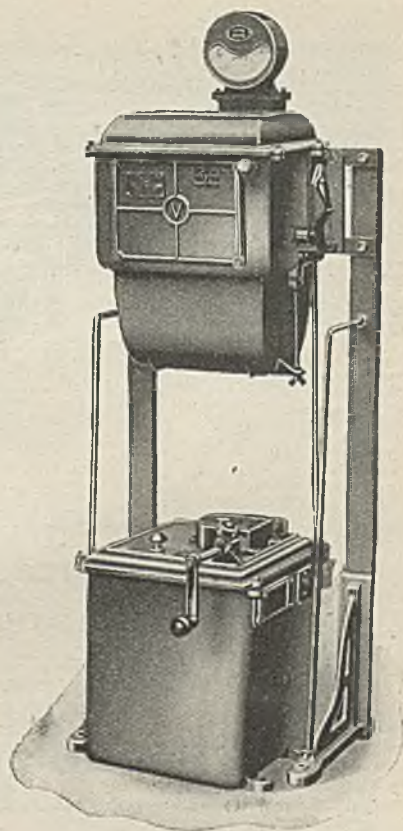
Telephone Rentals, Ltd., is again paying an interim dividend of 4 per cent.

Greenwood & Batley, Ltd., are maintaining their interim dividend at 5 per cent.

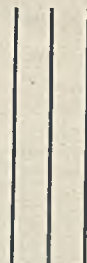
The Philco Radio & Television Cpn., Ltd.—As the accounts for the year ended March 31st have been delayed pending the settlement with



*for
control
of
slip-ring
motors*

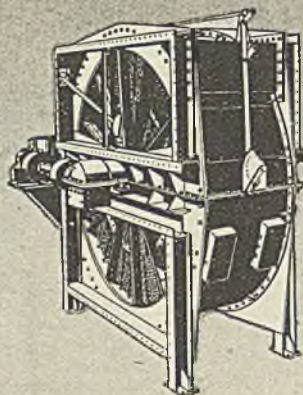


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smallest industrial installation.*

HOWDEN

James Howden & Company (Land) Ltd.
195, Scotland Street, Glasgow, C.5, and
101-103, Baker Street, London, W.1.

Government Departments of certain outstanding prices, the annual general meeting held yesterday was adjourned to a date to be fixed later.

The General Cable Mfg. Co., Ltd., is paying a final dividend of 9 per cent., making 15 per cent. (same) for the year.

New Companies

Portogram Radio Electrical Industries, Ltd.—Private company. Registered December 5th. Capital, £2,000. Objects: To acquire the business of the "Portogram Radio Manufacturing Co.", 69, Streatham Hill, S.W.2., and to carry on the business of manufacturers of, and dealers in, radio, television and electrical apparatus, etc. Directors: H. F. Bowers, Flat 4, 69, Streatham Hill, S.W.2. S. Bowers, Kenilworth, Park Road, Waterloo Park, Liverpool, and Ivy E. Jarvis, 175, Gleneldon Road, S.W.16. Registered office: 166, Streatham Hill, S.W.2.

Collectric (1944), Ltd.—Private company. Registered December 16th. Capital, £1,000. Objects: To acquire the business of an electrician and wireless engineer and dealer carried on by H. R. Collis at 1, London Road, Knebworth. Directors: H. H. Humphries, The Hermitage, Welwyn, and H. H. Collis, 1, London Road, Knebworth, Herts. Registered office: 1, London Road, Knebworth.

Stephen W. Glaser, Ltd.—Private company. Registered December 12th. Capital, £1,000. Objects: To carry on the business of power transmission engineers, mechanical and electrical engineers, etc. Directors: S. W. Glaser, 5, Manor Court; B. W. Inglis, 7, Manor Court, both Twickenham. Registered office: 5, Manor Court, Twickenham.

Fulec, Ltd.—Private company. Registered December 6th. Capital, £500. Objects: To carry on the business of manufacturers of, and dealers in, electrical and wireless goods, etc. Directors: C. F. G. Hunt, 89, Lebanon Road, and A. L. Michael, 76, Orchard Avenue, both Croydon. Secretary: J. Pateman. Registered Office: 179, High Street, Bromley, Kent.

Companies to be Struck off the Register

The following companies will be struck off the Register at the expiration of three months from December 15th, unless cause is shown to the contrary:—Ismay Zeros, Ltd.; Radiometers, Ltd.; and Radio Winton & Television, Ltd.

Company Struck off the Register

The following company was struck off the Register on December 15th and is thereby dissolved:—Shepherds Bush Radio Stores, Ltd.

Companies' Returns Statements of Capital

Lamp Caps, Ltd.—Capital, £50,000 in £1 shares. Return dated June 29th, filed July 5th. All shares taken up. £50,000 paid. Mortgages and charges: Nil.

Anglo-American Telegraph Co., Ltd.—Capital, £7,000,000 in £185,980 ordinary stock, £3,407,010 preferred ordinary stock and

£3,407,010 deferred ordinary stock. Return dated June 8th. All stock taken up. £600,000 paid. £6,400,000 considered as paid. Mortgages and charges: Nil.

Shoreham & District Electric Lighting & Power Co., Ltd.—Capital, £200,000 in £1 shares (all ordinary). Return dated July 12th. 140,000 shares taken up. £133,500 paid. £6,500 considered as paid. Mortgages and charges: Nil.

British Mica Co., Ltd.—Capital, £5,000 in £1 shares (2,000 preference and 3,000 ordinary). Return dated June 23rd. 885 preference and 2,194 ordinary shares taken up. £1,079 paid. £2,000 considered as paid. Mortgages and charges: £2,300.

Electrical Engineers, Ltd.—Capital, £2,500 in £1 shares. Return dated June 7th. 2,000 shares taken up. £700 paid. £1,300 considered as paid. Mortgages and charges: Nil.

Marconi Sounding Device Co., Ltd.—Capital, £75,000 in £1 shares. Return dated June 5th. All shares taken up. £75,000 paid. Mortgages and charges: Nil.

Increases of Capital

New Insulation Co., Ltd.—The nominal capital has been increased by the addition of £30,500 beyond the registered capital of £21,000. The additional capital is divided into 30,000 preferred ordinary shares of £1 each and 4,000 ordinary shares of 2s. 6d. each.

J. G. Sneath, Ltd.—The nominal capital has been increased by the addition of £3,000 in £1 ordinary shares beyond the registered capital of £3,000.

Wego Condenser Co., Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £5,000.

Liquidations

T. C. Gilbert & Co., Ltd.—Meetings to-day (Friday) at New Chambers, 4, West Cliff Gardens, Folkestone, pursuant to Section 244 of the Companies Act, 1929.

Bankruptcies

R. Jackson, electrician, lately carrying on business at 38, Whalley Range, Blackburn.—First and final dividend of 3s. 6d. in the £ payable on January 5th at the Official Receiver's Office, 16, Cornwallis Street, Barrow-in-Furness.

B. J. Wainwright, electrician, lately carrying on business as The Wells Road Garage, 197-202, Wells Road, Shepherd's Bush, W.12, and as Wainwright Neon Displays, 197, Wells Road, Shepherd's Bush, W.12, and previously at 14, St. Thomas' Road, Harlesden, N.W.10.—Order for discharge suspended for six months until May 14th, 1945.

L. R. Williams, electrical contractor, carrying on business at 1a, Angel Street, Bridgend.—Supplemental dividend of 5d. in the £ payable on December 29th at the Official Receiver's Offices, Government Buildings, 10, St. Mary's Square, Swansea.

E. W. Pearson, electrician, carrying on business at 59, Bedford Road, Southport.—Last day for receiving proofs for dividend January 2nd. Trustee, Mr. A. Barrett, Hunter Street (Friends' Meeting House), Liverpool, 3.

STOCKS AND SHARES

WEDNESDAY EVENING.

THE record of Stock Exchange business and prices during 1944 has been one of satisfactory volume in the first case and of steady appreciation in the other. Throughout the twelve months the Government has steadfastly adhered to its policy of cheap money, and has emphasised, on various occasions, the intention to keep down money rates. In the autumn, the Chancellor of the Exchequer announced a new issue of Treasury Bonds, bearing no more than $1\frac{1}{2}$ per cent. interest, this being the lowest rate of interest, as Sir John Anderson pointed out, which had been offered by the British Government for many years.

Cheap Money Effect

The effect of this cheap money policy is manifest in prices not only of gilt-edged securities, but of ordinary shares, as well as preference, in good class industrials. In fact, the demand for the latter, which has raised prices to an unusually high level, has scarcely wavered throughout the year, although a slight reaction occurred when war news seemed to disappoint expectations or, on the other hand, when the effect of "Salute the Soldier" weeks became evident in the falling-off of business in Stock Exchange markets.

The year ends with the prices of gilt-edged stocks standing on a high plane. London Passenger Transport, 5 per cent. "B" stock for example, quoted at 112½ at the beginning of the year, is now 10 points higher and the Board's "C" stock has risen from 65 to the present 69.

Manufacturing and Equipment

It is, perhaps, the group of ordinary shares in the manufacturing and equipment companies connected with the electrical industry to which most of the public interest is directed. During the whole of 1944, prices went ahead, with seldom a break. The year finishes with marked strength in this department, due, in a measure, to the decision of the Central Electricity Board to spend £90,000,000 over a period of three years in the extension of the grid. This in itself was taken to ensure profitable employment in the equipment branch for several years after the war. Moreover, it is known that other ambitious electrification schemes are in contemplation and will, in all probability, be started as soon as opportunity presents itself.

Bearing these facts in mind, investors are content to disregard, for the time being, the yields afforded by present dividends. The consequence is, of course, that the income derivable from purchases of the shares is modest. Here is one list of shares in this

group. It will be noticed that the price movement on the year is in every case favourable to previous holders of the shares:—

Ordinary shares	Dec. 31st. 1943	Now	Rise
	s. d.	s. d.	s. d.
Assoc. Elec. Ind.	49 0	61 0	12 0
British Insulated	107 6	115 0	7 6
Callender's	99 0	115 0	16 0
Crompton Parkinson (5s.)	27 0	33 6	6 6
English Electric	47 6	55 6	8 0
Ever Ready (5s.)	38 6	42 0	3 6
General Electric	88 6	98 0	9 6
Henry's (5s.)	25 0	27 6	2 6
Johnson & Phillips	66 6	79 0	12 6

Electricity Supply Shares

Attention has been drawn many times to the steadiness of prices in the list of Home electricity supply companies. In the absence of annual reports and accounts which, for security reasons, were not allowed to be published, it might have been supposed that investment would adopt a somewhat cautious tone, and await the time when detailed information could be given, before making further purchases of shares in this department. In point of fact, the investment of money in the shares of electricity supply companies has gone on without intermission throughout the whole year.

The Treasury has announced that the ban placed upon publication of accounts, may be relaxed to some extent. It is, therefore, expected that when the reports appear next spring, they will give more information than has been available during the war years. How steady prices have kept, and how the general tendency has been upwards, this table demonstrates:—

Ordinary shares	Dec. 31st. 1943	Now	Rise
	s. d.	s. d.	s. d.
Bournemouth & Poole	61 6	62 6	1 0
Clyde Valley	41 0	42 0	1 0
Edmundsons	28 6	31 0	2 6
Elec. Dis. Yorks.	44 0	45 6	1 6
Lancs. Light & Power	34 6	37 0	2 6
Midland Counties	39 0	41 6	2 6
Midland Elec. Power	42 6	44 0	1 6
North Eastern	32 6	34 6	2 0
Northampton	48 0	50 0	2 0
Scottish Power	38 6	40 6	2 0
Yorkshire Elec.	42 6	43 0	0 6

London Companies

Shares in the group of London companies are subject to factors of which some are peculiar to themselves. Air raids in the early part of the year, followed by flying bomb and rocket attacks, gave rise to some doubt in the minds of shareholders as to whether their interests were likely to be effected by enemy action. People who sold their shares—and there were a few such timid souls—probably regretted their decision afterwards, for prices recovered, and fairly soon, from the touch of

(Concluded on page 942)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend		Middle Price Dec. 27	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Dec. 27	Rise or Fall	Yield p.c.
	Pre- vious	Last					Pre- vious	Last			
Home Electricity Ordinary						Equipment and Manufacturing					
Bournemouth and Poole	12½	12½	62/6	..	£ s. d. 4 0 0	Aron Elec. Ord.	15	15	61/-	..	£ s. d. 4 18 4
British Power and Light	7	7	33/-	..	3 4 10	Assoc. Brit. Eng.	6	7	57/6	..	2 8 9
City of London ..	7	6½	30/-	..	3 13 4	Assoc. Elec. :					
Clyde Valley ..	8	8	42/-	..	3 16 0	Ord.	10	10	57/6	..	3 9 5
County of London ..	8	8	43/-	..	3 14 5	Pref.	8	8	39/6xd	..	4 1 1
Edmundsons ..	6	6	31/-	..	3 17 5	Automatic Tel. & El.	12½	12½	67/6	-6d.	3 14 0
Elec. Dis. Yorkshire	9	9	45/6	..	3 19 6	Babcock & Wilcox	11	11	53/-	..	4 3 0
Elec. Fin. and Se- curities	12½	13½	60/6	..	4 9 0	British Aluminium	10	10	46/-	..	4 7 0
Elec. Supply Cor- poration	10	10	50/6	..	3 18 6	British Insul. Ord.	20	20	5½	..	3 9 0
Lancs. Light and Power	7½	7½	37/-	..	4 1 1	British Thermostat (5/-)	18½	18½	21/3	-½	4 7 0
Llanelli Elec. ..	6	6	26/6	..	4 10 7	British Vac. Cleaner (5/-)	30	30	32/6	..	4 12 3
Lond. Assoc. Electric	3	4	26/-	..	3 1 6	Brush Ord. (5/-)	8	9	11/-	..	4 1 9
London Electric	6	6	30/6	..	3 18 8	Burco (5/-) ..	15	15	16/6	..	4 11 0
Metropolitan E.S.	8	8	43/-	..	3 14 5	Callender's ..	15	20	5½	..	3 9 0
Midland Counties	8	8	41/6	..	3 17 0	Chloride Elec. Storage	15	15	85/-	..	3 10 7
Mid. Elec. Power	9	9	44/-	..	4 1 10	Christy Bros. ..	12½	17½	77/6	..	4 10 4
Newcastle Elec.	7	7	32/-	..	4 7 6	Cole, E. K. (5/-)	10	15	37/6	..	2 0 0
North Eastern Elec.	7	7	34/6	..	4 1 2	Consolidated Signal	24	27½	6½	..	4 1 6
Northampton ..	10	10	50/-	..	4 0 0	Cossor, A. C. (5/-)	7½	10*	32/6	++	1 10 9
Northmet Power	7	7	41/-	..	3 8 4	Crabtree (10/-)	17½	17½	43/-	..	3 19 7
Richmond Elec.	6	6	26/-	..	4 12 4	Crompton Parkinson Ord. (5/-) ..	20	22½	33/6	..	3 7 3
Scottish Power ..	8	8	40/6	..	3 19 0	De La Rue ..	35	40	9½	++	4 2 1
Southern Areas	5	5	23/-	..	4 7 0	E.M.I. (10/-)	6	8	35/6	..	2 5 1
South London ..	7	7	30/-	..	4 13 4	Elec. Construction	10	12½	61/3	++	4 1 8
West Devon ..	5	5	24/-	..	4 3 4	Enfield Cable Ord.	12½	12½	64/-	..	3 18 2
West Glos. ..	4½	3½	25/-	..	2 16 0	English Electric	10	10	55/6	..	3 12 2
Yorkshire Elec...	8	8	43/-	..	3 14 5	Ensign Lamps (5/-)	25	15	21/3	..	3 10 8
Public Boards						Ericsson Tel. (5/-)	22*	20*	53/9	..	1 17 8
Central Electricity :						Ever Ready (5/-)	40	40	42/-	..	4 15 3
1955-75	5	5	115	..	4 7 0	Falk Stadthmann	7½	7½	34/6	..	4 7 0
1951-73	4½	4½	106	..	4 5 0	Ferranti Pref. ..	7	7	31/9	..	4 8 2
1963-93	3½	3½	104	..	3 7 4	G.E.C. :					
1974-94	2½	3½	100½	..	3 4 8	Pref.	6½	6½	33/3	..	3 18 4
London Elec. Trans.	2½	2½	98½	..	2 10 9	Ord.	17½	17½	98/-	..	3 11 6
London & Home Counties 1955-75	4½	4½	112	..	4 0 4	General Cable (5/-)	15	15	17/-	..	4 8 3
Lond. Pass. Trans. Bd.						Greenwood & Batley	15	15	48/9	..	6 3 0
A	4½	4½	121½	..	3 14 1	Hall Telephone (10/-)	12½	12½	31/6	..	3 19 4
B	5	5	122½	..	4 1 8	Henley's (5/-)	20	20	27/6	..	3 12 9
C	3	3½	69	..	4 14 2	4½% Pref. ..	4½	4½	24/-	..	3 15 0
West Midlands						Hopkinsons ..	15	17½	73/9	..	4 12 9
J.E.A. 1948-68	5	5	106½	..	4 14 0	India Rubber Pref.	5½	5½	23/-	..	4 14 9
Overseas Electricity Companies						Intl. Combustion	30	30	6½	..	4 12 4
Atlas Elec. ..	Nil	Nil	7/-	..	—	Johnson & Phillips	15	15	79/-	..	3 15 9
Calcutta Elec. ..	6*	6*	46/6	..	2 11 9	Lancashire Dynamo	22½	22½	100/-	..	4 10 0
Cawnpore Elec...	10	7	41/3	..	3 7 9	Laurence, Scott (5/-)	12½	12½	14/-	..	4 9 3
East African Power	7	7	35/-	..	4 0 0	London Elec. Wire	7½	7½	38/-	..	3 19 0
Jerusalem Elec. ..	7	5	29/-	..	3 9 0	Mather & Platt ..	10	10	55/-	..	3 12 9
Kalgoorlie (10/-)	5	5	10/6	..	4 15 3	Metal Industries (B)	8	8½	49/-	..	3 9 6
Madras Elec. ..	Nil	4	30/6	-2/-	2 12 4	Mct. Elec. Cable Pref.	5½	5½	21/3	..	5 3 6
Montreal Power	1½	1½	25	..	—	Mid. Elec. Mfg. ..	25	25	7½	..	3 9 10
Nigerian Elec. ..	8	10	35/-	..	5 14 5	Murex	20	20	5½	++	3 19 0
Palestine Elec. "A"	5*	5*	38/8	..	2 12 0	Newman Ind. (2/-)	20	20	7/3	..	5 10 0
Perak Hydro-elec.	6	7	13/-	..	—	Philco (2/-) ..	—	—	14/6	-3d.	—
Tokyo Elec. 6%	6	6	25	..	—	Power Securities	6	6	29/6	..	4 1 4
Victoria Falls Power	15	15	90/-	+½	3 7 7	Pye Deferred (5/-)	25	25	33/9	++	3 14 0
Whitehall Inv. Pref.	—	6	26/-	..	4 12 4	Ransome & Marles	20	20	87/6	..	4 11 4
						Revo (10/-) ..	17½	17½	44/-	..	3 19 7
						Rayrolle	12½	12½	72/8	..	3 9 0
(Continued on next page)											

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend		Middle Price Dec. 27	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Dec. 27	Rise or Fall	Yield p.c.
	Pre- vious	Last					Pre- vious	Last			
Equipment and Manufacturing (Continued)											
Siemens Ord.	7½	7½	36/3	..	4 2 9	Cape Elec. Trams	5	6	26/-	..	4 12 4
Strand Elec. (5/-) . .	10	12½	11/6	..	5 8 8	Lancs. Transport	10	10	47/6	..	4 4 3
Switchgear & Cow- ans (5/-)	20	20	20/9	..	4 16 7	Southern Rly. :					
T.O.C. (10/-)	5	7½	25/-	..	3 0 0	5% Prefd.	5	5	77½	..	6 9 2
T.C. & M.	10	10	56/-	..	3 11 6	5% Pref.	5	5	119	—½	4 4 0
Telephone Mfg. (5/-) .	9	9	12/-	..	3 15 0	T. Tilling	10	10	62/-	—6d.	3 4 6
Thorn Elec. (5/-) . .	20	20	28/9	..	3 9 6	West Riding	10	10	47/6	..	4 4 2
Tube Investments . . .	20	22½	5 ½	+1	4 6 9	Telegraph and Telephone					
Vactric (5/-)	Nil	22½	17/6	..	6 8 0	Anglo-Am. Tel. :					
Veritys (5/-)	7½	7½	9/-	-3d.	4 3 4	Pref.	6	6	124	..	4 16 7
Walsall Conduits (1/-)	55	55	52/6	..	4 3 10	Def.	1½	1½	30	..	5 0 0
Ward & Goldstone (5/-)	20	20	30/-	..	3 6 8	Anglo-Portuguese	8	8	29/6	..	5 8 6
Westinghouse Brake	12½	14	75/-	..	3 14 8	Cable & Wireless :					
West, Allen (6/-) . .	7½	7½	8/9	..	4 5 9	5½% Pref.	5½	5½	117	..	4 14 0
Traction and Transport						Ord.	4	4	84½	..	4 14 8
Anglo-Arg. Trans. :						Canadian Marconi	\$1 Nil	4cts.	9/6	..	—
First Pref. (£5) . . .	Nil	Nil	2/6	..	—	Globe Tel. & Tel. :					
4% Inc.	Nil	Nil	6½	..	—	Ord.	8½	5	41/-	+1/-	2 8 9
Brit. Elec. Traction :						Pref.	6	6	31/-	..	3 17 5
Def. Ord.	45	45	1200	..	3 15 0	Great Northern Tel. (£10)	Nil	Nil	28	..	—
Pref. Ord.	8	8	190	..	4 4 3	Inter.Tel. & Tel. . .	Nil	Nil	20	+1	—
Bristol Trams	10	10	57/-	..	3 10 2	Marconi-Marine . .	7½	7½	35/6	..	4 4 6
Brazil Traction . . .	1½	2	26½	—½	7 12 4	Oriental Tel. Ord. .	16	10	48/-	..	—
Calcutta Trams . . .	6½	7½	68/6	-4/-	2 3 10	Telephone Props. .	Nil	6	20/-	..	6 0 0
						Tele. Rentals (5/-)	10	10	12/6	+3d.	4 0 0
* Dividends are paid free of Income Tax.											

* Dividends are paid free of Income Tax.

Stocks and Shares (Continued from page 940)

nervousness that became noticeable when the attacks were going on. This table repeats the story of the uniform advance in values:—

Ordinary shares	Dec. 31st. 1943	Now	Rise
	s. d.	s. d.	s. d.
City of London	28 0	30 0	2 0
County of London	41 0	43 0	2 0
London Assoc. Elec.	23 0	26 0	3 0
Metropolitan	41 6	43 0	1 6
Northmet Power	37 6	41 0	3 6
South London	27 0	30 0	3 0

New Issues

Further lists of changes that have occurred during 1944 will be added next week. Meanwhile it may be said that the reasons for the rise in prices include, amongst other matters, the closure of the new issue market, the cheap money programme of the Government and the increased circulation of capital for which some employment has to be found at better rates of interest than those which are offered by the Treasury. Critics of the Government's financial policy are asking whether it might not be a good thing to relax, from now, the war ban which has hitherto been placed upon new issues. The question is one towards which arguments on both sides can be advanced. The General Electric Company is making a new issue of 2,000,000 4½ per cent. "C" preference shares at 20s. but this is intended to pay off a loan contracted

at the beginning of the war. The shares have been taken by Morgan Grenfell & Co., and 150,000 of them are to be marketed in the Stock Exchange early in the new year.

Calcutta Tramways

The position with regard to the acquisition of the Calcutta Tramways Company's system by the Calcutta Corporation has apparently reached another stage. A *Reuter* message dated December 23rd says that the Corporation at a special meeting agreed under certain conditions to a suggestion from the Chief Minister of Bengal regarding the formation of an autonomous transport board to control and carry on the administration of all forms of transport in the area.

Under certain conditions the Corporation has agreed to the proposals put forward by the tramway company. First, the company to retain possession of the undertaking for its own benefit until December 31st, 1945, and to retain the profits for the year; secondly, the purchase price of the whole undertaking to be assessed as at December 31st, 1944; thirdly, the immediate endeavour by the Corporation to obtain the necessary consent and the passing of legislation to enable it to take over from January 1st, 1945, and the purchase price to be paid; fourthly, in the event of the Corporation failing to obtain the necessary consent to implement this arrangement, the company to be left in possession after December 31st, 1945, on the terms of the existing agreement.

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.

AUTOMATIC Telephone & Electric Co., Ltd., P. N. Roseby and H. J. McMath.—"Electrical switching devices for alternating current circuits." 8901. June 3rd, 1943. (565996.)

Automatic Telephone & Electric Co., Ltd., W. Saville, T. P. Preist and G. W. Thompson.—"Telephone systems." 8964. June 4th, 1943. (566020.)

Birmingham Electric Furnaces, Ltd., A. G. E. Robiette and P. F. Hancock.—"Decarburisation of austenitic manganese cast-iron alloys." 2568. February 27th, 1942. (565946.)

British Industrial Plastics, Ltd., Micanite & Insulators Co., Ltd., A. Brookes and G. E. Haefely.—"Laminated electrical insulating materials." 931. January 18th, 1943. (565984.)

British Thomson-Houston Co., Ltd.—"Dynamo-electric machine." 7537/43. May 13th, 1942. (565934.) "Production of vinyl chloride." 2201/43. February 16th, 1942. (566003.)

J. A. Crabtree & Co., Ltd., H. F. McLoughlin, B. G. Harrison and R. W. Morgan.—"Electric tumbler switches particularly for alternating current circuits." 8743. June 1st, 1943. (565960.)

Diamond H Switches, Ltd. (Hart Manufacturing Co.).—"Luminous electric discharge tube or bulb." 8931. June 3rd, 1943. (565963.)

T. C. Gilbert.—"Conduits for electrical wiring." 8858. June 2nd, 1943. (565995.)

H. Jefferson.—"Radio direction finding systems." 3756. March 20th, 1942. (566026.)

Mallory Metallurgical Products, Ltd., and N. A. Tucker.—"Gauge for use in connection with electric spot welding." 7080. May 5th, 1943. (566043.)

Marconi's Wireless Telegraph Co., Ltd.—"Piezo-electric crystal assembly." 8967/43. June 4th, 1942. (566021.)

Mullard Radio Valve Co., Ltd., and L. M. Myers.—"Manufacture of grid-like electrodes for electric discharge tubes." 5337. April 2nd, 1943. (565949.) "Metal-ceramic joints and electric discharge apparatus incorporating such joints." 5338. April 2nd, 1943. (565950.)

Northern Aluminium Co., Ltd., and V. Simon.—"Systems for the protection of electrically propelled vehicles running on tracks." 5308. April 2nd, 1943. (566033.)

W. C. Pallant, J. Booth and J. Dorras.—"Fuse boxes for electric circuits." 6539. April 23rd, 1943. (566040.)

A. Redler.—"Conveyors and elevators." 2170. February 9th, 1943. (565987.)

G. S. P. Scantlebury.—"Arrangements for reducing variations in an electric supply." 4974. March 27th, 1943. (566031.)

Siemens & General Electric Railway Signal Co., Ltd., and H. J. N. Riddle.—"Road traffic controlling electric signalling systems." 10301. June 25th, 1943. (565970.)

Standard Telephones & Cables, Ltd., and H. S. Bishop.—"Electrical gauging arrangements." 8737. June 1st, 1943. (565959.)

Standard Telephones & Cables, Ltd., and L. E. Weaver.—"Apparatus for testing cables." 8995. June 4th, 1943. (566022.)

Superheater Co., Ltd. (Superheater Co.).—"Closures for the access openings in the fluid circulating elements of tubular heat-transfer apparatus." 7553. May 12th, 1943. (566047.)

A. V. Tomlinson (Union Switch & Signal Co.).—"Electrical relays." 15268. October 30th, 1942. (565978.)

Amended Specifications

551414. **English Electric Co., Ltd., and others.**—"Construction of electromagnetic slip couplings."

551516. **English Electric Co., Ltd., and others.**—"Prime mover, such as a turbine."

556157. **Westinghouse Brake & Signal Co., Ltd., and others.**—"Mechanical rectifiers or converters for alternating electric currents."

Forthcoming Events

Monday, January 1st. — London. — Caxton Hall, S.W.1, 6.30 p.m. Institution of Rubber Industry. "Infra-red Radiation and its Application to Industrial Heating Processes," by L. J. C. Connell, and "High-frequency Heating of Dielectrics," by N. R. Bligh.

Tuesday, January 2nd. — Birmingham. — James Watt Memorial Institute, 6 p.m. Electro-depositors' Technical Society. "Black Finishes for Steel," by H. Silman.

Coventry. — Coventry Electric Club. Annual general meeting.

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

Nottingham. — Corporation Gas Showrooms, 5.30 p.m. Illuminating Engineering Society (Nottingham Centre). "Lighting: The Contractor's Point of View," by J. Ashmore.

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

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

Tuesday, January 9th. — Glasgow. — Royal Technical College, George Street, 6.15 p.m. I.E.E. Scottish Centre. "Transmission and Distribution of Electricity to Mines," by B. I. Metcalf.

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

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

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

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

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

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

Batley.—January 10th. Electricity Department. 750-kVA transformer and c.h.v. ring main unit. (See this issue.)

Orders Placed

Birmingham. — Electricity Committee. Accepted for three months to November 17th. Spare exciter armature.—G.E.C. Portable industrial vacuum cleaning plant.—Sturtevant Engineering Co.

Cardiff.—Transport Committee. Accepted. Electrification of two hand cranes (£530 each).—Herbert Morris.

London. — ST. PANCAS. — Contracts and Libraries Committee. Accepted. Battery for electric vehicle (£120).—Chloride Electrical Storage 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.

Barnsley.—Additions (£250,000). Mining and Technical College; H. Taylor, borough surveyor, Town Hall.

Brentwood.—Extensions, District Hospital, including nurses' home and maternity unit; clerk to District Hospital Committee, Brentwood, Essex.

Clydebank.—Restoration of 400 houses; burgh surveyor.

Hebburn-on-Tyne. — Extensions to factory including three-storey office block, for the Pyrotenax Co., Ltd.; R. W. Gregory and Partner, consulting engineers, Pilgrim House, Newcastle-on-Tyne.

Ipswich. — Canteens at several schools; borough surveyor, Town Hall.

Kilmarnock (Ayrshire).—Proposed new post-war theatre (£10,000); burgh surveyor.

Liverpool.—School proposed at Penny Lane; L. H. Keay, city architect, Blackburn Chambers, Dale Street.

London. — ST. MARYLEBONE. — Offices, 176-204, Marylebone Road; J. Stanley Beard & Bennett.

Lowestoft.—Maternity centre, Regent Road; North Suffolk Hospital governors.

Maidenhead.—Power station and boiler house, Mill Island and Glen Island; New Taplow Paper Mills, Ltd.

Middlesbrough.—Factory; John Laing & Sons, builders, Mill Hill, London, N.W.7.

Hotel for Beverley Bros.; Kitching & Co., architects, 40, Albert Road, Middlesbrough.

Middlesex.—Extensions, Central Middlesex County Hospital (£20,623); Wm. Moss & Sons, Ltd.

School and hospital repairs (£15,000) county surveyor.

Newcastle-on-Tyne.—Workshop, the Manors, for G. Sinclair & Sons; Simpson & Lawson, architects, Emerson Chambers.

Extensions to workshop, Strawberry Place, for Harding & Son; Tasker & Child, architects, Trinity Buildings, 25, New Bridge Street, Newcastle.

Nottingham.—Additions (£13,343), Newstead Sanatorium; J. E. Richards, town clerk, Guildhall.

Scarborough.—Garage for Corporation Police Department (£3,000) and reconstruction of Council houses in Seamer Moor Road; borough engineer.

Sleaford.—Scheme for memorial hospital (£30,000); secretary to Appeals Committee, Sleaford.

Sunderland. — Factory and canteen for National Galvanisers, Ltd., and extensions in Monk Street for Youngs (Motors), Ltd.; Matkin & Hawkins, architects, Barclays Chambers, Fawcett Street, Sunderland.

Twickenham.—Factory buildings, laboratory, and canteen; Crimony Co., Ltd., 183, Heath Road, Twickenham.

Wallasey.—Branch library, Moreton (£1,500); borough surveyor, Town Hall.

TRADE MARK APPLICATIONS

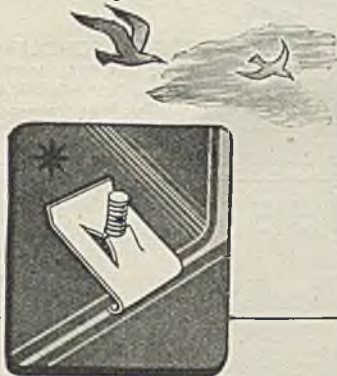
APPPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within one month from December 20th:—

PROMONTORY. No. 624,719, Class 7. Machine tools and welding machines; and tools for use therein.—Thos. P. Headland, Ltd., 164-168, Westminster Bridge Road, London, S.E.1.

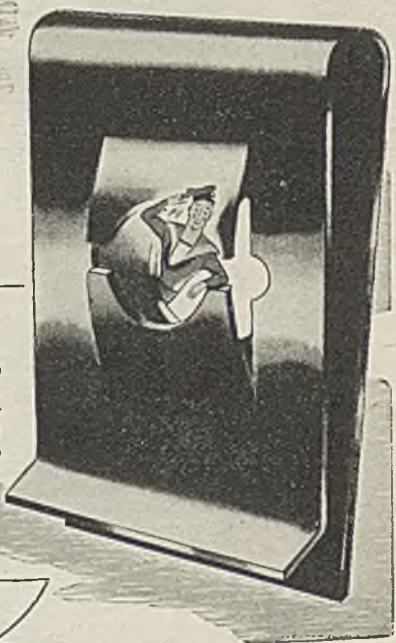
CLASPED HANDS (design). No. 624,550, Class 9. Electric lighters for smokers and for gas, electric soldering irons, electric apparatus for domestic purposes not included in other classes and heating elements for all these goods; electric vacuum cleaners and sweepers, electric floor polishers, electric torch lamp batteries; scientific, nautical, surveying, photographic, cinematographic, optical and wireless instruments and apparatus; cases for electric pocket lamps (not of metal); electric cables, etc.—Scottish Co-operative Wholesale Society, Ltd., 95, Morrison Street, Glasgow, C.5. To be associated with No. 267,515 (1403) viii and others.

READY...AYE READY!

What a fine fumbling job it is, messing around with dozens of tiny nuts and washers and bolts, picking up the nut, holding the bolt with one hand while the other fiddles round the back to get the nut on the thread. And drops it! You know! Spire solves the problem. Spire U Nuts slip into position over the bolt holes—no washers needed with a Spire fixing, of course. So both hands are free to put in the screws and once they're in, they're in for good. Sounds easy and it *is* easy!



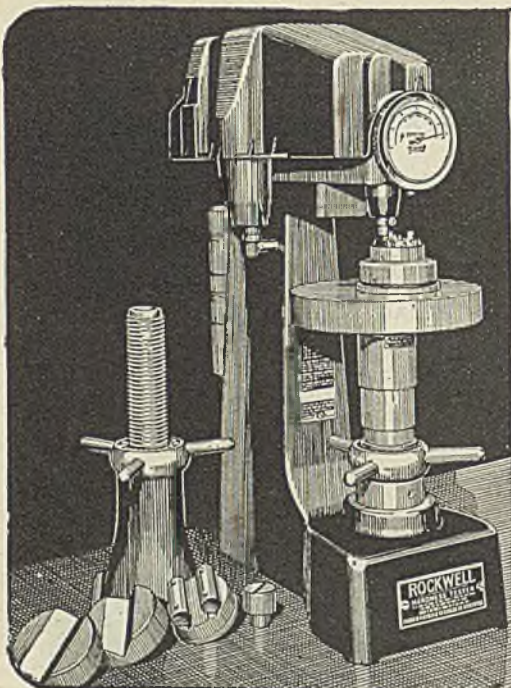
THAT'S Fixed THAT! Here's a little chap in action Reference No. NU 531. Its uses are legion. Wherever there is blind assembly work, wherever your operatives are fumbling with nuts and washers the NU 531 will save time and cost and a lot of bad temper. Clip it into position and it stays "put" until you are ready to drive home the screw. No washer needed of course.



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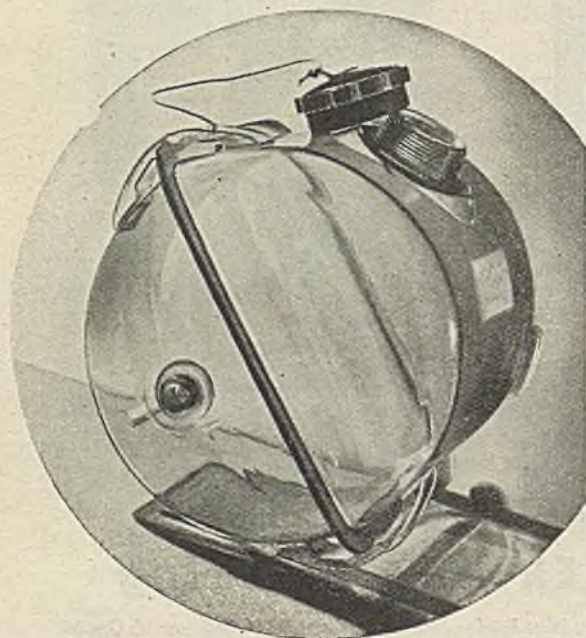
HARDNESS TEST—Wylex make their own tools, and "hardness" determines the quality of the tool. Here is shown The "Rockwell" Hardness Tester, with which all Wylex Tools are tested. The tools are tested—the products are tested.

"Wylex must be good"

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

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

LOOK INTO THIS



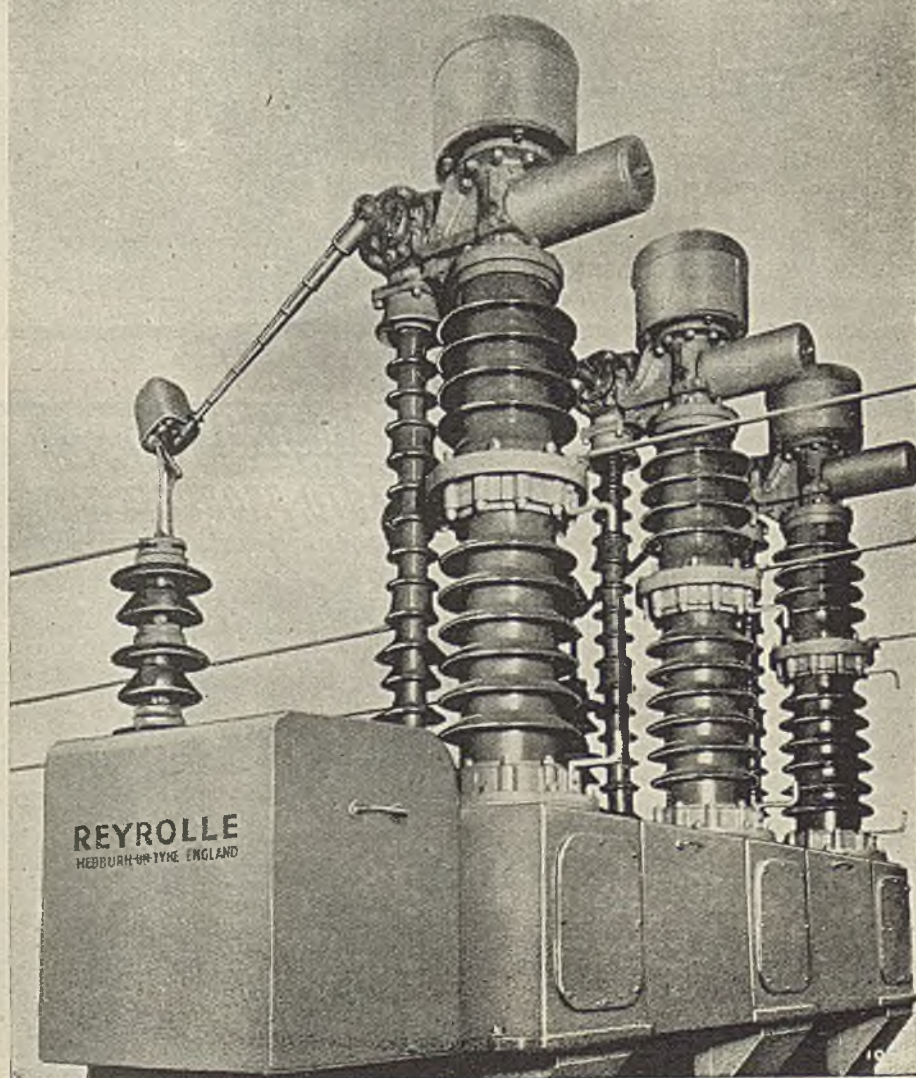
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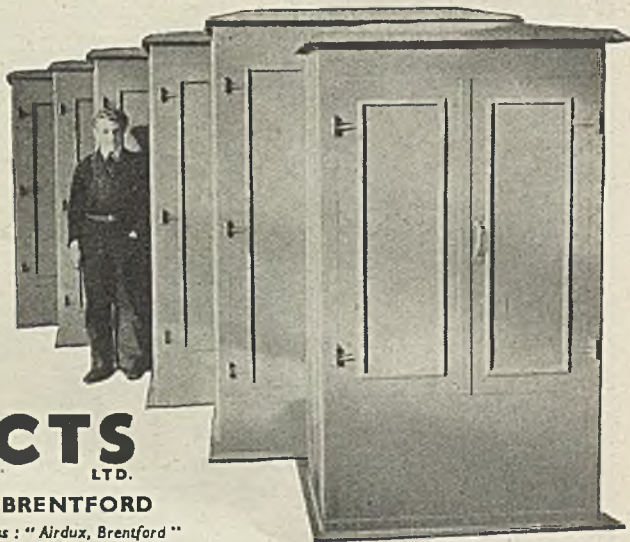
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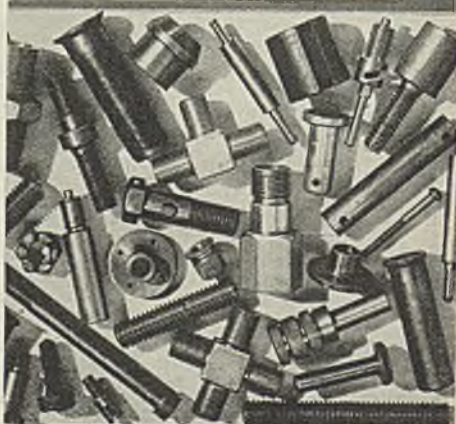


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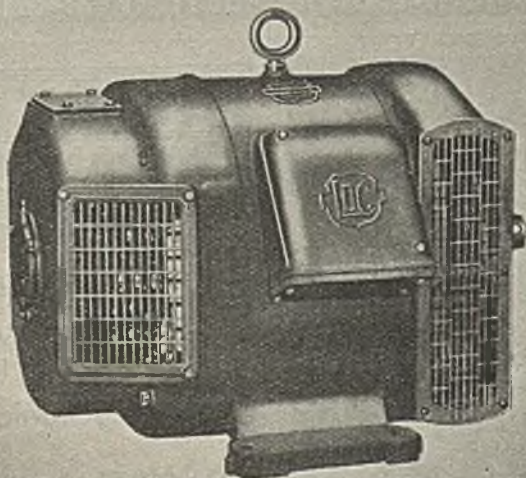
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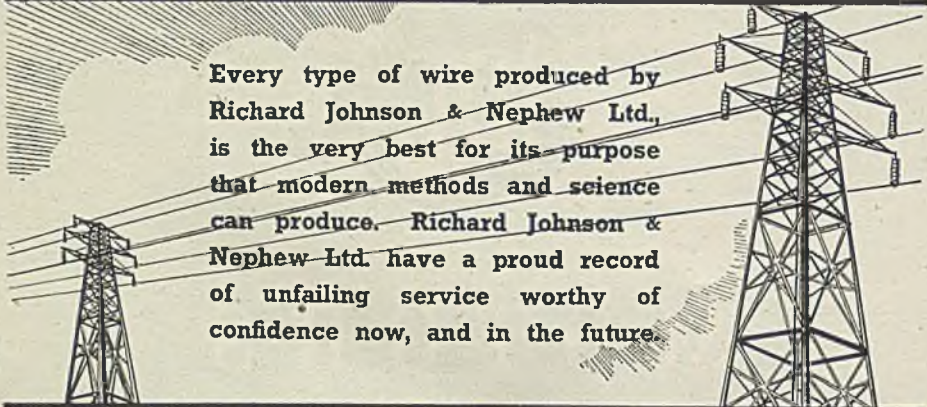
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GREETINGS

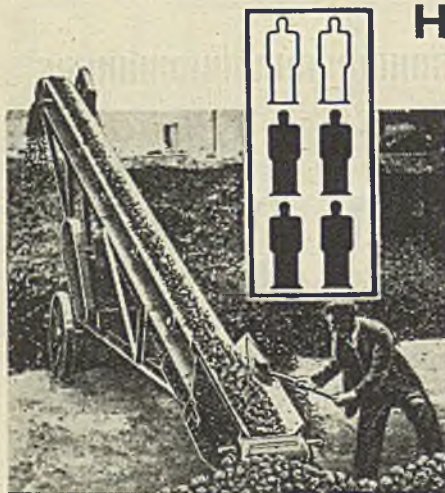
We take this opportunity of extending the Season's Greetings to all our friends. It has been a matter of regret to us that through the year now closing we have not been able to meet all the demands for Premier Fine-Quality electrical appliances. Our friends have been most helpful with their kindly indulgence and understanding of our difficulties. In the New Year we sincerely hope that their patience will have a better reward. For our part we will see that all demands are met as generously and fairly as possible.

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Hewittic Rectifiers

for Industrial Applications

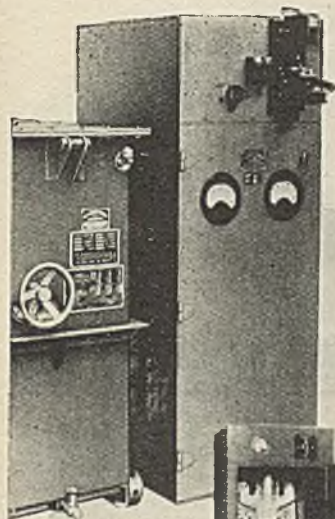
THE problem of providing a D.C. supply—for the operation of electric locomotives and trucks, cranes, hoists, lifting magnets, magnetic clutches and separating plant, for small scale or bulk charging of batteries for electric vehicles, emergency lighting, etc., and for almost every application where D.C. is required—is most effectively solved by installation of a HEWITTIC RECTIFIER, the simplest, most reliable converting plant made. This equipment normally operates completely unattended, is easily installed in existing buildings and awkward sites, and has proved highly immune from bomb blast and shock.

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Telephone : Walton-on-Thames 760 (8 lines)
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1



2



3



4



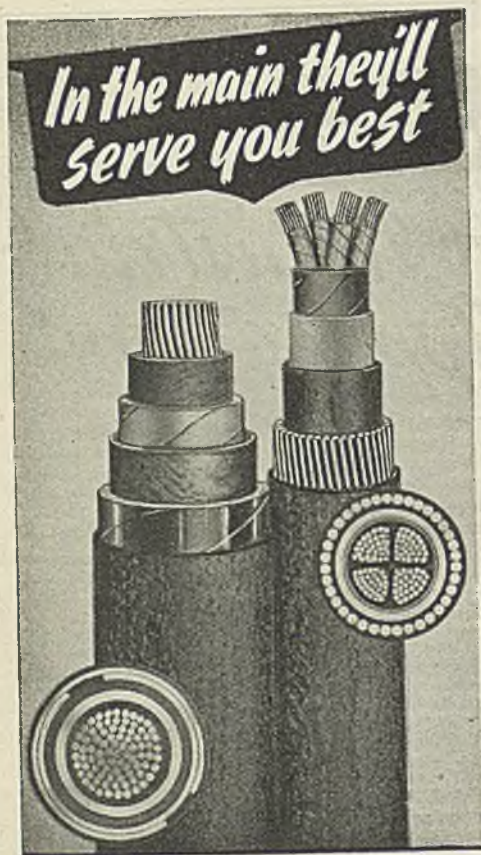
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6



7



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H.T. & L.T. *Best in the Main* CABLES

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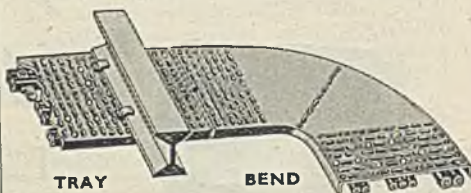
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Isn't a watt!
It's the c.g.s. unit of energy.

WHAT'S "ERG" ?

ERG is the trade mark identifying a line of
products that will be available when we've
finished the biggest job of all.



ERG

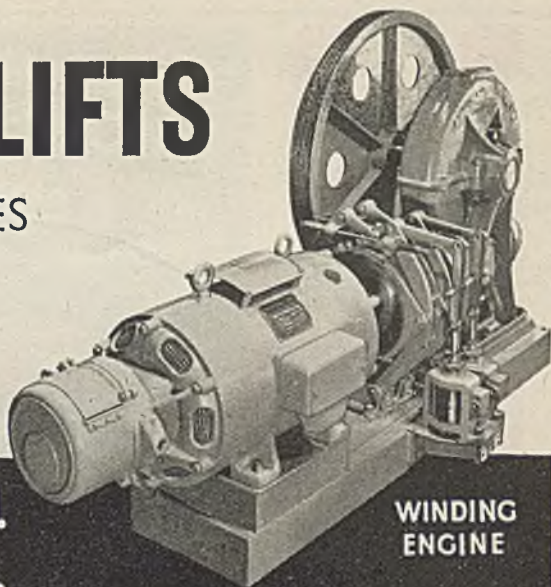
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1021a, FINCHLEY ROAD
LONDON, N.W.11

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FOR ALL DUTIES



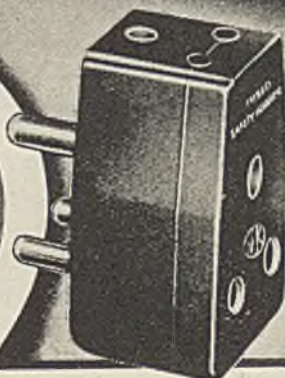
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EDMONTON N.18

Safety Adaptors were invented by M.K. Provide two outlets from one point. Extremely useful where there are insufficient outlets already installed. Fitted with B.S.S. 646 fuse. Page 36 of 1939/40 catalogue.



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... and less cutting time. The Van Dorn Lectro Shear reduces production costs and enables operators to work speedily but without fatigue. The Lectro Shear will cut up to 16 gauge in steel, more in softer materials, and is capable of working down to $\frac{3}{4}$ " radius. One of the wide range of Van Dorn Portable Electric Tools ready for your future production.

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VAN DORN ELECTRIC TOOLS, HARMONDSWORTH, MIDDX.

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BS.280

This illustration shows a W. & G. Domestic Appliance Connector, one of many types of insulated Connectors supplied with and without earthing attachments and also with Switches, both single and double pole.

A wide and comprehensive range of Electrical Accessories is available to consumers for National Service.

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Our Glass Fabrics and Tapes are manufactured with special heat-resisting varnishes so that no loss in flexibility or dielectric and tensile properties result when heated in transformer oil for 2 hours at 200° C.

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FOR HIGH TEMPERATURE INSULATION

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OF EVERY DESCRIPTION
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SPRINGS

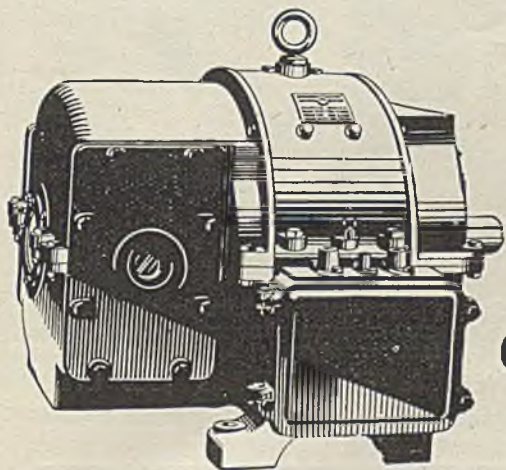


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ROCHDALE LANCs Phone 2424

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FULLY
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EVERY SPRING A SOURCE OF INSPIRATION

Months in 5% brine



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Crompton D.C. field coils.

A recent Crompton development in the construction and impregnation of field coils greatly increases the ability of D.C. motors to withstand the onerous conditions met in marine and other exacting services.

The coils are doubly impregnated with a special varnish which has extraordinary penetrating and moisture-resisting properties and the absence of a former ensures thorough impregnation and, at the same time, freedom from crevices that harbour dirt, oil, moisture, etc. The exterior of the

coil presents a smooth, glossy, sealed surface, and there are no air pockets inside the coil.

The coils have been subjected to prolonged heating and cooling cycle tests ; immersion in water ; immersion in 5% brine solution ; atmospheres of 99% humidity ; and other artificially created onerous conditions. Daily high-voltage tests to earth failed to cause break-down. The new coils are now fitted as standard to Crompton D.C. Motors. Crompton have been prominent in perfecting the D.C. motor ever since its earliest days.

B.V.C**INDUSTRIAL
PORTABLE
VACUUM
CLEANERS**

Plant in operation in a factory, showing two operators at work.

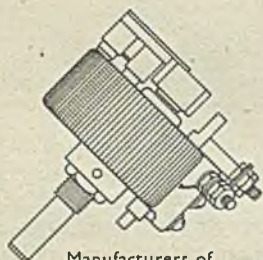


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ALUMINIUM-BRONZE
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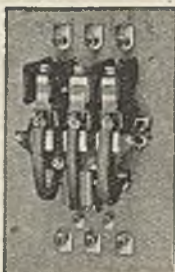
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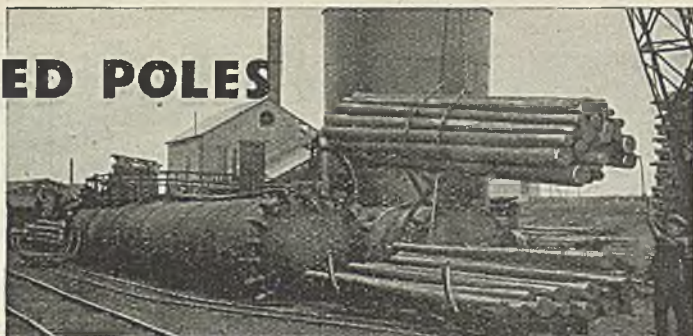
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Telegraph Poles,
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GIVES WARNING
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Manufacturers of
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Excellent wall space, side or front
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Used largely for Black-out Shelter Operation

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RATCHETS, PAWLS, SPRINGS
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E.L.M.A.**80 watt 5 ft Fluorescent Lamps****List Price Reduction****on****January 1st, 1945****From 30/- to 24/-****★ Claims**

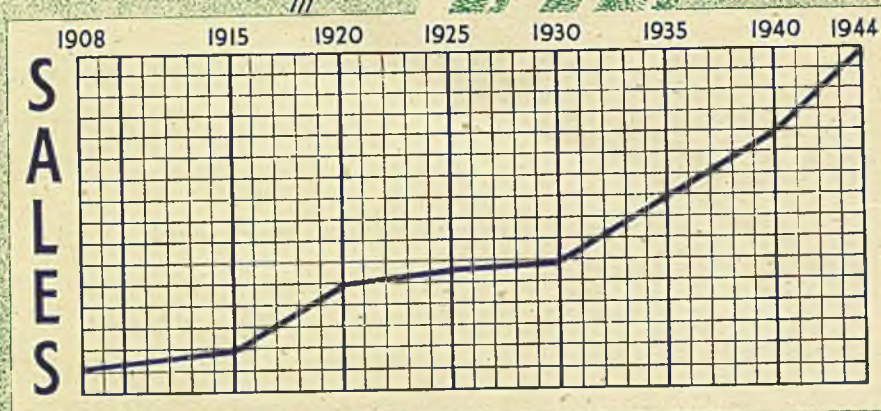
Claims in respect of Allowance on Stocks as at 31st December, 1944, will be considered from Reseller Agreement Holders and Supply Authorities provided particulars of such Stocks are sent to E.L.M.A., 25, Bedford Square, London, W.C.1, on or before 8th January, 1945, as follows:—

- (a) Make of Lamp
- (b) Number in Stock
- (c) Name of Supplier

★ Note: To relieve postal services and to save paper this is the only notification being made to the Trade.

**ELECTRIC LAMP MANUFACTURERS' ASSOCIATION
25, BEDFORD SQUARE, LONDON, W.C.1.**

***CUSTOMERS
APPRECIATE
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***TRY IT /
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***London's
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Best Seasonal Greetings to all our Customers



Conditioned

1. Air conditioned room in our propeller works.
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to the last degree

The exacting demands in the production of our laminated wood propellers for fighter and bomber aircraft necessitate the highest degree of efficiency in conditioning the blades.

Airscrew Air-Conditioning plants meet these demands. The almost unparalleled opportunity for design and practical experience with these plants over many years, enables us to offer the most up-to-date equipment.

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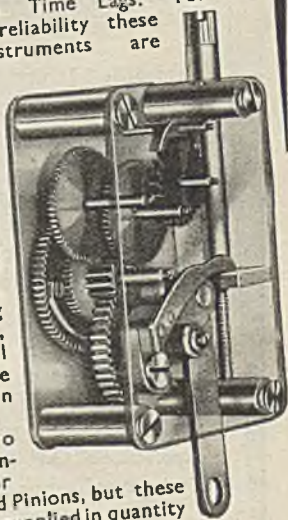
Grosvenor Gardens House, Westminster, London, S.W.1
Telephone : VIC 4527. Telegrams : Airscrew, Sowest, London

TIME LAGS

The important part in so many processes played by delayed action timing mechanisms has led to a demand for much greater accuracy than is afforded by the Oil Dash Pot method. Many engineers have found such problems completely answered by Rotherham Time Lags. For accuracy and reliability these ingenious instruments are

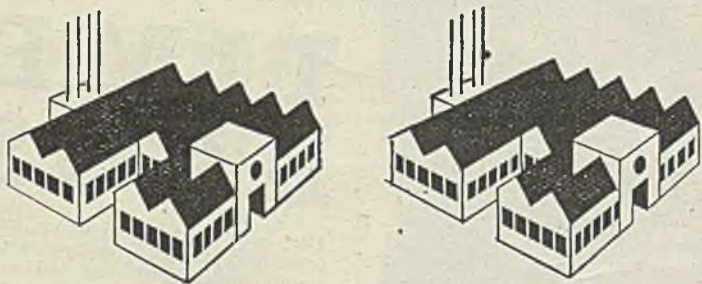
worthy products of the famous House of Rotherham & Sons of Coventry. Details of the various types available, and also of Instruments, Recording Clocks, etc., will gladly be supplied on request.

We also welcome enquiries for Wheels and Pinions, but these can only be supplied in quantity to customers' own designs, as no stock lines are held.



Rotherham's
OF COVENTRY

ROTHERHAM & SONS LTD.
COVENTRY.
Tele. : 4154
PRECISION MANUFACTURERS SINCE 1750



one of these factories is out-of-date

ITS PLANT IS first-class, its workers skilled and willing, its management capable—but its lighting is wrong. All the good work, the new machinery, the careful executive control, operate in extremes of light and shadow, trying to the eyes and nerves, slowing up output . . . In the other factory, OSRAM Fluorescent Tubes provide a cool, shadowless light that is the next best thing to daylight itself—restful, diffused, evenly distributed. And economical, too! The 80-watt OSRAM Fluorescent Tube gives almost as much light as a 200-watt tungsten lamp. No wonder records are broken in Factory No. 2 while it is always a struggle to keep abreast in Factory No. 1.

Proved facts in favour of the OSRAM Fluorescent Tube are so overwhelming that demand has made it necessary to restrict its application to nationally-important work. If your work is of this kind, we can discuss installation with you. But if not, you may still count upon the advice and service and long experience of G.E.C. lighting engineers to help you make the best possible use of whatever lighting system you have.

Osram
FLUORESCENT
TUBES



CLASSIFIED ADVERTISEMENTS

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

THE CHARGE for advertisements in this section is 2/- per line (approx. 8 words) per insertion, minimum 2 lines 4/-, or for display advertisements 30/- per inch, with a minimum of one inch. Where the advertisement includes a Box Number there is an additional charge of 6d. for postage of replies.

SITUATIONS WANTED.—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES TENDERS, ETC.

COUNCIL OF THE BOROUGH OF BATLEY

Electricity Department

TENDERS are invited for the supply and delivery of one 750-kVA Transformer and one E.H.T. Ring Main Unit.

Specifications and forms of tender may be obtained from the Borough Electrical Engineer, Electricity Works, George Street, Batley.

Tenders should be sent to the undersigned in plain sealed envelopes bearing no mark to indicate the sender, endorsed "Tender for Transformer" or "Tender for Substation Switchgear," and are to be delivered not later than 12 noon, Wednesday, January 10th, 1945.

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

Town Hall, Batley.
December 18th, 1944.

THOS. E. CRAIK,
Town Clerk. 1179

SITUATIONS VACANT

BOROUGH OF KENDAL

Electricity Department

Appointment of Borough Electrical Engineer

THE Council invite applications for the position of Borough Electrical Engineer. Applicants must not exceed 45 years of age and must possess a recognised professional qualification, and have had experience in a responsible position, in the administration, management and development of an Electricity Undertaking, both in the engineering, distribution and commercial branches of the work. The main supply of electricity dealt with by the Council's undertaking is taken in bulk, but a small generating station is maintained and practical knowledge of the operation of Diesel oil engines would be an advantage. The "unit assessment," based on the year ended 31st March, 1944, is 6.9 millions.

The appointment will be subject (a) to the provisions of the Local Government Superannuation Act, 1937, the person appointed being required to pass a medical examination, and (b) to three months' notice on either side.

The salary offered is according to the agreement dated 9th July, 1941, made by the National Joint Committee of Local Authorities and Chief Electrical Engineers for the Electricity Supply Industry, and will commence at £677 6s. per annum, rising, at the commencement of the third year of service, to the full scale salary in accordance with Clause 10 of the said Agreement.

Applications, stating details of the candidate's qualifications, experience, age and present appointment, and accompanied by not more than three recent testimonials, should be delivered to the undersigned, in an envelope endorsed "Borough Electrical Engineer," not later than 31st December, 1944.

Canvassing, either directly or indirectly, will be a disqualification.

14, Kent Street, Kendal.
12th December, 1944.

H. RHODES,
Town Clerk. 1150

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.

COUNTY BOROUGH OF GREAT YARMOUTH ELECTRICITY DEPARTMENT

Appointment of Charge Engineer and Junior Shift Engineer

APPPLICATIONS are invited from suitable candidates for the following positions:

Shift Charge Engineer

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

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

Junior Shift Engineer

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

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

Forms of application may be obtained from the undersigned, and should be returned in the official envelope provided not later than the first post January 16th, 1945.

GERARD T. ALLCOCK,
Engineer and General Manager.

Electric House,
Regent Road,
Great Yarmouth.

1181

APPPLICATIONS are invited for the post of Shift Charge Engineer. The salary paid and conditions generally are in accordance with the National Joint Board Schedule, Grade 8, Class F, at present £387 per annum. Applicants must have sound theoretical knowledge and practical experience in the operation of H.P. boilers, turbo alternators, E.H.T. and L.T. switchboards and usual auxiliary plant. Applications, stating age, and giving full particulars as to training and subsequent experience, with copies of any testimonials, to be addressed to—The Chief Engineer, Slough Estates Ltd., Trading Estate, Slough, Bucks. 1155

ELECTRICAL Engineer (temporary staff) required by the Nigerian Government Public Works Department for one tour of 12 to 24 months in the first instance. Salary between £600 and £1,000 p.a., according to qualifications and experience. On salary of £600 separation allowance is payable to married men between £36 and £156 p.a., according to number of children. Outfit allowance £80. Free passage and quarters. Candidates must be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications; have had sound training in both electrical and mechanical engineering, with experience in the operation of large electrical undertakings, and possess a competent knowledge of the maintenance of high and low tension, overhead and underground distribution systems and substation plant. Applicants should write, quoting D.926A, to the Ministry of Labour and National Service, Central Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 9th January, 1945. 1178

LAMP Sales Representatives required. One for Liverpool, Wirral, and North Wales district, and the other for Sheffield and part of West Riding. Permanent progressive posts with salary, expenses and commission. Previous experience of lamp market and men with connections preferred, but not essential. Write, giving age and full particulars of experience, to—S. W. Fuller, E. K. Cole Ltd., Southend-on-Sea. 1171

SALES Representative required for North London by electrical wholesaler. Knowledge of electrical trade preferred, and own car an advantage. Permanent and progressive position. Remuneration by salary, commission and expense allowance.—Box 1114, c/o The Electrical Review.

SENIOR Electrical Designer required by well-known company in the North-West, for position vacant immediately after the removal of the present restriction of employment. Must be conversant with design of A.C. and D.C. dynamo-electro machines of all types and sizes. State age, experience and salary required.—Box 1132, c/o The Electrical Review.

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

TECHNICAL Representative required by manufacturers to sell nickel-chrome electrical Resistance wires and tapes.—Box 1145, c/o The Electrical Review.

WORKS Manager required in London by small electrical manufacturing firm of relays, automatic control, scientific equipment, etc. Sense of organization, internal and sales, desirable. Position entails good post-war possibilities.—Box 1105, c/o The Electrical Review.

APPOINTMENTS FILLED

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

SITUATIONS WANTED

A young Engineer (21), A.M.J.I.E., taking 5th year. Nat. Cert., 6 years' A.C./D.C. plant experience, seeks progressive position, B'ham area.—Box 6558, c/o The Electrical Review.

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

A RTIST specialising in poster and catalogue lay-out work, engineer's drawing office and sales experience, seeks position having post-war prospects, with firm of Commercial Artists or advertising department.—Box 6557, c/o The Electrical Review.

CHARGE Engineer (39), Class H, experienced power station operation and maintenance large units, free end December, desires permanent position, station operation or industrial maintenance, London area preferred.—Box 6563, c/o The Electrical Review.

FOREMAN Electrician seeks post, working or otherwise, competent large contracts, power, lighting, all systems, estimating, labour control.—Box 6596, c/o The Electrical Review.

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

METAL Finishing. Chief seeks staff-post. Age 39, 20 years' experience, chromium, cadmium, anodic, zinc, tin, sheradising, sandblasting, enamelling, control labour, mass production, electrical products, London area.—Box 6562, c/o The Electrical Review.

SUPERVISING Electrical and Mechanical Engineer (44), 28 years' practical experience new installations, factory maintenance, labour control and general management, now disengaged, seeks position. Reply—Box 6564, c/o The Electrical Review.

FOR SALE

Traders buying and selling hereunder must observe the Restriction of Resale Order, S. R. & O. 1942 No. 953.

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

Latest Development

THE ELECTROPLANT CO.

(Established 1912)

combined with

G-POWER UNITS

(G.P.U. LTD.)

AS a result of recent negotiations, the activities of the Machinery Department of Messrs. J. Gerber & Co. Ltd. have been taken over by G.P.U. Ltd., which also controls The Electroplant Co.

The combined activities of the two concerns will ensure the most economical working operation, and the Company will henceforth trade under the name of The Electroplant Co., at the Palace of Engineering, Wembley, Middx

The Company, under the management of Mr. F. L. Kessel, hitherto in charge of the Machinery Department of Messrs. J. Gerber & Co. Ltd., welcomes enquiries for their well-known G-Power Units and assures customers of the very best service at all times.

1175

REBUILT MOTORS AND GENERATORS

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

SEND US YOUR ENQUIRIES.

OVER 1,000 RATINGS ACTUALLY IN STOCK HERE

DYNAMO & MOTOR REPAIRS LTD.,

Wembley Park, Middlesex.

Telephone: Wembley 3121 (4 lines).

Also at Phoenix Works, Belgrave Terrace, Soho Road, Handsworth, Birmingham.

Telephone: Northern 0893.

20

WATER TUBE BOILERS IN STOCK

Four	25,000 lbs. evaporation,	175 lbs. W.P.
Three	20,000 lbs.	175 lbs. ..
One	15,000 lbs.	175 lbs. ..
One	12,000 lbs.	175 lbs. ..
One	12,000 lbs.	200 lbs. ..
One	12,000 lbs.	180 lbs. ..
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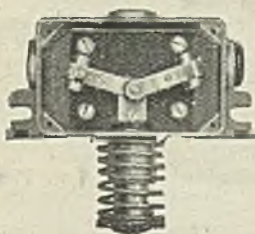
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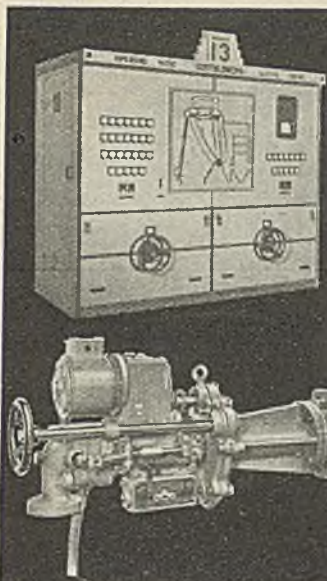
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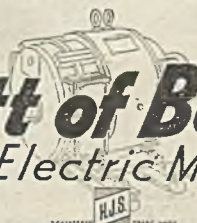
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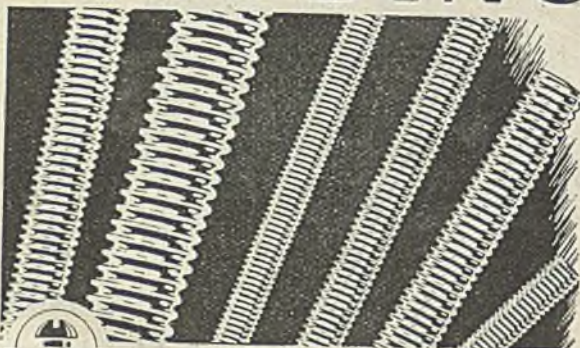
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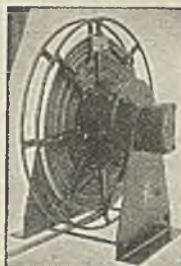
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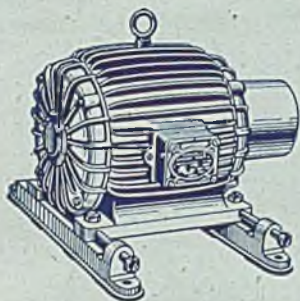
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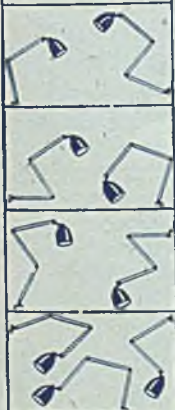
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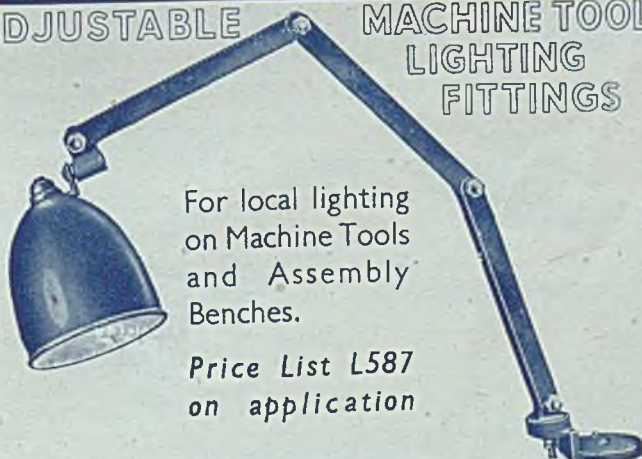
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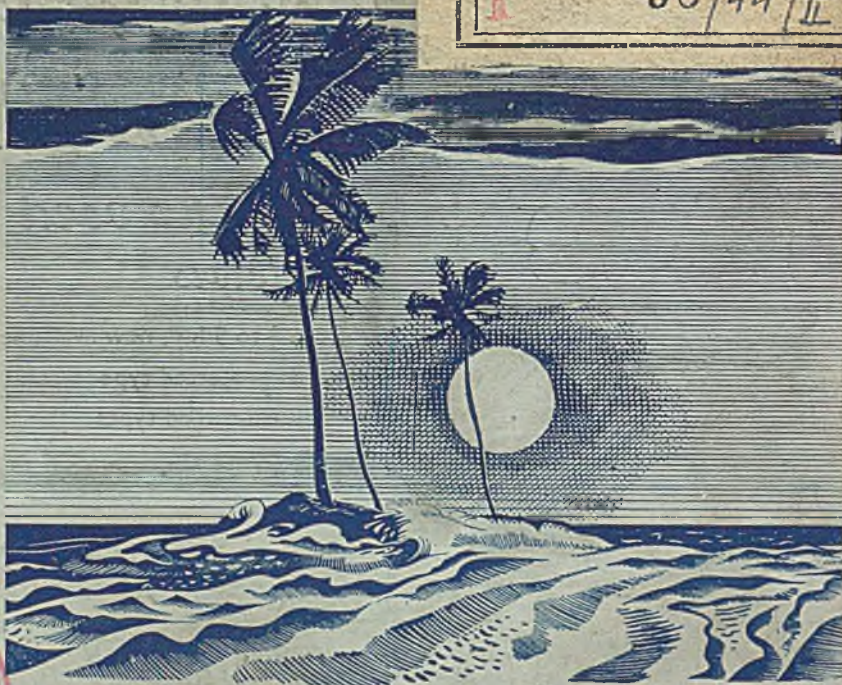


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