

ELECTRICAL FOUNDED 1872 REVIEW

Vol. CXXXVI. No. 3517

APRIL 20, 1945

9d. WEEKLY



**The
Big Name in Lighting**

MAZDA
LAMPS



The British Thomson-Houston Co., Ltd.

Crown House, Aldwych, London, W.C.2



ELECTRIC POWER TRANSMISSION

has progressed with

ALUMINIUM

At their introduction, plain aluminium conductors brought economy in capital costs. The development of steel-cored aluminium increased the economy factor considerably because the great strength of the conductor made possible longer spans, with correspondingly fewer supports and hence fewer potential sources of weakness, reducing maintenance costs. That these economies are coupled with reliability, explains the phenomenal growth of S.C.A. mileage all over the world . . . during the lifetime of the British Aluminium Co. Ltd.

This is the
Jubilee year of
British Aluminium

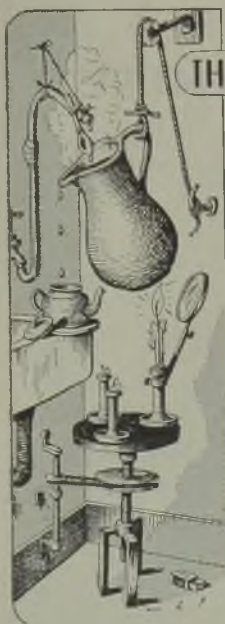


THE BRITISH ALUMINIUM CO. LTD. SALISBURY HOUSE LONDON WALL LONDON E.C.2

Telephone CLerkenwell 3494

Telegrams Cryolite, Ave, London

J.4. E.R.20. 4.45



THE VALUE OF CONTRAST

One may obtain a given result by a round-about method or the SAME result on more straightforward lines.

It all depends upon **FORETHOUGHT** in design—the simplicity of which determines the success (or otherwise) of an Electric Water Heater.

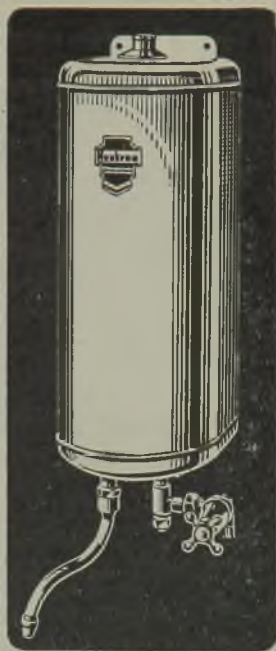
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Send for Prices
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Makers of all
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—oOo—

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PAPER, RUBBER, SYNTHETIC RUBBER
THERMOPLASTIC AND VARNISHED
CAMBRIC INSULATED CABLES

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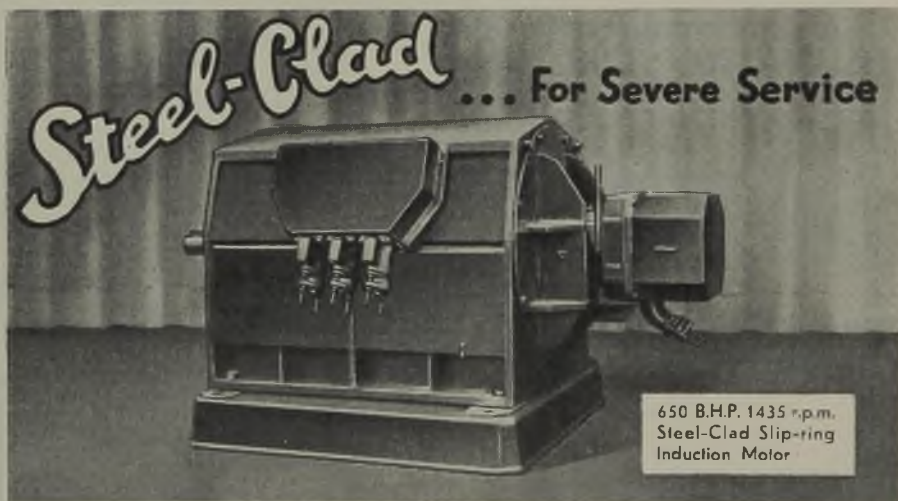
IMPREGNATED PAPER INSULATED CABLES FOR WORKING
PRESSURES UP TO AND INCLUDING 33,000 VOLTS.

ALSO

MINING CABLES, TRAILING CABLES, SHIPWIRING CABLES,
WELDING CABLES, HOUSEWIRING CABLES, CONTROL CABLES,

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A complete range of self-contained A.C. Motors
in sizes up to 1600 B.H.P. at 1000 r.p.m. possessing
extremely robust features for hard service conditions.



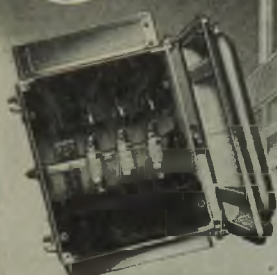
BRUCE PEEBLES & CO. LTD. ENGINEERS, EDINBURGH.

MAIN CONTROL SWITCHES

for all factories



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



Made for 30, 60, 100, 160, 200, 300
& 500 Amps., 600 Volts: Double,
triple and four pole and with
neutral links.
Fitted for Conduit, busbar chamber
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"The Yardstick of Good Lighting"

**DELIVERIES FROM STOCK
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INDUSTRIAL INSTALLATIONS**

Siemens Electric Lamps & Supplies Ltd.
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G.E.C. **EQUIPMENT** *for* **THE REINSTATEMENT** *of* **STREET** **LIGHTING**

• •



The Ministry of Home Security Circular No. 8/1945 recommends that street lighting installations should be brought into good repair, including the reinstatement of destroyed or damaged equipment, so that when full lighting returns, there will be no dangerous unlit sections of thoroughfares.

The G.E.C. can now provide limited quantities of street lighting equipment to comply with

these recommendations, and lighting authorities are asked to place their enquiries and orders as soon as possible to enable the company to give the best service with present resources.

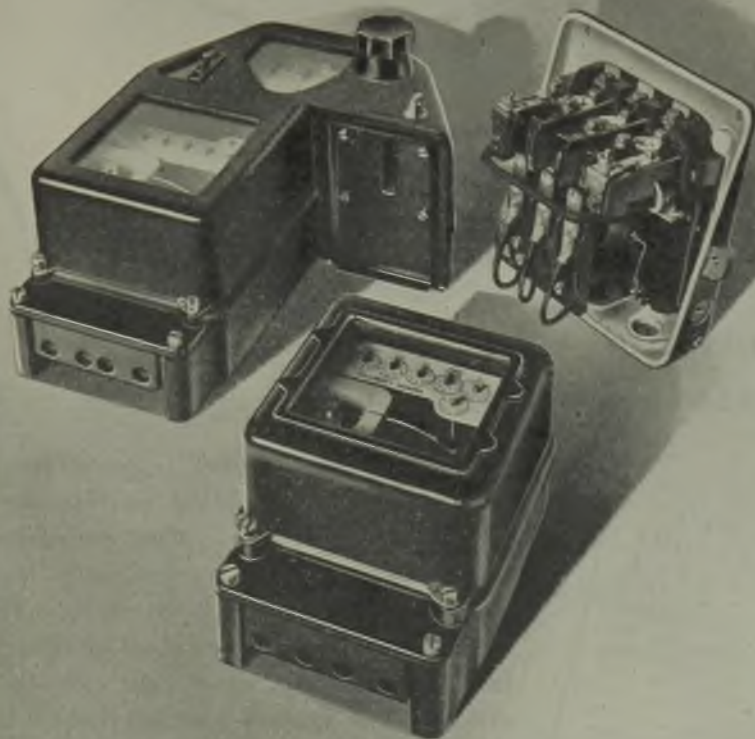
FOR THE FUTURE

The services of G.E.C. Street Lighting Engineers are available to give advice and prepare schemes for Post-War Street Lighting.

Full particulars from the Street Lighting Dept. of

THE GENERAL ELECTRIC CO. LTD., Magnet House, Kingsway, London, W.C.2

MOULDINGS for ELECTRICAL PURPOSES



Moulded by
De La Rue Plastics

Enquiries to : IMPERIAL HOUSE · 84-86 REGENT STREET · LONDON · W-1



Stop a minute!

What are you spending on Electric Lamps?



Whatever your annual expenditure for electric lamps may be, you can save money by buying Atlas Lamps. They are subjected to the most exhaustive tests at every stage of manufacture and are guaranteed to conform to the highest possible standard of efficiency. Instal Atlas Lamps and you will see the difference in quality and maintained luminosity, and the extra discounts you receive will lighten your annual bill. Write for terms before you forget.



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Nothing better has come to light

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 Northern Branch: 55 Blossom Street, Manchester. 'Phone: Central 7461
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EQUIPMENT for ALL INDUSTRIES

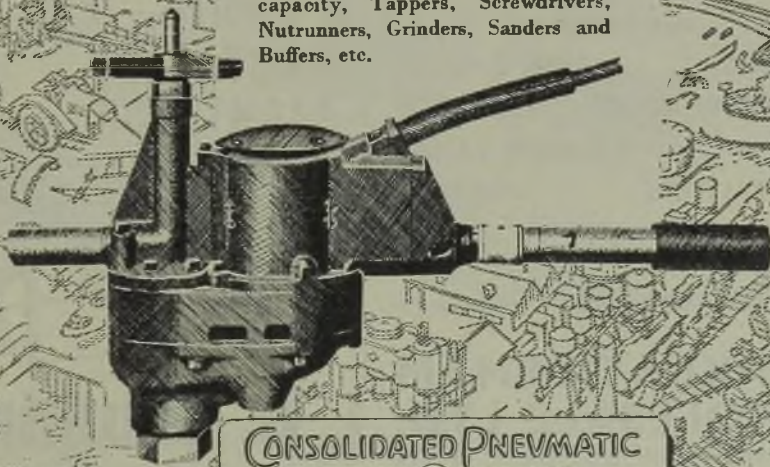


Wycle DRILLS

Wycle Drills and Reamers with their simplicity of design combine power with light weight, freedom from break-down and exceptionally low operating costs. Greater production is obtained at a fraction of the power costs of compressed air tools.

The machine illustrated is the "505" Wycle Drill and Reamer—capacity drilling $1\frac{1}{2}$ ", reaming 1".

The Wycle range of machines also includes drilling machines from $\frac{3}{16}$ " capacity, Tappers, Screwdrivers, Nutrunners, Grinders, Sanders and Buffers, etc.



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TOOL CO. LTD.
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THE POCKET TESTOSCOPE

Size of a Fountain Pen

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



for use
on
100-750 volts

FOR TESTING

SWITCHES OPEN CIRCUITS
LIVE CONDUCTORS LEAKAGES
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The Electrician's Good Companion.

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W. T. BOWER, 184 Jockey Road, Sutton Coldfield

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WITH THE

"SUPREME" ELECTRIC GLUE POT

SPECIALLY
DESIGNED
FOR
FACTORY
USE

Price

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Please state
voltage required



L. G. Hawkins PUTS LIGHT EVERYWHERE

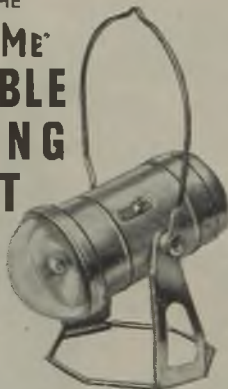
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"SUPREME" PORTABLE LIGHTING UNIT

IT HAS A 100 USES
— IN THE FACTORY
ON THE FARM, IN
THE GARAGE, ON
LADDERS, IN
VEHICLES, ETC.

Price **25/-**

Without batteries,
plus purchase tax.



Takes Ever Ready 6 v. Battery R996

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Write to L. G. HAWKINS & CO. LTD.,
30/35 DRURY LANE, LONDON, W.C.2
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For full details of these 'SUPREME' products

**Every Substation Engineer should
have this new Publication —**



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— STAFFORD —



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CROMPTON

V.I.R. CABLE

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Telephone: TEMple Bar 5911

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Generator TRANSFORMERS



The 80,000 kVa transformer used for the test. The forerunner of 5-80,000 kVa and 2-87,000 kVa 11/66 kV generator transformers for the London Power Company (Battersea Generating Station).

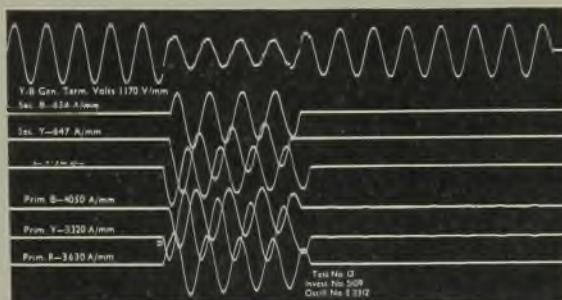
**LARGE
POWER TRANSFORMERS**
supplied by Ferranti —

Over 9,000,000 kVa for
voltages 33 kV and above
Over 6,000,000 kVa for
voltages 66 kV and above

Ferranti Large High Voltage Generator Transformers are designed on facts confirmed by full-scale practical tests.

In 1935 a Ferranti Generator Transformer of 80,000 kVa 66 kV was tested to destruction by a series of 14 full-scale short circuit tests.

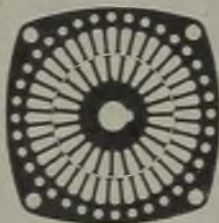
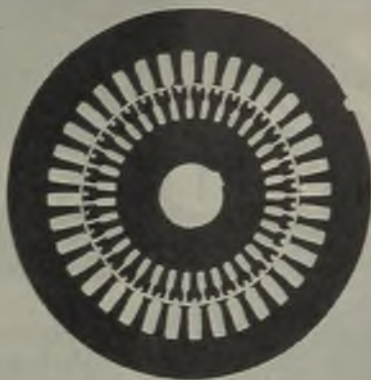
A typical oscillogram showing 1,420,000 maximum instantaneous kVa (720,000 kVa symmetrical r.m.s. value.)



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ELECTRICAL
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Brands :

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

JOSEPH SANKEY & SONS LTD., BILSTON

LONDON : 168 Regent Street, W.1

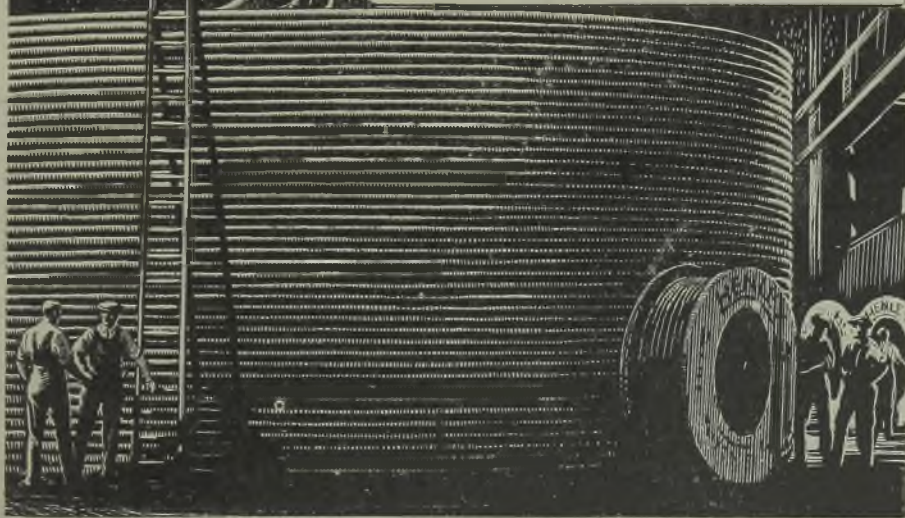
We raised the roof

"Bell wire" was what they called it down at the Works, but it was quite a bit bigger than any bell wire you ever saw, and — well, least said soonest mended. Like many other jobs we have tackled in the last few years it was extremely confidential. Also like many of these other jobs it meant special plant, re-arrangement of factory layout, yes and in this case we even had to raise part of the factory roof.

Your orders, when the time comes, may not call for such extreme measures, but we shall be just as ready to put ourselves out to give you good service.

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FAMOUS FOR OVER A CENTURY



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

Britain still is Free

**Manufacturers of
Sheets, Rods, Tubes
and machined
Components.**

VULCANISED FIBRE LTD



Broudford Mills.

GUILDFORD ENGLAND

THAT DIFFERENCE IS IN DETAIL



THE craftsman has always laboured to the end that his product shall be beautiful. And beauty, of course, will ever remain the hall-mark of craftsmanship. But in the engineering product, beauty means something

more than an exterior which is good to look upon. It is expressed in good lines and pleasant contours, yet its real beauty—its true quality—has always to be measured by its “fitness for purpose.”

This involves a greater obstacle than good taste. Beauty of line, indeed, is seldom difficult to achieve, since a sense of beauty is the gift of all men. But fitness for purpose can never be accidental. That smoothness and efficiency—the difference between any two products designed for the same job—lies essentially in detailed effort. We have, in fact, to look and strive for quality “below the cover” . . . pouring into each part, however small, the finest thought and care of which we are capable.



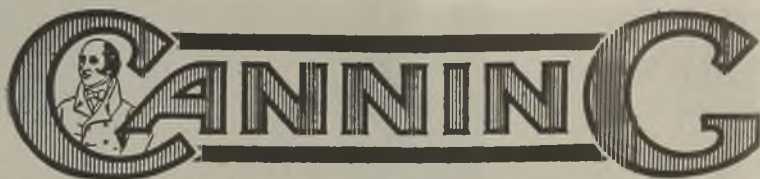
Even so simple a product as a one way switch demands an infinitude of care if it is to give the user a long life of unfailing service. This particular switch consists of 44 separate parts calling for 126 operations and 12 inspections during and after assembly.

CRABTREE

A • NAME • SYNONYMOUS • WITH • PROGRESS • IN • ACCESSORIES • AND • SWITCHGEAR

“Crabtree” (Registered)

C.225/16. Advt. of J. A. Crabtree & Co. Ltd., Walsall, England

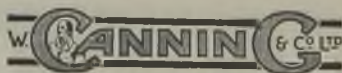


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The Modern Process, using Stannate Tin Solution, produces strictly controlled coatings, predetermined and uniform in thickness, even on articles of irregular shape.

Deposits of reasonable thickness may be built up, which are not possible with a tin chloride bath.

The solution also permits of a faster speed of deposition.



**GREAT HAMPTON STREET
BIRMINGHAM 18**



The Engineer concerned ...

Standard L.T. Substation Panel with thermal maximum demand indicators and voltmeter, earthing bar and duplicate earth connections.

Lower illustration shows a Standard L.T. Substation Panel 250 kVA Capacity.

B.I. SUBSTATION PANELS

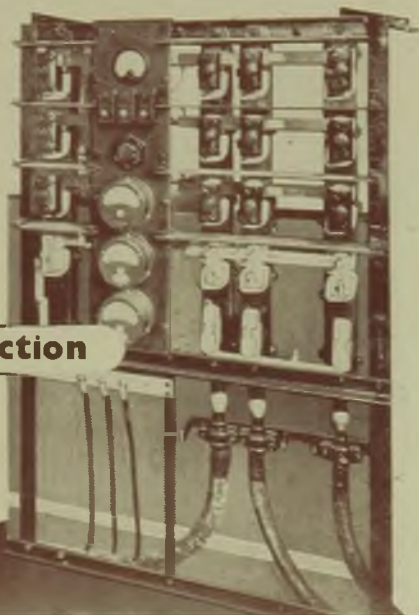
Built up from tailless type units, an original **B.I.** development, these panels provide maximum adaptability of layout in a neat and compact design. The **B.I.** Technical Advisory Service will gladly assist Engineers engaged in developing or replanning L.T. Distribution Centres.

Particulars on request.

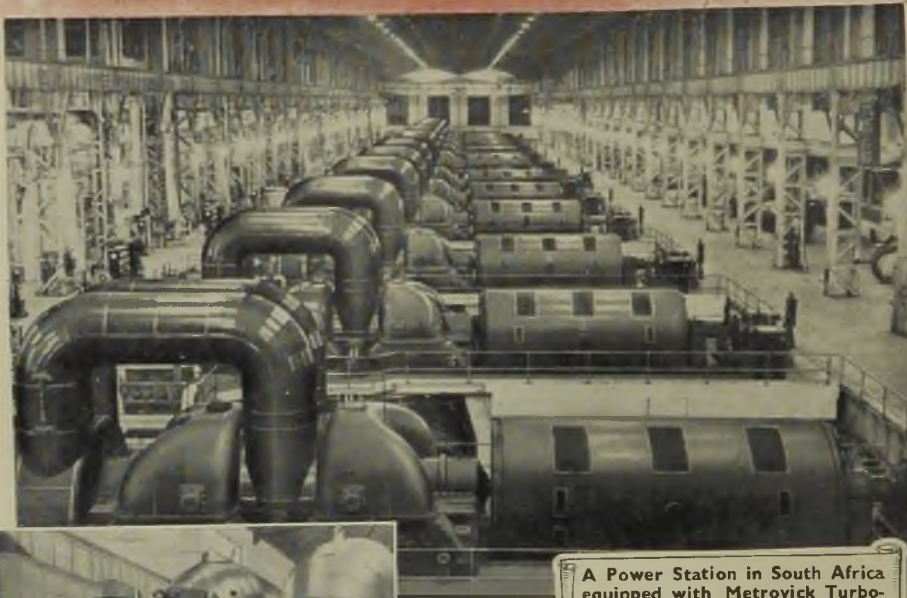
...expressed entire satisfaction

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Telephone: PRESCOT 6571



METROVICK Power Station Practice



The inlet end of
the turbine of a
"Metrovick"
31,250 kW
3000 r.p.m.
Turbo-Alternator
set.

A Power Station in South Africa equipped with Metrovick Turbo-Alternators with an aggregate capacity of 424,000 kW. The installation includes 12-33,000 kW and 4-7,000 kW sets, all at 3000 r.p.m.

For
**POWER STATION
EQUIPMENT**
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B/B502

*Light aids
production*

IMPROVE YOUR LIGHTING in consultation with
METROVICK'S ILLUMINATING ENGINEERS



If the place

is damp and dirty . . .



this is your motor.

It is the Parkinson "Klosd" fan-cooled Motor. It has the virtue of keeping cool while keeping out damp and dust. And it does it exceptionally well. Being a Parkinson Motor that is not extraordinary. But what is extraordinary is that the special motor is one of over 2,000 types in the standard Parkinson range. It, and other very much more

unusual motors, can be obtained with remarkable ease and speed.

With the Parkinson flow production system standardised parts and sub-assemblies are always kept stored and ready. Final assembly of any required type is quickly completed if the motor is not a stock item. In this way Crompton Parkinson can give you a service that is as good as the motor itself.



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accessories..*



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RP-344

Metal

PRESSINGS and STAMPINGS

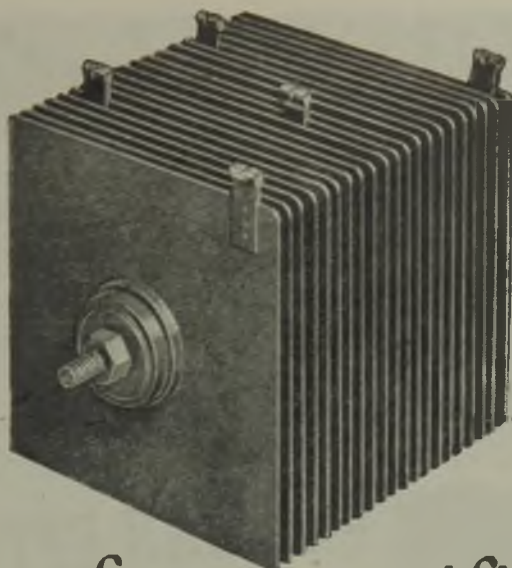
ANY SHAPE-ANY SIZE (Up to 15" Blank Diameter)

6745 B



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The finest rectifier we know how to build

Thousands can — and will — testify that fifteen years ago we built rectifiers that are still giving efficient service . . . and yet today we are producing better rectifiers than we could have built even a year ago.

The mass of accumulated experience enables us to continue pioneering new and advanced designs, and the "Westalite" selenium compound unit is the direct result of years of steady progress towards ever better rectifiers.



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SEND FOR DESCRIPTIVE BOOK D.P.11.



OUR WAR EFFORT

363,280,000

YARDS OF ASHTON CABLE

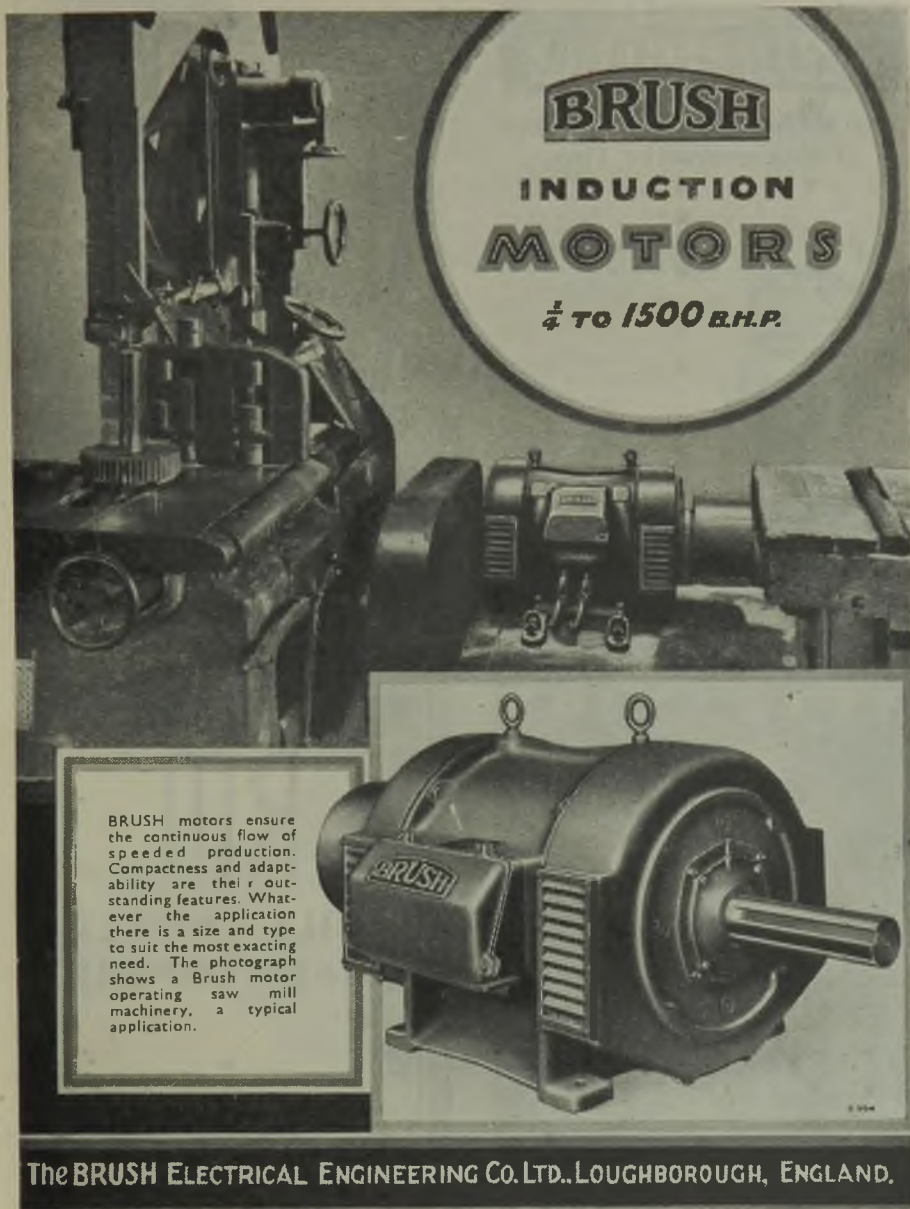
have been supplied by Aerialite Ltd. to
the Fighting Services to date.

CABLES FOR LIGHTING, HEATING, TELEVISION,
RADIO, TELECOMMUNICATION, ETC.

AERIALITE LTD

Castle Works

STALYBRIDGE · CHESHIRE



BRUSH
INDUCTION
MOTORS
 $\frac{1}{4}$ TO 1500 H.P.

BRUSH motors ensure the continuous flow of speeded production. Compactness and adaptability are their outstanding features. Whatever the application there is a size and type to suit the most exacting need. The photograph shows a Brush motor operating saw mill machinery, a typical application.

The BRUSH ELECTRICAL ENGINEERING CO. LTD., LOUGHBOROUGH, ENGLAND.

BRANCHES: London, Manchester, Leeds, Birmingham, Newcastle, Glasgow, Cardiff, Belfast, Dublin

B-21

FOR BETTER JOINTS IN LESS TIME

ERSIN MULTICORE

The Solder Wire with 3 Cores
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- Avoids Dry Joints.
- Speedily makes Sound Joints on Dirty or Oxydised Surfaces
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- No additional Flux required.
- Approved by Air Ministry and G.P.O.

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

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Specialists in:-

**SWITCHGEAR and
CONTROL EQUIPMENT
AUTO & CAPSTAN PARTS
PRESS & WELDED WORK**

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**COILS, CHOKES
TRANSFORMERS**

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TEAM VALLEY,
GATESHEAD, II.

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In the engineering industry, and particularly in the aircraft industry, photography is already widely used for applying drawings to metal or wood surfaces. The photographic process is much quicker than hand-scribing, requires less skilled labour, and it excludes the possibility of error.

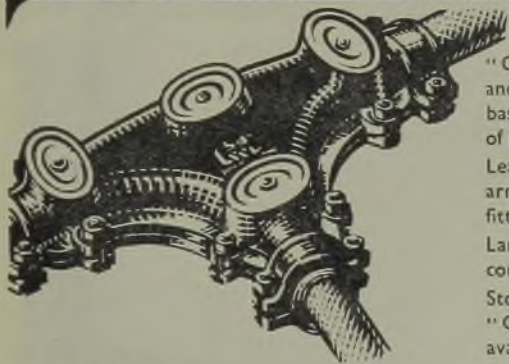
A similar process can also be used with plastics, and the advantages are the same as with metal. The application of surface designs to—for example—dial faces, instrument panels, and pictorial panels can be carried out photographically with speed, economy and accuracy.

Other ways in which photography can be used to solve problems in the electrical industry will undoubtedly suggest themselves to technicians, to whom full details of the Kodak transfer-sensitising materials will gladly be supplied by

KODAK Limited,

Dept. 84, KINGSWAY, LONDON, W.C.2.

CABLEGRIP SERVICE BOXES



"Cablegrip" Service Boxes ensure speedy and trouble-free jointing. The design is based on long experience, and allows plenty of room for making the conductor joints.

Lead strip applied round the lead sheath and armouring, and secured by the "cablegrip" fittings, ensures efficient bonding.

Large compound filling holes make the compound filling operation easy.

Stocks of "Cablegrip" Service Boxes, and "Cablegrip" Straight Through Boxes are available for immediate despatch.

Write for Catalogue UCD.2.

Trade  Mark

HENLEY

ELECTRICAL DISTRIBUTION EQUIPMENT

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

R·E·A·L SERVICE

Chapter One

OUR WAR EFFORT

Lightly passing over the production of some million—or so—lighting devices for A.R.P., Dock and Harbour work, Aircraft work, Airborne equipment, "D" day and "D" night and other war purposes . . .

. . . and almost forgetting, in the passing of time, that we were one of the pioneer firms engaged in the development and production of tank-busting equipment . . .

. . . we can now tell you that a major reason for the inevitable shortage of "R.E.A.L." equipment for general use was our devotion to the production of the famous P.I.A.T. bomb.

SWITCHGEAR *by* SPECIALISTS

Installed Intelligently



Controlled Confidently

REYROLLE

HEBBURN - ON-TYNE
— ENGLAND —

**A SINGLE INSTRUMENT
PATTERN A.C. TESTING
SET**

The Elliott "Weameter"

A combined testing set for A.C., for the measurement of Amperes, Volts and Watts on one instrument.



- ★ With the addition of a small portable current transformer, the instrument meets the requirements for a testing equipment for the engineer in charge of a works or any industrial plant.

Full description upon request.

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SIMPLEX



CRYSELCO



LAMPS

Fuel Watchers need Good Lamps

• CRYSELCO • LIMITED • BEDFORD •



How many homes for how much?

The post-war demand will be for good houses in large numbers at reasonably low prices. How is the building industry to meet it? One thing is clear. As many components as possible will have to be factory-made on the most efficient and highly mechanised lines.

One kind of equipment for every building—electrical switch and fuse gear—has been manufactured by M.E.M. in this way for many years. They have shown how cost can be progressively reduced and quality improved by steadily perfecting large-scale production on the basis of experience. The war has added to this experience and the benefits will be at the service of Installation Engineers when peace comes.



'Meminx' Switch Splitter



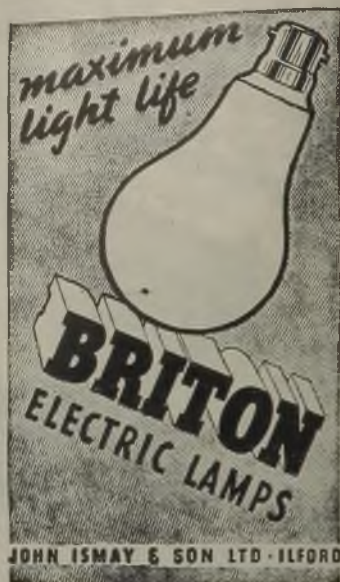
SWITCHGEAR • MOTOR STARTERS
FUSEGEAR • ELECTRIC FIRES

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London Showrooms and Stores: 21-22 Rathbone Place, London, W.1 • Manchester Showrooms and Stores: 48-50 Chapel Street, Salford, 3

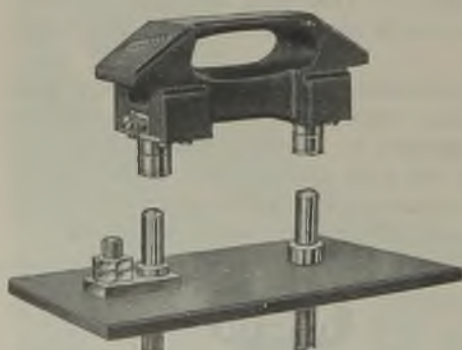


M.S.M. are specialist manufacturers of tilting type mercury switches suitable for instrument work, domestic and industrial apparatus and power control gear.

THE MERCURY SWITCH MANUFACTURING
CO. LTD.
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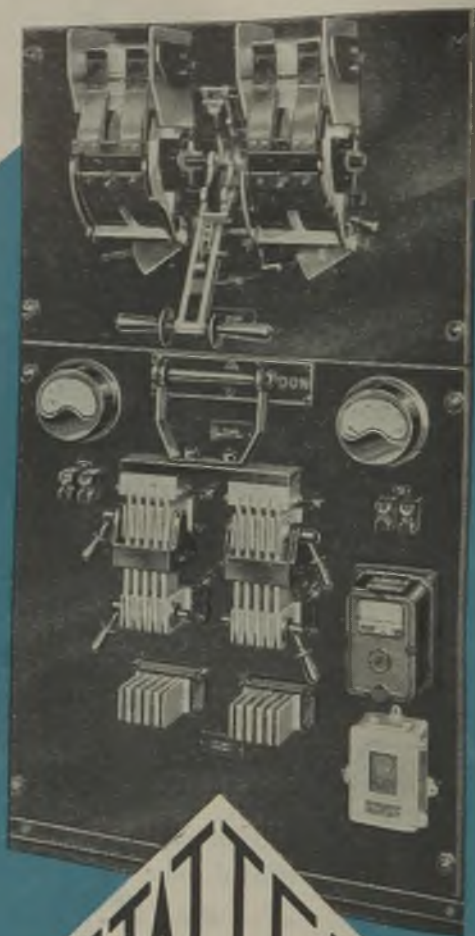
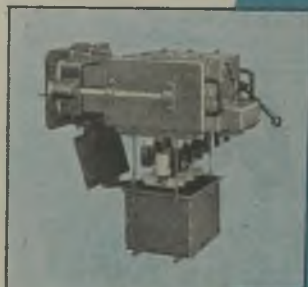
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ELECTRICAL REVIEW

April 20, 1945

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Vol. CXXXVI. No. 3517.

APRIL 20, 1945

9d. WEEKLY

Next Winter—and After

The Fuel Position

ACCORDING to Ministerial warnings, the fuel position next winter is likely to be worse. This will affect the public supply of electricity in several ways. Short of coal, the public will tend to use more electricity, which being generated by the less efficient plant will use a disproportionately large amount of coal per kWh, thereby encroaching still further on the exiguous stocks at the power stations. Anxiety on account of coal stocks is expressed in the Report of the Central Electricity Board for 1944, which is reviewed in this issue. It seems most unlikely that during the coming summer they can be brought up even to last year's low level, which has proved insufficient to meet all contingencies.

Inevitable Delays

A further serious result of extra demands for electricity will be an aggravation of the present shortage of *effective* generating capacity, the reasons for which, in so far as they related to the immediately preceding years, were discussed in our issue of February 16th. The position in this respect, the Report shows, still gives grounds for perturbation. Immediate war requirements have necessarily been awarded first claim on manufacturing resources by the Government, but the fact remains that nearly half of the new plant capacity required to meet the load for the next four years or so still awaits Departmental permits. After these have been granted no unnecessary engineering delays need be feared. Other consents will, however, have to be obtained, particularly

in regard to the limited number of sites that are technically suitable for installing the new plant and its connections. The securing of these consents often involves delicate questions of amenities, entailing a hard choice between electrification on economic terms and the preservation of something having æsthetic value or, perhaps as it may be found, only the merit of old age.

Difficulty of Maintenance

It is most unfortunate that the past winter was exceptionally severe, so that the equivalent of a year's plant extensions was needed to meet the additional load on cold days. The shedding of load should have been unnecessary with a normal allowance for plant out of commission for repairs, since the margin of installed capacity above maximum demand should have been ample at that time. On critical occasions, however, this margin has become negative on account of a plant-casualty rate that has been quite four times the pre-war figure—a state of affairs that is due mainly to non-availability of even half the number of extra men required to keep up a routine overhaul schedule for plant that is running at a higher load factor than its obsolescent state in many cases would ordinarily warrant.

The Board, in asking the Government to decide how any prolonged restrictions of supply should be arranged, if necessary, has had the courage to face possibilities squarely. It is important that the public should be brought to realise that any

temporary inability to maintain the usual high standards of continuity of service is not due to defects in the organisation of electricity supply. If the public is prepared in advance and kept informed of the facts it will, we doubt not, be ready to accept the situation as it has accepted many worse. Any discomfort that may be suffered will after all be immeasurably less than those endured in most countries—some indication of which is provided by the relatively small outputs of the mobile power stations which have been made in Great Britain for restoring essential supplies in devastated cities.

RECENT suggestions

Back-Pressure that generating plant Turbines extensions should be held up pending investigations

into the feasibility of installing back-pressure turbines have been rejected by the Minister of Fuel and Power on the ground that the plant is urgently needed. The idea behind the question was the use of exhaust steam for district heating. The thermo-dynamic case for doing so was clearly stated by Mr. J. H. Harris before the I.E.E. Tees-side Sub-Centre as a result of successful operation of a process-steam installation in a works in which one would expect the ratio of steam to electricity requirements to be exceptionally high. In extending the principle to public electricity supply he is less convincing and still less so in his submission that no more condensing stations should be built in the immediate future.

Too much reliance seems

Process to be placed by Mr. Harris on the early establishment of self-

contained communities and the possibility of attracting to them industries that would take process steam of a reasonably constant amount throughout the life of the station, say twenty years. He would obviate the difficulty of non-coincident demands for steam and electricity by running in parallel with the local network, but this would surely be practicable in only a minority of cases. Even the C.E.B. grid can absorb only a limited amount of dumped energy, as the recent Severn Barrage Report showed, whereas 3 million kW of plant will be required within the next four years or so, and its manufacture must be put in hand now.

Oil-Engine Generation

IN his letter published in this issue, Mr. W. E. Jones states the case for the use of oil-engine stations for "peak lopping." He has, however, missed our point. We were not concerned with the practicability or desirability of running these in parallel with public supply systems. Indeed we expressly took it for granted that existing arrangements for reciprocal supplies would be fully implemented. Nevertheless, while the demands for skilled labour and material are such as to threaten to delay the construction of needed units in main stations, national resources should not be frittered away in manufacturing equipment that could give little aid in emergency even if operating conditions were suitable.

Visual Problems

OF all the applications of electricity, illumination—although one of the earliest—is probably the least completely worked out in practice. This is not on account of any extraordinary complexity in what may be termed the physics end of it, but because of the variety of individual conditions to be met and because the eye and not the photometer must be the judge of results. The last-named formed the basis of the paper presented by Mr. R. O. Ackerley before the I.E.E. Installations Section last week. His summary of the large number of factors to be allowed for was satisfyingly comprehensive and well organised. They can be applied to existing as well as to new installations.

I.E.E. Sections

ALTHOUGH the limited sectionalisation of the Institution of Electrical Engineers has proved its worth in catering for specialised technical interests, it is as well for those concerned to have a reminder occasionally that they are all primarily members of a larger body. Only the Institution as a whole can co-ordinate the work of the Sections and, further, ensure that their achievements are seen against the broadest possible social background, which they may thereby profoundly influence. Good advantage was taken of the opportunity afforded by the Installations Section luncheon last week by the many members of other Sections present to demonstrate the essentially common factor of their profession.

Electron Lenses

Their Fundamental Mechanism

SOME details of the design of electron lenses were given in an article on the electron microscope which appeared in the *Electrical Review* for February 18th, 1944. These lenses are an important feature of cathode-ray oscillographs and an essential part of television transmitters and receivers, electron-diffraction cameras, as well as electron microscopes. The growing utilisation of electron tubes has increased interest in their optical components, and in the fundamental mode of operation of both electrostatic and magnetic lenses. In common with other scientific devices, a simple explanation is only rendered possible by ignoring certain factors which unduly complicate the action; such as the effect of mutual repulsion upon the trajectory of an electron stream. It should therefore be understood that the present treatment is an approximation, but one which is considered quite justified for present purposes.

In the previous article it was stated that any electric or magnetic field having axial

By **W. Wilson,**
D.Sc., B.Eng., M.I.E.E.

motion and the direction of the flux, just as in the case of a conductor in a motor armature.

These elementary principles can be employed to produce true lens action.

Optical Lenses.—Every lens depends upon refraction, so a beginning may be made by considering the familiar "light" lens, usually made of glass. Suppose four men are walking in line across a field, part of which

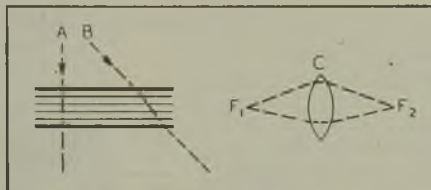


Fig. 2.—Principle of optical lenses

(XY in Fig. 1) consists of a ploughed strip of uniform width. At A the men are advancing at right angles to this strip and thus all reach the margin XX together; consequently all are slowed down at the same time and speed up again on emerging at YY. The heavier going has thus retarded their progress, but not altered their direction. At B, however, they approach the ploughed strip obliquely and are therefore slowed up in succession; the man on the right making only half the progress of the one on the extreme left until the latter also reaches the margin of the "heavy going." Thus the direction of advance is bent, or "refracted," to the right. The opposite effect takes place as they emerge and the original direction is restored.

Now this effect is quite similar to that of a strip of glass interposed in the path of a light-beam. At A (Fig. 2) where the strip is perpendicular to the beam the speed of the latter is retarded, but its direction is unaltered, whereas at B not only is the speed reduced in the glass, but the beam is bent, or "refracted," to the right. Finally, the simple bi-convex lens at C (Fig. 2) is so designed that all rays emanating from F_1 are bent at the glass surfaces in such a way that they reach the same point F_2 on the other side of the lens.

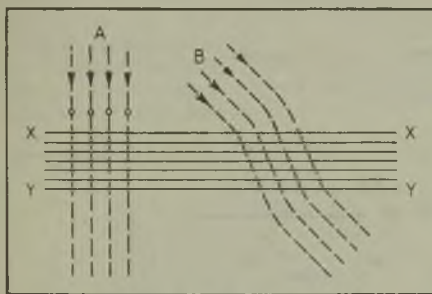


Fig. 1.—Analogy of optical refraction

symmetry is capable of functioning as an electron lens; examples were given of each type. It was also explained that as the electron beam consists of a stream of negative charges of electricity, which are naturally attracted or repelled by unlike or like electric charges in their vicinity, deflection by means of an electrostatic field is not difficult to understand. The moving electrons constitute an electric current, so that wherever the latter cuts a magnetic flux it is urged in a direction perpendicular both to its own

It will be observed that the longer the path of the rays, the shorter will be the distance in the glass; hence the fundamental property of a lens may be deduced, indicating that

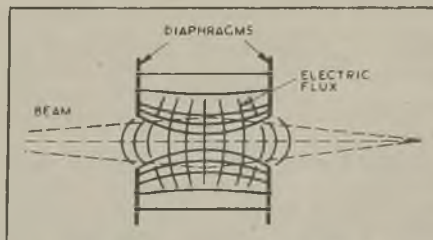


Fig. 3.—Two-disc electrostatic lens used in cathode-ray tubes

all rays from the original source F_1 reach the final point F_2 at exactly the same time. A further consequence is that the light waves will arrive in step with one another. These examples show that the basic effect of the glass is to retard the speed of the light, and its power to do so is termed its "index of refraction."

Electrostatic Lenses.

—An electrostatic field set up between any two conductors maintained at different potentials is usually represented in diagrams by "lines of force" drawn in the direction down which the potential falls from the one conductor to the other. An important property of the lines is that of mutual repulsion.

If, therefore, a metal disc pierced by a central hole is opposed by another (Fig. 3) the two being maintained at different potentials, such as 100 V and 250 V respectively, the lines of force (or flux) between them will curve inward between the holes. Then an electron passing at high speed through the holes so as to cut the lines will be bent in the opposite direction to the lines it cuts. The action can be visualised most clearly by drawing in the equipotential lines, which are always at right angles to the flux. They form sections of curved surfaces, symmetrical about the axis of the discs. Now the potential of the field is analogous to the refractive index of an optical lens and,

consequently, the equipotential surfaces correspond exactly with the surfaces of the glass lenses. The chief difference between the two systems is that whereas the refractive index changes suddenly as the rays pass from air to glass and, therefore, all the bending occurs at the lens surfaces, the potential of the field changes gradually so that the bending is distributed throughout the length of the flux.

Two coaxial tube electrodes (Fig. 4) with the lines of force only sketched in the upper half of the diagram to avoid confusion, will serve to indicate the shape of the equipotential surfaces, which again behave like the surfaces of glass lenses in focusing the beam. It is not necessary for

the tubes to be of different diameters. The optical glass equivalent is shown in the lower part of the figure, the refractive index of the bi-concave element being assumed to be relatively weak.

The formation of a condenser lens at the cathode by means of the cathode cylinder, which is maintained at a negative voltage with respect to the cathode (Fig. 5) illustrates its function. It causes more of the radiation from the

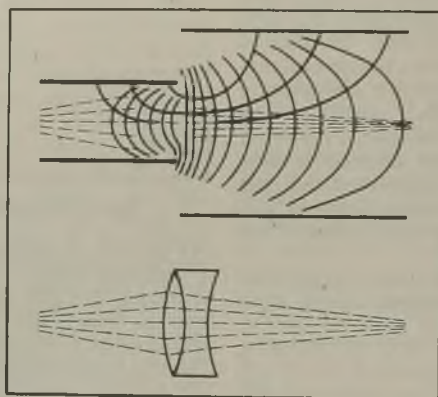


Fig. 4.—Two-tube electrostatic lens with optical equivalent below

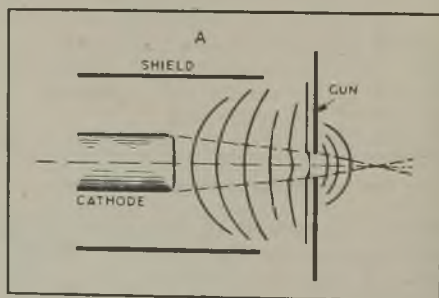


Fig. 5.—Electrostatic condenser lens of cathode-ray tube

cathode to pass into the beam than would otherwise be the case, just as with the glass condenser of a projecting lantern. Since the focus of the electronic "condenser" can be widely varied by altering the voltage of the cylinder, the quantity of the rays passing

through the aperture can be varied through a wide range, from maximum brightness to a complete blackout. The electronic condenser is thus able to adjust the beam and is hence frequently termed the "modulator." Since this function is analogous to that of the control grid of a radio valve, it is often called simply the "grid." It is an important feature in a cathode-ray oscillograph because it can initiate the beam when required for recording transients, provide for hand control of the brightness of the spot, and regulate automatically the brightness in proportion to the speed of travel. Finally, it is an essential component of a television tube, in which it is responsible for the graduations of light and shade in the picture.

Other arrangements of electrostatic lens electrodes are based on the same principle. Most glass cathode oscillographs possess one, consisting of two discs (as in Fig. 3) with a tube at an intermediate voltage between them. Adjustment of the focus is carried out by altering the voltage of the tube. The G.E. electron-microscope (shown in Fig. 4 of the previous article) employs three lenses, each consisting of three discs, the outer of which are at earth potential and the relative ones at a relatively high voltage.

Magnetic Lenses.—Magnetic fields are more familiar than electrostatic to electrical engineers, since the great majority of electrical machines, apparatus and instruments require the production of a magnetic flux for the development of

mechanical force or motion through interaction between the field and a live conductor. Fluxes of moderate strength, suitable for long focus lenses, are induced by circular coils without an iron circuit; but intense and concentrated fields for high magnification

lenses require an almost complete magnetic circuit with the short gap so shaped as to create the flux just where it is wanted. A

permanent-magnet core could be used without any winding and, if made of one of the new high-retentivity alloys, would have ample strength for most requirements, but would lack the capability of being "focused" by rheostatic control.

The action of the magnetic lens is rather different from that of the electrostatic. Let the distributed dots (Fig. 6) represent an end view of a parallel and uniform set of lines of force going down into the paper. Also let the small circle E be an electron moving towards the paper. So long as it is travelling parallel to the lines of force, it will not cut them and is hence not affected by them in any way. But if its motion has a component transverse to the flux, it will be acted upon by a force which may be predicted by Fleming's "left-hand" rule; a moving electron being recognised as a current flowing in the conventional direction of anode to cathode, which is opposite to the motion of the electron.

Thus if the transverse component be upwards as shown, the electron will be acted upon by a clockwise force perpendicular to that direction. Since the field is uniform, the resultant motion will be in a circle as in the diagram; that is, the electron will follow a helical course. The correctness of this conclusion may be checked by considering the converse action of a current being made to flow in a helical course, when it will induce an axial flux as is shown in the figure.



Fig. 8.—Finch-type electron-diffraction camera showing electro-magnetic lens (focusing coil) and vacuum pump
A, diaphragms; B, focusing coil; C, specimen port; D, viewing ports; E, mercury vapour trap; F, vapour pump

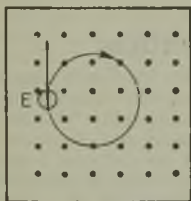


Fig. 6.—Representation of deflection of electron stream by uniform magnetic flux

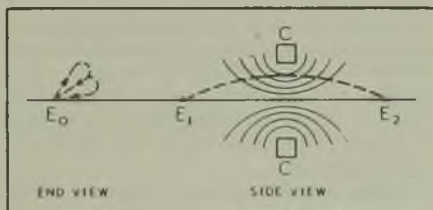


Fig. 7.—Focusing of electron stream by magnetic lens

Next, suppose the field is not parallel and uniform, but is localised by being generated by a coil CC (Fig. 7) then the end view of the motion will be not circular, but straight in that part of the course before reaching the flux, then more or less circular while in the flux, and straight again after leaving it. Adjustment of the magnetising current would be necessary to make the electron return to its starting line and so be sharply focused.

It should be observed that the transverse motion (Figs. 6 and 7) is independent of the

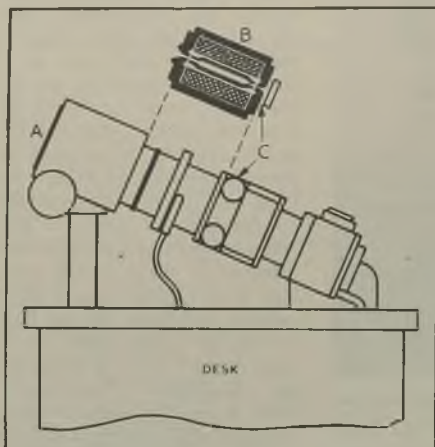


Fig. 9—Console-type RCA electron-microscope showing double electromagnetic lens

A, fluorescent screen; B, sectional elevation of lens; C, object holder

direction of travel along the axis. If therefore the electron on reaching E_2 were to start returning by the path along which it arrived, it would not retrace its course as through an optical lens, but would move still further in a clockwise direction, as shown by the dotted loop. For a completely reversible path, the directions of both the electron and of the flux would have to be reversed. This is analogous to the reversal of a motor by reversing either the armature or the field, but not both.

A consequence of the magnetic method of focusing is that the image is bodily rotated, as the exciting current is varied. This, however, is the only result of the spiral direction of the electrons, since in spite of the twist all of them reach the focal point in the same time.

Magnetic lenses are used in several forms. For large cathode-ray oscillographs a plain coil is fitted outside the tube (Fig. 8) where it

is shown mounted on micrometer screws in order to adjust its electrical axis, which does not as a rule correspond with the mechanical axis.

For electron microscopes, because the shortest possible focus is required, an iron-clad magnet with very short air-gap and specially shaped pole pieces is used. As the useful magnification is proportional to the sine of α , the angular aperture of the lens, this is made as large as possible by placing the object very close to the lens, to make 2α nearly 180° and sine α nearly unity. Hence the air-gap is usually at one end of the magnet "pot" and, in addition, it is commonly necessary for the object holder to be lowered into the bore in order to reach the most favourable position. These features were all exemplified in the microscope shown in section in Fig. 4 of the article of February 18th, 1944, p. 220.

A final example may be given of a double lens consisting of a single magnetic circuit with one coil and two air-gaps, constituting the objective and projection lenses respectively of the R.C.A. "console" type microscope briefly described on p. 221 of the previous article, in which its maximum magnifying power was shown to be $\times 100,000$. The side elevation (Fig. 9) of the microscope, with a cross-section of the two lenses adjacent to their position in the tube, indicates the shapes of the air-gaps for securing the optimum configuration for the lens-flux. The fluorescent screen occupies the upper end of the tube, with the large knob beneath it whereby the photographic plate is rotated into place before the screen when the record is to be taken.

Girl Apprentices

THE Spring issue of the *Woman Engineer* (journal of the Women's Engineering Society) refers to the inequality existing between girls and boys in the matter of apprenticeship. "Equal pay," it says, "is a more topical claim . . . but the full unqualified right to apprenticeship on exactly the same terms for boys and girls would be a still greater boon to would-be women engineers." After a reference to the attitude of the trade unions, which is said to be "not obviously hostile," gratification is expressed at the opportunities provided by such concerns as Metropolitan-Vickers, W. H. Allen, Sons & Co., and the Brush Electrical Engineering Co., the last of which has recently extended its training scheme to include girl student apprenticeships.

Central Electricity Board

Report for 1944

IN our issue of February 16th we reviewed the annual reports and accounts of the Central Electricity Board covering the period 1940-43 then released for publication. The report for 1944, the seventeenth, has now been issued (Whitehead Morris, Ltd., ls.) and its salient particulars are given below.

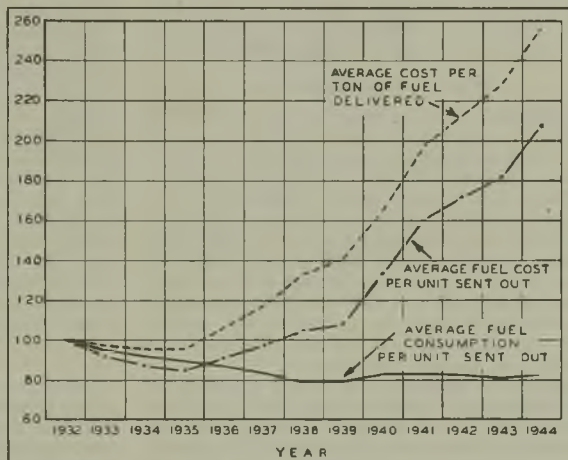
Since the beginning of the war we have from time to time recorded changes in the composition of the Board, which is now as follows:—Mr. Harold Hobson (chairman), Lord Barnby, Sir Percival Bower, Mr. Frank Hodges, Mr. R. P. Sloan, Sir Duncan Watson (who represents the C.E.B. on the North of Scotland Hydro-Electric Board), Sir Ralph Wedgewood and Mr. W. K. Whigham. Its chief officers are: Sir Johnstone Wright (general manager), Messrs. J. Hacking (chief engineer), E. R. Wilkinson (commercial manager), D. W. Coates (chief accountant), C. L. Poyser (solicitor), O. A. Sherrard (secretary) and the district managers. The latter comprise Messrs. E. J. Edgar (Scotland), V. A. Pask (N.E. and M.E. England), C. T. S. Arnett (N.W. England and N. Wales), W. S. Burge (C. England), J. N. Waite (S.E. and E. England) and J. T. H. Legge (S.W. England and South Wales).

At the end of last year, the grid comprised 5,142 miles of transmission lines, 3,614 of which were operated at 132 kV, and included 348 switching and transforming stations with a transformer capacity of 13,422,750 kVA. Reinforcements and extensions made during 1944 were: A 132-kV double-circuit line (27 miles) between Natland (near Kendal) and Barrow-in-Furness to connect the Corporation's recently selected Buccleuch Street station to the grid; a 132-kV line between Brighton and the Board's substation at Southwick; three lines, one at 132 kV and the others at 22 kV for supplying war factories; a double-circuit line, 9½ miles, between Melksham and Bath. In addition modifications to existing lines were made in order to avoid interference with the construction of aerodromes and extensions to war factories.

The installed capacity of the 141 selected stations at the end of the year amounted to 11,254,081 kW, while 48 other stations were operating for the Board under temporary

arrangements. Public supply stations generated 38,354 million kWh—3.8 per cent. more than in 1943 or 45.2 per cent. more than in 1939. Apart from North Scotland, all but one-tenth of the electricity supplied by authorised undertakings was produced at stations generating for the Board. The load factor on the grid was 47.6 per cent.

A maximum simultaneous demand of 8,351,000 kW* was made on December 29th (7,867,000 kW in 1943), when over 18 per cent. of the output capacity of all Board-



Trend of price and consumption of coal

directed stations was out of service, compared with a pre-war average of 6 per cent. In exceptionally cold weather on November 9th and 16th, about 200,000 kW (2½ per cent. of the system's load) was shed for about half an hour each day in the southern part of the country. At those times the plant out of service represented 26 and 23 per cent. of aggregate capacity. Much of this increase in the normal allowance is attributed to the retention in service of obsolete plant, increase in boiler repairs due to inferior and unsuitable quality of coal and shortage of labour. Regarding the last named, only 44 per cent. of the requisite additional labour required was provided by the Ministry of Labour.

During the summer coal stocks were built up to 3,550,000 tons—310,000 less than in the previous year. In the early months of the year less than two weeks' consumption was held at some stations and coal had to

* The figure rose to 8,653,000 kW on January 25th, 1945.

be sent to South Wales during a miners' strike there. Difficulties in obtaining suitable qualities continued, reducing the available capacities of the boilers and hence of the stations, resulted in a loss of availability of as much as 300,000 kW.

Coal cost at the Board-directed stations 39s. per ton in 1944, as against 14s. 9d. in 1935 and 20s. 3d. in 1938. As this 85 per cent. advance beyond the 1938 figure has been brought about by flat-rate increases, the rise in price has continued its trend of being relatively greater to public generating stations than to the average of the home market. Overall thermal efficiency was only slightly higher than in 1938 owing to the running of older plant and the use of inferior and variable quantities of coal so that in spite of a much higher load factor and new efficient plant, the average cost per kWh sent out was 99 per cent. over the 1938 level.

Delayed Plant Extensions

Although it is estimated that 3,394,000 kW of new generating plant will be required to meet anticipated demands up to 1948, over 1,500,000 kW still awaited Government release for manufacture. Extension programmes approved for completion comprised 253,000 kW outstanding for 1944, none for 1945, 992,600 kW for 1946 and 557,600 kW for 1947. In addition 535,000 kW for 1947 and 641,000 kW for 1948 had been approved provisionally but not released for manufacture, while 414,000 kW for 1948 was still subject to further consideration.

After the Board has obtained approval of its programmes and has issued directions for extensions, it still remains necessary for the authorised undertakings concerned to secure the requisite statutory consents. To the war delays occasioned by lack of suitable priorities and hence of adequate labour there have recently been added other delays that arise out of the expectation of those interested in town and country planning that developments of the grid and the selected stations connected with it should conform to conditions that are inconsistent with technical and economic requirements.

Among technical developments recorded is that of the installation of two further nitrogen-pressure cables, in which mass-impregnated paper replaces the pre-impregnated dielectric of earlier cables. Manufacturers tested under working conditions 132-kV 94,000-kVA three-core nitrogen-pressure cable (not previously in commercial service in any country) and a 132-kV self-contained nitrogen-pressure single-core cable which had been developed from a similar 66-kV cable already in operation on the grid. The first 132-kV oil-filled cable to be operated under water was laid in the bed of the River Cart.

Air-blast switchgear is stated to be more rapid and adaptable for reclosing than the

oil-filled type and is expected to prove inherently less costly for higher voltages and rupturing duties. Two breakers of three installations comprising ten units in all (the first on the grid for more than 66 kV) were nearing completion at the end of the year. Although protective gear operated 1,134 times, as compared with 400 as a pre-war average, 93.5 per cent. of the faults were cleared correctly. In order to obtain maximum speed of operation for relays, most of the new protective gear on primary overhead lines was of the carrier-current type. A large-scale experiment on 12-kV cap-and-pin glass insulators has given encouraging results. Methods developed by the Board's staff of measuring, indicating and summing at control rooms the outputs of individual power stations are in successful service.

Revenue during the year was enough to meet all outgoings, including interest and amortisation, and to increase the credit balance on net revenue and appropriation account by £1,154,653 after setting aside £500,000 towards deferred maintenance and £1,000,000 in respect of prospective liability for taxation. The balance of this account now exceeds the total interest, amounting to £6,132,529, paid out of borrowed money in earlier years. Maximum borrowing powers are £70 million, of which approximately £56 million have been exercised—£39.76 for general purposes and £16.23 for standardisation of frequency.

War Record

An appendix summarises the contribution of the Board to the war effort. It is divulged that the central pool of reserve equipment provided out of the Electricity (Civil Defence) Fund was dispersed over thirteen localities; it included 94 transformers, 350 switch equipments, 118 miles of single-core cable and 39 miles of overhead line components. Some of these items were used for expediting supplies to war factories. All 132-kV and vulnerable 33-kV grid substations were protected against blast by surrounding walls.

Of the 1,979 faults on lines caused by the war up to the end of 1943, only 14 per cent. were the result of enemy action; of the remainder 73 per cent. were due to barrage balloons and 13 per cent. to low-flying aircraft, A.A. shells and military exercises. More than two-thirds were cleared without interruption to supplies. No lattice transmission tower was destroyed by a bomb until February, 1944. The emergency control room in Birmingham for the Central England area was twice destroyed. Communication for control was throughout available in each district, the most critical conditions being when 34 out of 63 private lines in south-east England were put out of action by the raid of May 10th, 1941. Loss of power-station capacity never exceeded 400,000 kW. The

most serious incident was when 190,000 kW at the Fulham station was put out of service, but local supplies were restored after a few hours by means of the grid substation.

Before the war the South-West England and South Wales Area used to export about 7,000 kW in the winter, while the South-East England Area imported 96,000 kW. Under war conditions the former has imported up to 244,000 kW and the latter has exported 292,000 kW. This changed load distribution

necessitated the reinforcement of the grid in 1941 and 1942 by 363 miles of 132-kV lines. Towers and cadmium-copper conductors were secured from the United States in fifty-two shipments, two of which were lost owing to U-boats, and some further losses were incurred in air raids after landing. During the same period 71 miles of 132-kV lines and 58 miles of lower-voltage lines were erected solely for supplying new war factories with individual loads of up to 50,000 kW.

Training Radio Workers

Relative Importance of Physics and Engineering

LAST month's discussion meeting in London of the Radio Section of the Institution of Electrical Engineers considered apprenticeship and training systems. DR. J. GRIEG introduced the subject with the explanation that the purpose of the discussion was to deal not with those general problems of training which were common to all or to most branches of engineering, but with such special features or problems as were characteristic of the radio industry.

He said that on the craft side the employment of a wide range of insulating materials necessitated knowledge of special machine-shop and processing techniques which constituted an addition to the stock-in-trade of the craftsman engaged in radio manufacture. It could hardly be claimed, however, that such knowledge or skill was of an essentially electrical character. Specific electrical skill and knowledge appeared to be requisite rather in the assembly and testing branches. Outside the purely manufacturing sphere, both installation and maintenance called for electrical craftsmanship of a closely similar type.

One of the important questions concerning trade apprenticeship in radio was whether there should be general recognition of an electrical trade containing the basic elements of electrical skill common to most branches of the industry. The training of technicians and potential professional engineers appeared to be very similar to that in heavy electrical engineering, but there were interesting points of difference. For example, in the manufacture of valves, cathode-ray tubes and other electronic devices, physics and chemistry had important first-hand applications. For the young physicist or chemist destined to act in a specialist professional capacity in valve manufacture, there was need for the inculcation during a training period of the engineering approach to production problems. For a young technician engaged in this class of work it might well be difficult to say in individual cases whether the bias should be towards physics or towards engineering. Possibly the choice might be determined in

such cases by the preference of the individual. There was need for a technician qualification in physics and something of the character of an apprenticeship must be developed to meet the requirement.

A somewhat parallel problem arose in connection with the personnel employed in research and development work. Where industrial research proceeded along fairly fundamental lines the knowledge and skill involved were those of the physicist rather than of the engineer. At the other end of the scale, development and design had essentially an engineering rather than a physics technique. Radio research demanded competence in branches of electrical theory at levels much beyond those of university undergraduate courses. The need for this additional (and expanding) stock of electrical knowledge had for the most part been met in the past by laborious private study. It was clearly desirable to initiate a programme of post-graduate courses designed specifically to meet the needs of radio research workers.

Haphazard Pre-War Methods

In the discussion that followed, stress was laid on the haphazard nature of much pre-war training, and many speakers emphasised the fact that the radio industry had depended largely on ex-amateurs for its technical workers. Several speakers thought that far too much stress had been laid in the past on the need for specialised training in "craftmanship" for the radio industry. Much discussion took place on the relative importance of physics and engineering in the training of the higher grade of technicians and engineers. The general tendency was to stress the importance of physics to those engaged in the radio manufacturing industry.

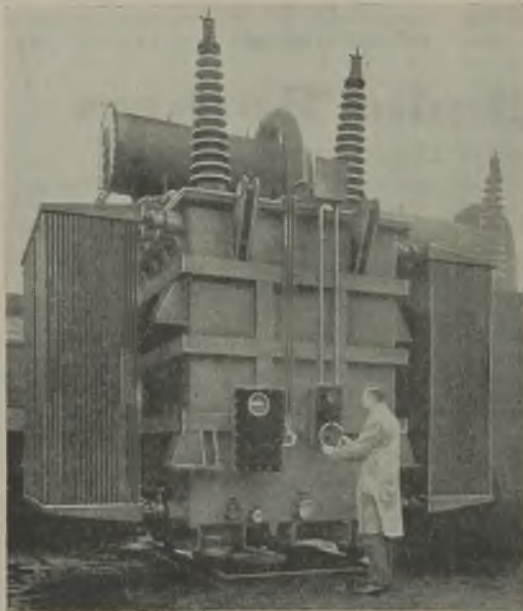
Several speakers held that the principle of alternating periods of work in industry with study was likely to have disturbing effects. Vocational training outside normal working hours was deprecated. A suggestion was made that the grade of "craftsman-designer," well established in other spheres, should be thrown open to suitably trained entrants to the radio industry.

Aid for Russia

High-Voltage Transformers

IN the description of manufacturers' activities during the past year, published in the January 12th, 1945, issue of the

Separate Fully Insulated Tapping Winding



Fully assembled single-phase transformer

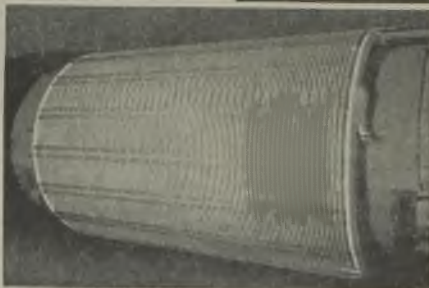
Electrical Review, reference was made to the construction by C. A. Parsons & Co., Ltd., of four 10,500-kVA single-phase transformers. We are now able to inform our readers that these transformers are for export to the U.S.S.R. and to give further information on their design. They are of special interest in consequence of the system requirements for fully insulated windings for 115-kV operation, together with a large variation in the voltage ratio by fully insulated tappings on the 115-kV windings.

Each transformer is a single-phase 10.5-MVA outdoor unit suitable for

The higher-voltage winding comprises a number of continuously wound disc coils, the whole winding being a continuous length of conductor

forming a three-phase 31.5-MVA bank with a ratio of 115/10.5 kV. A fourth unit was constructed as a spare for the bank. The transformer windings are fully insulated throughout, the higher-voltage windings being designed to withstand a pressure test of 231 kV to earth. Tappings covering a range of plus and minus 10 per cent. in $2\frac{1}{2}$ per cent. steps, were provided and connected to a fully insulated high-voltage off-circuit tapping switch.

The core of each single-phase transformer is of three-limb design embodying a wound central limb. This is of multi-step construction with one axial row of core bolts and clamp plates, whilst the outer limbs are of rectangular section, clamped in a similar manner. An oil duct is provided throughout the core limbs and yoke

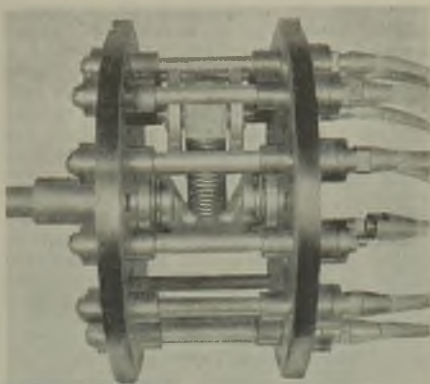


The start and finish of each tapping coil are brought along the face of the coil and flexibly connected to the off-circuit tapping switch

to ensure uniform cooling. Substantial mild-steel frames are provided, together with axial tie bolts. The frames have been designed and

constructed to support each column of spacers throughout the winding, without the use of separate pressure rings and screws. The top frames are adjustable axially, so that in the remote event of winding shrinkage taking place after prolonged service, the pressure can be adjusted by pulling down the top frames by means of the tie bolts.

The provision of a 20 per cent. total tapping range on the higher-voltage fully insulated winding presented a number of problems, electrical and mechanical, for the provision of such a wide range of tappings in the middle of a 115-kV winding under impulse conditions leads to high inter-coil stresses, a matter which presents difficult insulation problems. Further, the provision of such a wide tapping range in the middle of the limb, under short-circuit conditions, gives rise to large out-of-balance forces which are difficult to control. The problem was finally solved by providing a separate fully insulated tapping winding wound on the outside of the main higher-voltage coil, the tappings being distributed in such a manner that on each position a coil of full winding length is cut in or out of circuit. The windings are arranged with the low-voltage coils next to the core, followed by the high-voltage winding and finally a high-



Special rotary tapping switch

voltage tapping winding on the outside. The major insulation between windings comprises insulating cylinders and flanged end rings of oil-impregnated press-board.

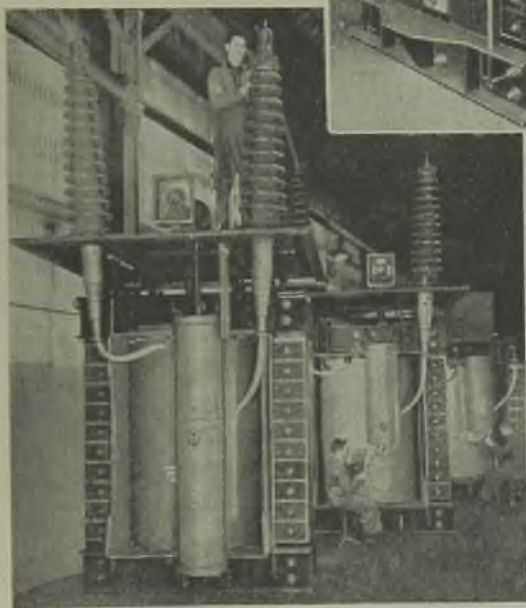
The lower-voltage

The core of each single-phase transformer is of three-limb construction with a wound central limb

winding comprises a two-layer cylindrical coil with a number of paper-insulated rectangular conductors wound in parallel. Suitable cross-overs are provided to reduce the stray losses to

a minimum, and axial oil ducts ensure uniform cooling of the winding. The higher-voltage winding comprises a number of continuously wound disc coils, the whole winding being a continuous length of conductor, composed of two parallel rectangular conductors, wrapped together with paper tape, and with suitable cross-overs distributed throughout the length of the winding. Each disc coil is separated by radial spacers dovetailed to laths over which the coil is wound. The start and finish of the higher-voltage winding terminate in static end rings which are paper insulated.

The transformer-tank cover and the higher-voltage bushings are assembled with the transformers out of their tanks to ensure correct alignment



The fully insulated higher-voltage tapping winding comprises a number of paper-insulated rectangular conductors wound in spiral form, each complete turn being separated by insulating spacers. The start and finish of each of the separate tapping coils are brought along the face of the coil and connected through flexible connections to the off-circuit tapping switch. In order to provide major insulation to earth and provide a further safeguard in the mechanical stability of the higher-voltage tapping winding, a thick bakelised paper cylinder is finally slipped over it and fixed with axial wedges to ensure complete mechanical rigidity.

Nine-Position Tapping Switch

The voltage variation range requires a nine-position tapping switch insulated for a pressure test to earth of 231 kV and for a test between contacts of 57.5 kV. The switch was specially developed to meet these requirements and also the voltage conditions which are met with in service when the transformer is subject to impulse voltages. The switch comprises two insulated plates in which the fixed contact rods are assembled, the moving contact comprising a spring-loaded double-roller contact, arranged to give a snap action during switching from step to step. Special connectors are provided on the base of the contact assembly to allow flexible paper-insulated cable to be connected between the switch and the tapping winding. The contact assembly is housed in bakelised-paper cylinders, each end of which terminates in a non-ferrous clamp rigidly connected to the transformer top and bottom frames. The tapping switch is connected by means of a flexible coupling to a drive on the top of the tank cover. From this point a chain wheel drive is provided to allow operation of the tapping switch from ground level.

The assembly of the transformer-tank cover and the higher-voltage bushings is effected with the transformers out of their tanks to ensure correct alignment and to check the electrical clearances of the higher-voltage bushings and phase connections, which terminate in the top of the outdoor bushings. The fully assembled single-phase transformer is complete with tubular radiators, conservator, explosion vent, higher-voltage bushings and junction box. The transformer is mounted on swivel rollers which are suitable for running on standard rails in two directions. The hand-operation mechanism for the tapping switch includes a position indicator which clearly shows at ground level the position of the tapping switch. The transformer tank is of robust mild-steel fabricated construction, suitable for withstanding vacuum drying on site. An outdoor junction box houses a mercury-in-steel oil-temperature indicator with

alarm contacts, together with the wiring terminations from a gas-actuated relay and remote oil- and winding-temperature indicators. The control cables terminate in glands on the junction box. The four single-phase transformers were successfully tested in accordance with the requirements of B.S.S. 171, and a full-load heat run was carried out on one unit before despatch from the works.

Charges in London

Parliamentary Questions

ON April 10th in the House of Commons Sir William Davidson asked the Minister of Fuel and Power whether he would make a statement on the present position with regard to the large increases in charges for electricity which had been made during the war by Central London Electricity, Ltd., and other companies; whether any recent review of the position had taken place; and what action was being taken in the matter.

Major Lloyd George said that the Electricity Commissioners periodically reviewed the financial position of Central London Electricity and other companies. Though there had recently been some improvement in the position of the company named he did not feel justified on the information before him in taking any action in the matter at present.

Sir W. Davison asked whether the Minister was aware that although the Notting Hill and other electric lighting companies advertised all sorts of electrical equipment, when inquiries were made by the public about the installation of this equipment they were put off with various excuses, including the high charges in connection with this installation. Did he not think that an inquiry should be made?

Major Lloyd George said that he would be glad to go into the matter if the questioner would communicate with him.

Comparison with other Undertakings

Mr. Silverman asked if the Minister could explain why the charges for electricity by this private company in London were nearly three times the corresponding charges for electricity supplied by municipal undertakings all over the North of England?

Major Lloyd George replied that one reason was that in 1940 the experience of electricity companies in the North of England was very different from that of companies in London. There had been evacuation and damage on a large scale there, and a great increase in the cost of equipment.

Sir Herbert Williams: Is the Minister aware that the charges of this company have been halved and that the costs of telephone calls have been doubled?

Mr. Silverman: Does the Minister realise that the comparative costs of electricity in London and elsewhere in the country before the war and before any of these considerations applied, were always largely to the advantage of the areas outside London, and that the ratio was always nearly two to one?

Major Lloyd George said he could not answer that question without notice, but he would think it would depend very largely upon the type of area which the company served.

CORRESPONDENCE

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

Pressure upon Space

I AM in full agreement with the views expressed in your recent leading article on the above subject. The technical Press fills the very important and almost vital role of enabling engineers to keep up to date. Every attempt must be made to strengthen its position. Most association and institution journals confine themselves mainly to their own activities and this policy should be continued. If this were departed from on a big scale it would inevitably adversely affect the general technical Press, with considerable disadvantage to all concerned—including the readers.

It is commonly accepted that most copies of technical journals are read by many individuals so that the actual circulation is much higher than the apparent figure. We all realise that it is just as important that we study the advertisements as it is that we read the technical matter. It is therefore ardently hoped that the present policy of the main British technical journals of keeping the two separate will be continued. The policy of mixing advertisements and technical articles and splitting up the latter into parts widely separated in the journal as is followed in certain foreign papers leads to exasperation.

If it is dictated by the advertisers I think it can be safely said that it tends to defeat its apparent object as I have yet to meet the individual who will give praise to the scheme.

Slough.

F. E. BUTCHER.

Earthing in Rural Areas

JUDGING by his article in your issue of April 6th, Mr. R. Mallet's experience seems to be in line with that of most engineers concerned with rural earthing. I am surprised that engineers faced with these difficulties do not at least investigate the claims made for voltage-operated protection, which is in extensive use on the Continent. Some details of this system are given in the two E.R.A. Reports, "The Safety of Consumers in Rural Areas"—later amended, I believe, to "The Use of Protective Multiple Earthing and Earth Leakage Circuit Breakers in Rural Areas," but I write without these documents before me.

In addition there is a considerable amount of published matter concerning the system, and it would seem that not only would some measure of safety be achieved by its use—safety now being largely problematical—but in addition a great deal of expense saved. The author of the article refers to the use of leakage trips on heavy connected equip-

ment, but does not pursue the matter to its logical conclusion—the use of voltage-operated protection on the neutral line.

Norfolk.

T. C. GILBERT.

Gas for Power Stations

YOUR correspondent Mr. Roper must be severely answered when he suggests that gas should be diverted to electric power stations instead of consumers (*Electrical Review*, March 2nd). In viewing the gas situation does one consider that gas is a by-product in the production of coke or that coke is a by-product because people want gas? The chemical by-products are now of little economic importance, although on a broad view they should be treated as a source of vital importance in our economy.

Any consideration of reallocating the use of coal should be entirely dependent on the efficient utilisation of the potential heat therein. Only in this way can the actual prices charged to the consumer be minimised. Conversely, any consequent inefficiency must raise the price to some consumers, apart from price increases from any other direction.

The major source of loss of heat is in the rejection of heat in the condensate from turbines, and to use gas which has already been through a process at a gas station, and therefore at an efficiency appreciably less than 100 per cent., must waste more of the potential heat.

When one considers the usage of coal from the national point of view, electricity becomes so low in efficiency of heat utilisation that it should be used only in instances where no other source of power is convenient. Thus the basic heating of houses should certainly be by gas, since thermostatic control irons out the fluctuations in pressure, which make gas unsuitable for cooking and lighting as compared with electricity in large communities and also in remote rural areas.

If one is to advocate anything on a large scale from a new angle it should be that such things as central heating and general hot water supply in domestic premises and process heating in factories should be derived from a system of district heating, utilising the heat which is otherwise wasted in our thermal power stations.

I am quite willing to go a little way with your correspondent and suggest that whereas district heating cannot be applied to existing power stations, because the final temperature of the output water would be too low for domestic purposes, I would tolerate the topping up of this temperature by large

gas boilers specially installed to avoid the heat waste in existing stations. But is there all this gas to spare, and why not use coal?

It is a matter of regret that the future electricity plans for the country, amounting to some £90,000,000, include no mention of district heating and indeed any reconsideration of the problem would put these plans back possibly several years.

As an engineer, and since district heating is novel and, at least in this country, experimental, although a great deal of information respecting this system is known, I would advocate that the powers that be carry on with approximately half their programme along existing lines and reconsider the other half of their problem, including district heating.

London, N.W.8.

L. E. C. HUGHES.

Oil Engine Stations

THE views expressed in your leading article of April 6th are, I think, somewhat prejudiced and are not based on a full knowledge of the utilisation of oil-engine generating stations for public electricity supply. As an engineer of a public supply undertaking with many years' practical experience in the operation of an 11-kV oil-engine station running in parallel with the grid, I should like to express my views as follows.

The parallel operation of even comparatively old AC and DC (through the medium of motor generators) oil-engine generating plant with the grid should present no difficulty whatsoever. Even under conditions of very low frequency and bad surges the oil-engine plant has stayed on load, and continued to operate quite satisfactorily. Also no trouble has been experienced with a private heavy-oil engine station operating in parallel with the undertaking's supply system. Actually suitable heavy-oil engines have certain electrical and mechanical advantages over steam turbines under certain fault and surge conditions.

With reference to the 0.3 per cent. output as quoted, practically all public supply heavy-oil-engine generating stations operate on very low annual load factors, due to their use being generally restricted to winter peak loads, with which they deal more efficiently than would steam generating plant. For stand-by purposes the value of this type of plant cannot be over-emphasised, especially because only a small proportion of consumers' load is of a vital nature. Where continuity of supply is absolutely essential as in water and sewage pumping and communications, oil-engine plant with its quick starting and other advantages can be of immense value if, and when, local failures of supply occur.

With the apparently ever-increasing cost of coal, heavy-oil engine plant should be able

to effect a considerable saving in costs for peak generation, especially as fuel-oil costs will decrease when shipping and insurance charges are lowered and for other economic reasons. The provision of oil-engine sets of 10,000 kW and upwards presents no difficulty, and they should receive the consideration they merit. In conclusion I venture to predict that the internal-combustion turbine will be one of the prime-movers of the future, though possibly not for the next few years, perhaps even in the conservative public electricity supply service.

Basingstoke.

W. E. JONES, M.I.E.E.

Guarantees

MR. FERNS' letter might be summed up as saying that "everything in the garden is lovely." That may be true if you ignore the weeds. He states that the conception of a percentage guarantee is fundamentally unsound, and having propounded the only meticulous solution which he admits is quite obviously not practicable, concludes by admitting that some other method of ensuring an adequate return had to be evolved, *viz.*, the guarantee method. Since one is fundamentally unsound and the other not practicable, I presume Mr. Ferns would say, "You pay your money and take your choice."

His meticulous solution, however, does not work out in practice; even if a consumer does pay the special capital charges involved, the tariff charges will not take care of all the undertaking's normal working and capital costs involved *unless there is an adequate consumption at these tariffs*. His statement that 20 per cent. on the capital outlay has been shown to be reasonable on the average is not borne out by the experience of all the undertakings in the country.

Mr. Ferns has missed the main point of my article in which I only re-stated from another point of view what both the McGowan Report and Sir John Kennedy in his I.E.E. paper drew attention to, *viz.*, the progressive decline in the efficiency of distribution capital. This can only be remedied by an increased consumption per consumer, and this in turn can only come about by a reduction in tariffs. The connection of new consumers without an adequate guarantee (another way of saying not less than the average consumption) throws a burden on the undertaking, as Mr. Ferns admits, so the desired result is not obtained, thereby preventing both a reduction in tariffs and an increase in consumption per consumer.

Mr. Ferns has fallen into the trap of comparing increase in revenue solely with increase in mains and services outlay, but if he will carefully examine the accounts of all undertakings he will find that there is more than the increase in mains and services

outlay to take into account. An outlay of £100 on mains and services will itself entail a cost of approximately £7 per annum to the undertaking, but a revenue of £7 will be insufficient to avoid a loss, and even £20 will be equally insufficient. If Mr. Ferns can demonstrate by facts and not his own theories that this is not the case, it will be most interesting.

If, as Mr. Ferns asserts, 20 per cent. pays, what happens to the 100 per cent. (or more) profit which all the undertakings obtain by collecting 40 per cent. from their consumers?

London, W.C.2.

F. W. PURSE.

Educational Qualifications

■ SYMPATHISE somewhat belatedly with your correspondents of February 16th in their pessimistic view that occasionally educational qualifications do not bring their reward and are not therefore worth the effort, and, in particular, are not, in some instances, recognised as being of value by their employers.

In my definition a man is acting as a true engineer only when he is responsible for making technical decisions on behalf of his non-technical superiors, i.e., those who employ him. If he is not satisfied with the way in which he is treated by his non-

technical or semi-technical superiors, there is only one remedy, to get out and seek employment with others who do value his technical competence. The difficulty in moving about in wartime should be a greater incentive to obtain more "paper" qualifications for use when these difficulties end. There are ways of changing jobs, but they cannot be explained on paper!

Having left an educational career to direct research in industry, I take considerable interest in the continued education of my assistants, and make sure that whatever they are doing they have full information and understanding in their work. They have their own duplicate files, and every drawing, report or letter originating with one of them bears their initial, and a copy is routed back to them. The result is that there is no lack of new ideas from them; these are sorted out, and any suspicion of anything clearly new is sent immediately to the patent department. A successful filing of a patent means a monetary reward and a splitting of profits made outside the firm.

They are encouraged at all times to attend meetings of learned societies, and to take their proper status in such bodies, particularly the Institution of Electrical Engineers.

RESEARCH.

PERSONAL and SOCIAL

News of Men and Women of the Industry

ON the invitation of the National Executive Committee of the South African Trades and Labour Council, Mr. E. W. Bussey, general secretary of the Electrical Trades Union, has been selected by the General Council of the Trades Union Council to make a lecture tour in South Africa.

Sir Clive Baillieu, K.B.E., C.M.G., has been elected president of the Federation of British Industries in succession to Sir George Nelson, who has been president for the past two years. On the formation of the Export Council in 1940, Sir Clive Baillieu was appointed an executive member. In January, 1941, he became Director-General of the British Purchasing Commission in the United States. A year later he was appointed head of the British Raw Materials Mission in the United States and the British representative on the Combined Raw Materials Board. On his return to this country in 1943, he retired from these posts and was elected deputy-president of the F.B.I. and subsequently chairman of its Empire Committee.

Mr. F. J. Cole, who was recently appointed borough electrical engineer and manager at West Bromwich, was educated at Dulwich, the Friends' School, Saffron Walden, the Northampton Engineering College and Loughborough College. He was a pupil with the Brush Electrical Engineering Co., Ltd., and in 1925 became assistant engineer to the Weston-super-Mare & District E.S. Co. From there he went in 1928 to Bermondsey as technical

assistant and was then successively assistant distribution engineer at Walthamstow, deputy electrical engineer and manager at Darwen, and electrical engineer and manager at Shipley. Mr. Cole is a member of the Institutions of Electrical and Mechanical Engineers.

Mr. Alfred Clark, chairman of Electric & Musical Industries, Ltd., who as we reported last week has been elected first president of the

Radio Industry Council, has had many years' experience in the gramophone and radio spheres. He began his career in Edison's laboratories fifty years ago; he introduced the phonograph to this country and has been responsible for the building up of the great E.M.I. organisation. In this connection he has been a leading contributor to radio and television progress; his company was largely responsible for the Marconi-E.M.I. television system adopted by the B.B.C. The picture accompanying this note is a reproduction of part of the portrait of Mr. Clark by Professor Artur Pan presented to him by his co-directors recently.



Mr. Alfred Clark (from a portrait by Artur Pan)

Mr. A. W. Jackson, honorary treasurer of the Liverpool Engineering Society for the past ten years, has been elected president of the Society. He is a member of the Institution of Civil Engineers and the Institution of Naval Architects. **Mr. H. Hamer**, city engineer and surveyor, has been elected senior vice-president and **Mr. J. Cormack** junior vice-president.

Mr. Norbert Merz, A.C.A., F.C.I.S., chairman of A. Reyrolle & Co., Ltd., has retired after forty-four years' service with the company. He was secretary of the company from its formation in 1901 until 1912, and has been a



Mr. G. Wansbrough



Col. B. H. Leeson

director since 1918 and chairman since 1939. **Mr. George Wansbrough**, Comp.I.E.E., deputy-chairman of the company, who succeeds him as chairman, has been a director of the company since 1934, and is also a director of C. A. Parsons & Co., Ltd., the British Power & Light Corporation, Ltd., Morphy-Richards, Ltd., Ross, Ltd., and other companies. **Col. B. H. Leeson**, O.B.E., T.D., M.I.E.E., director and general manager of A. Reyrolle & Co., Ltd., has been appointed managing director. He has been with the company since 1919, and has been closely identified with the technical development of the company's products. He has read a number of papers before the Institution of Electrical Engineers and other professional bodies. He is also a director of E.R.A. Patents, Ltd., Morphy-Richards, Ltd., and the British Short-Circuit Testing Station, Ltd.

Mr. Robert Lonsdale, of Birkenhead, has been appointed deputy burch electrical engineer and manager at Paisley, subject to official sanction.



Mr. R. Lonsdale

After five years spent in lecturing in electrical engineering subjects at the evening classes of the Burnley Municipal College, **Mr. Lonsdale** joined the Nelson Corporation Electricity Department in 1925, holding successively the appointments of switch-board attendant (power station), engineer-in-charge and technical assistant. In 1935 he was appointed technical assistant (consumers' department) and power

sumers' engineer at Birkenhead. In 1940 he was chosen for the position of electrical engineer to the Brierfield Urban District Council, but decided not to take up the appointment.

The Telcon Repertory Players, under the direction of **Mr. Michael Le Grice**, presented at the Telcon Works Concert Hall, Greenwich, on April 5th their thirty-fourth performance of **Kenneth Horne's** brilliant comedy "Love in a Mist." The play was excellently received by a very large audience which included **Sir Geoffrey R. Clarke**, C.S.I. (managing director) and other senior officials of the company. The "Players" have performed to all branches of the British and Allied forces and have augmented the Telcon Comforts Fund by approximately £130.

Mr. Frank Allen, M.I.P.E., has been appointed general works manager (Radio Division) to E. K. Cole, Ltd., and will control the company's radio factories. He served his apprenticeship with the Austin Motor Co., Ltd., and subsequently held executive appointments with that company and with other concerns. In 1941 he joined E. K. Cole, Ltd., and was until recently works manager of the Aylesbury factory.

Mr. E. H. Taylor, A.M.I.E.E., A.M.I.Mech.E., boiler house superintendent at the Ironbridge power station of the West Midlands Joint Electricity Authority, has, as already announced, been appointed power station superintendent at the Bradford Electricity Department's Valley Road power station.

A native of Hull, **Mr. Taylor**, who is forty-six, was educated at Hull Technical College. His technical training was received with the Hull Corporation Electricity Department, with which he served from 1928 to 1932 as charge engineer. He went to Ironbridge as charge engineer in 1932, becoming boiler house superintendent in 1935. Throughout the last war he served in the R.N.V.R. He was in the Home Guard from May, 1940, to December, 1944, being second in command of the Ironbridge power station company.



Mr. E. H. Taylor

Mr. H. Ainsworth, A.M.I.E.E., of the City of Plymouth Electricity Department, has been appointed to the position of consumers' engineer with the Harrogate Electricity Department. He was formerly with the Blackburn and Newport, Mon., undertakings.

Mr. Reginald W. Ayers, who has held the position of general manager to Sciaky Electric Welding Machines, Ltd., Slough, for the last four years, has been elected to the board and now takes up the office of managing director.

Mr. Arthur Hughes has resigned his position as managing director of Henry Hughes & Son, Ltd., after fifty years' service. He will continue to serve both Kelvin, Bottomley & Baird, Ltd., and Hughes as an advisory and consultative director. The appointment is announced of **Mr. F. A. King** and **Mr. G. B. G. Potter** as joint managing directors of Kelvin, Bottomley &

Baird and Henry Hughes & Son. Mr. King was a scientific assistant to Lord Kelvin, and Mr. Potter joined Henry Hughes & Son, Ltd., when that company associated itself with the Smith group of companies, of which S. Smith & Sons (England), Ltd., is the parent. Mr. Potter is also a director of Smith's Aircraft Instruments, Ltd.

Mr. R. G. Whitehead, joint chief electrical engineer and manager of Oldham Corporation Electricity Department, is to retire on superannuation at the end of this month. Mr. Whitehead was born at Liverpool and was educated at Wigan Grammar School, Bootle Technical College and Liverpool University. He served an engineering apprenticeship at the White Star Line works, Bootle, and for a time he was a seagoing engineer. In 1904 he joined the Wigan Electricity Department as charge engineer and three years later went to Oldham in a similar capacity. He was subsequently appointed mains engineer and later chief assistant engineer under Mr. F. L. Ogden, on whose retirement in 1941 he became joint "chief" with Mr. E. Binns.

Mr. C. A. F. Shapcott having relinquished his commission in the R.A.S.C. on account of ill-health, has now joined Morphy-Richards, Ltd., as sales executive. Before the war he was with the General Electric Co., Ltd., for a number of years, both in London and the North Midlands.

Mr. A. M. Perry, whose appointment as deputy electrical engineer and manager of the Southwark Electricity Department was recently announced, was born in 1907 and after education

at King's College School and Faraday House received practical training with the G.E.C. at the Fraser & Chalmers Works and at Birmingham. In 1921 he joined the Hackbridge Electric Construction Co., Ltd., and the Hewitt Electric Co., Ltd., as assistant chief of test and later transformer designer. He went to the London J.E.A. in 1934 and served in various sections, becoming personal assistant to the chief engineer, Mr. F. W. Purse.

In 1940 he was seconded to the Electrical Branch of the Factory Department, and acted as electrical inspector for the S.E. England Area and, in 1924, for the Midlands Area. Mr. Perry holds the London B.Sc. (Eng.) degree and is an associate member of the I.E.E.

At a meeting of the Ashford Urban District Council on April 9th, a presentation was made to Mr. H. Wilson, engineer and manager of the Council's electricity undertaking, on his retirement. The presentation consisted of a framed

address containing a graph of the progress of the undertaking, and a silver salver. It was stated that a wireless set would follow. The gifts were accepted by Mrs. Wilson, as the retiring engineer was unable to be present owing to ill-health. At the same meeting a welcome was given to Mr. Ramsden Mellor, previously engineer and manager at Kendal, who succeeds Mr. Wilson.

Mr. A. V. Cannon, who for the past forty years has been with the General Electric Co., Ltd., engaged on the use, sale, application and development of telephones, bells and fire alarm systems, has retired. He joined the G.E.C. in 1904 at its Manchester branch as manager of the bell and telephone department, after ten years with the National Telephone Company. After four years at Manchester he went to London to the company's bell and telephone department at its head office in Queen Victoria Street, and he has been associated as technical adviser with the department ever since.

Mr. J. F. Duffield, who has severed his connection with J. A. Crabtree & Co. after many years' service, has been appointed technical manager of M. K. Electric, Ltd.

Obituary

Mr. J. MacLaren.—We regret to report the death at Wanstead on April 9th of Mr. John MacLaren, A.M.I.E.E. Mr. MacLaren was station superintendent at the Bow Road station of the London Power Co., Ltd., but retired a year or two ago on account of ill-health. He was formerly at the company's Bow station.

Mr. A. Ladd, who had served for the past thirty-seven years as secretary to three borough electrical engineers and managers of Brighton, recently died at the age of sixty-one.

Calculating Illumination

THE lumen method of calculating illumination is discussed in a paper presented by Mr. G. S. H. MOGFORD to the London Students' Section of the Institution of Electrical Engineers.

The author commences with theory and derivation, based on the fact that one lumen per sq. ft. is equal to one ft.-candle. But that relationship is always modified by losses, which are taken into account by introducing into the formula a "room utilisation" factor, defined as the ratio of the total useful flux to the flux emitted by the lighting fittings. Normal practice is to group that factor and efficiency together into a "coefficient of utilisation," which is defined as the ratio of total useful flux to bare-lamp flux. The formula will then indicate the value of illumination to be expected from a system in its initial state, but it will be of little significance until a factor (either a multiplication or its reciprocal) is added to allow for depreciation.

Two only (flux and area) of the four terms in such formulæ can assume definite values because the others can only be ascertained from study of conditions prevailing in each specific case. Their assessment has been the subject of much research, the results of which are summarised by the author, who supplements them with practical considerations relative to the determination of coefficients of utilisation.



Mr. R. G. Whitehead



Mr. A. M. Perry

Electricity and Agriculture

Position Explained to Farmers

ADDRESSING the Farmers' Club on Monday, Mr. H. W. Grimmitt (Electricity Commission) referred to a unanimous feature of all reports presented by electrical associations to the Ministry of Fuel and Power regarding the reorganisation of electricity supply, viz.:—the need for full rural development. This work had been well begun by engineers and but for the war, he believed, would have been almost completed. Nevertheless, farms could now be electrified if the County Executive Committee certified that this would increase food production.

In 1939 there were 768,000 consumers in rural England and Wales, i.e., 63 per cent. of the total number of dwellings. The number of farms taking a public supply would be known when the Ministry of Agriculture published its census. Electricity was available in practically all villages with over 350 inhabitants and to 75 per cent. of the dwellings. The main backbone of mains—about 40,000 miles—had been provided and only spur lines remained to be constructed. Experience had shown that a rural area need have no urban background to be financially successful.

Fully-Planned Systems

Electricity supply had not been State-subsidised as in nearly all other countries. Another marked difference was that here the industry had planned its systems to cater for all predictable loads and had encouraged the use of heavy-current apparatus, which had entailed the cost of heavy mains. The use of electricity on farms here compared favourably with the Tennessee Valley.

The price structure of electricity supply was based on a gross return of 20 per cent. on capital expenditure and the kWh rate had to be kept to the minimum to encourage full use of electricity, so service charges to isolated farms were necessary. These farms usually required individual transformers costing with fittings at least £100 and high-voltage lines costing £300 to £600 per mile. Power on tap was obtainable at a running cost lower than for any other prime mover and the capital contribution was almost always less than charges on private plant. A prosperous industry could hardly ask for a subsidy in regard to the 25 per cent. of unremunerative load still unconnected. Complete electrification could not be expected within the next five years, having regard to the man-power available, but the industry would make a good start in this direction.

The Electrical Research Association had prepared a specification for a farm-service line,

over 300 miles of which had been erected, which saved nearly 30 per cent. on capital cost. It was also partly responsible for the Essex high-load-factor mill and was investigating sterilisers. The Electrical Development Association had for many years undertaken publicity and exhibitions at agricultural shows. It would be helpful if the supply industry, through its associations, could produce a uniform method of arriving at a form of service charge (preferably an annual charge for a term of years) and the next step would be a standard form of tariff about which there could be no bargaining. County organisations, if they survived after the war, were recommended to employ an engineer to advise farmers and keep in touch with the supply undertakings. Rural work could never be successful without complete co-operation between farmers and engineers.

A vote of thanks was proposed by Mr. Beresford, who gave a reasoned case for cheapness and availability of electricity to the farmers. It was seconded by Mr. F. E. Rowland (G.E.C.), who pointed out that human power cost 10s. per HP-hr., so that at 1½d. per kWh there was a very wide margin in favour of electricity. He also referred to the legal inability of a tenant farmer in England and Wales, as distinct from Scotland, to obtain compensation for electrical installations on termination of a lease.

Copper Powder

A SHORT talk on powder metallurgy preceded the presentation of a recent paper by Messrs. G. E. GARDAM and A. W. HOTHERSALL before the Electrodepositors' Technical Society in London on the preparation of copper powder by the electrolysis of acid copper-sulphate solutions.

The authors outlined the design of pilot-scale plant for producing 1 lb. of powder per hour, pink in colour and of an apparent density of 1.3 g. per c.c. Casts were analysed and the deposition conditions reviewed, a method of recovering the wet powder without undue oxidation being described. By maintaining an inadequate supply of copper ions at the cathode surface the potential is caused to rise so that hydrogen gas is discharged with the copper; thus what normally would be a coherent deposit becomes powdery. The requisite vat conditions are obtained by using a solution of relatively low copper and high acid concentration with a high current density at a relatively low temperature.

The paper takes no account of the patent situation. It is based on investigations carried out in 1934 at the then Research Department, Woolwich, for the British Non-ferrous Metals Research Association.

B.E.A.M.A. in 1944

Preparations for Conversion of Industry

PAPER restrictions have again limited the annual report of the British Electrical and Allied Manufacturers' Association to small dimensions but sufficient is said to indicate the main activities during 1944. As foreshadowed in the chairman's address last April, the constitution of the Council was altered at an extraordinary general meeting in September by increasing the number of elected members from 18 to 24, and the number who may be co-opted from 7 to 10. It is hoped that this change will result in a better representation of the specialist manufacturers on the Council and adequate representation of the increased number of Sections, a reflection of the rapidly increasing membership of the Association.

For the fifth successive year, the activities of members have again been largely directed to meeting the requirements of the Government for war purposes, but the increased signs of approaching victory in Europe have resulted in both the Government and members turning their attention towards the problems of reshaping the industry on a sound basis when the requirements of goods for war purposes decline in favour of demands for goods for industrial and domestic needs. In both these spheres the Association has been in close contact with the Government Departments concerned, and the Council feels sure that its representations to the Government have been of real value.

Reconversion Discussions

Sir Harry Railing, chairman and joint managing director of the General Electric Co., Ltd., was elected chairman of the Association for the session, and Mr. P. S. Turner (Metropolitan-Vickers) the retiring chairman, was elected vice-chairman. Unfortunately Mr. Turner died in June, when Mr. L. W. Smith, a past chairman of the Council, was elected in his place. The Council, on behalf of all members, has during the year had many consultations and discussions with various Government Departments on the subject of changing back from war to peace conditions. In addition to this the Association has been represented on many committees of the Federation of British Industries, which have discussed the same problems with the Government from the wider angle of industry as a whole. The Association has been fortunate in the fact that Sir George Nelson, an active member of its Council, has been president of the F.B.I.

One serious question which is bound to arise is connected with the disposal of

Government surplus stores. Discussions with the Board of Trade and the Ministry of Supply have been carried out in the most friendly spirit, and with every indication that the responsible Departments are anxious and willing to meet the views which were first submitted by a sub-committee of the Council which studied this question, having in mind particularly the difficulties which arose after the last war when there was uncontrolled liquidation of Government stocks.

Export Trade

In October, a letter was received from the Board of Trade asking for the views of the B.E.A.M.A. on a number of problems which were bound to affect export trade in the immediate post-war period. A committee of the Council considered this letter and a reply was made to the B.O.T. that month giving the views of the Council on those problems as they would affect the various sections of the industry. An appreciation of the Association's help and guidance was immediately forthcoming from the B.O.T. The Export Groups have continued to function to the limited maximum extent now possible, and certain changes have been made resulting in closer co-operation between the Electrical Machinery and Electrical Goods and Apparatus Export Committees, and the appointment of a joint secretary to the two Committees.

Through its appropriate sections the Association has been in constant touch with the Ministry of Works concerning equipment for the Government-sponsored houses shortly to be erected. Standard types of equipment have been evolved, and large orders have already been placed with the industry. Various types of equipment have been installed in demonstration houses in several parts of the country. During the year, the Association published a booklet entitled "A Peep into the Future," setting out the ideas and possibilities for domestic electrical equipment after the war. A committee consisting of representatives of all sections of the Association interested in domestic electrical appliances has been formed for the purpose of furthering the use of domestic electrical equipment generally, and of co-operating with the E.D.A. and other kindred bodies.

During the year representations were made to the Treasury concerning the Government's method of cost accounting, and the Association's observations have been acknowledged and put on record by the Treasury.

Many difficulties encountered by members were resolved through approaches made through the Association. A booklet "Pricing of Government Contracts," was prepared and circulated to all members. It has been of considerable value to members in carrying on negotiations with Government Departments on questions of price.

The Association, through the F.B.I., has kept in touch with the Board of Trade concerning the Government's intentions regarding the control of prices in the immediate post-war period, and it is believed that as a result of those representations acceptable methods will be agreed with the whole industry.

Two meetings of the Joint B.E.A.-B.E.A.M.A. Committee were held during the year at which points of mutual interest were discussed, and agreement was reached on the approach to be made to the Government by both Associations on several matters of major importance. Discussions took place with the E.D.A., the C.M.A., and the E.L.M.A., and the Council was of opinion that a Joint Committee to consider questions relating to the development and use of electricity for domestic purposes was necessary, and that publicity and propaganda in that connection were advisable. A committee of the four Associations was set up and has held meetings at which questions of joint interest have been examined.

The personnel of the various Council

committees has been reviewed and brought up to date. In May, a new committee—the Publicity Committee—was established.

The Council was approached to support the setting up of a Professional Engineers' Appointments Bureau under the auspices of the Institutions of Civil, Electrical and Mechanical Engineers. The Council undertook, on the formation of the Bureau, that the Association would give financial support for the initial period until it became self-supporting.

At the request of the Ministry of Labour and the British Council, the Association has undertaken to ascertain members' views on the advisability of accepting for training in the post-war period students from overseas, and, if possible, to put forward a scheme to the Ministry for the industry as a whole. A questionnaire has been sent to all members, and reports will be made to the Ministry when the replies have been received and co-ordinated.

Three new sections have been formed, namely, the Electric Resistance Furnaces, Small Switch and Fuse Gear and X-Ray Apparatus Sections. Twenty-three new members were elected during the year.

The report concludes with references to the knighthood conferred on Dr. A. P. M. Fleming and to the deaths during the year of Mr. P. S. Turner, Mr. J. A. Hirst, Mr. Arthur Berkeley, Mr. Dudley Docker and Mr. A. G. Seaman.

Restoration of Prosperity

Probable Changes in Export Trade

SPEAKING at the annual general meeting of the Federation of British Industries on April 11th, Sir George Nelson, the retiring president, said that to secure the necessary restoration of prosperity the machinery of home and international trade must be put into motion on as great a scale as possible, and we must then ensure that we had our proper share. The raising of world prosperity was dependent on greater investment of capital, on improving and making available in greater measure technical and industrial experience to those who needed it, on co-operation in the establishment of new activities in many countries which in the past had not developed their economy. Capital from this country—anyhow, until our export trade had grown to the substantial dimensions necessary to provide the means for us to pay for our imports—could not be so readily available as in the past; but in the long run, the more our customers developed their own economy the more would they be able and willing to buy from us. The nature of our exports would undoubtedly change and that would hurt certain established interests, but this trend was inescapable if we were to increase the volume of our exports as a whole.

The general tendency would be for countries to develop industries to supply their own needs

of distributive goods, but out of this would arise a demand for capital goods or high-grade distributive goods from this country, the total volume of which, with a proper policy, could be made to exceed any loss in the field of distributive goods. It was quite clear that the future policy of this country must be based on its ability to export the necessary amount of goods and services to enable us to maintain our own standard of living and industrial activity, while at the same time contributing greatly to the prosperity of those countries from which we bought supplies.

Industry would have to re-equip its factories to bring them all up to date in the post-war period, and this task would need great expenditure. The Government had recognised this by pursuing a taxation policy which would encourage initiative and enable the building up of the necessary reserves to keep industry continuously up to date. The highest efficiency could only be obtained with the highest quality of workpeople, and it would be industrial suicide for this country to spend capital on the latest machinery unless steps were taken to see that it was manned by the very best people. The more expensive the machinery the more important it was that the skill and ability of the workpeople should be of the highest.

COMMERCE and INDUSTRY

The Public and Design. Interim Patents Report.

E.D.A.'s Exhibition Policy

AT a recent meeting the Council of the British Electrical Development Association re-affirmed its policy of not contributing from central funds to the cost of local exhibitions, but agreed to continue to lend materials and provide personnel when requested to do so. It was hoped, however, that in view of the shortage of materials exhibitions should be kept to the minimum.

Where an Area could provide its own equipment for a kitchen planning exhibition of four kitchens the Council would make a contribution not exceeding £500. If an Area could establish the need for more than one exhibition a sum equal to 50 per cent. of the cost of transport and erection would be provided from central funds, subject to a maximum for any area of £750. As regards agricultural shows, the Association could be responsible only for exhibits at shows of a national character. For others the responsibility should rest on the neighbouring undertakings although the Association would continue to give advice and assistance and make nominal contributions to any show of more than two days' duration.

Importance of Design

Speaking at a lunch given by the Design and Industries Association on April 11th, Sir Thomas Barlow, chairman of the Council of Industrial Design, said that those who believed in private enterprise claimed that they could be left to conduct their own affairs and to serve the community well without having to be dragged into it. Industrial design was one of the chief fields in which they had their chance and could prove their case.

Good design did not always mean better sales and higher profits; courage was called for in setting out deliberately on the path of progress. Some people setting out to make innovations in design had lost money. But these things were apt to come right in the end, given courage and persistence. Those who wanted to see progress in design would have on their side a much larger section of the public after the war, and would have against them much less dead weight of inertia and indifference than ever before. They were dealing with a new generation whose unprecedented experiences had given it a new outlook.

The Council of Industrial Design had four main lines of action—to help industry set up design centres, to propagate the whole idea of design to the public at home and abroad, to help in the training of designers and to advise

the Government on its own purchases. The great problems would be solved if manufacturers made use of the proper people and treated design as serious and important a problem as technological efficiency.

Duchess at J. & P. Works

The Duchess of Kent recently visited the Charlton works of Johnson & Phillips, Ltd. On her arrival she was received by the chairman and managing director of the company, Mr. G. Leslie Wates, J.P.; the deputy managing



At the J. & P. Works: (Left to right) Mr. F. O. Townsend (Inspector of Factories); Mr. G. Leslie Wates (chairman and managing director); the Duchess of Kent; Mr. W. Glass (deputy managing director and general manager); Lady Herbert; and Mr. W. D. Short (Inspector of Factories)

director and general manager, Mr. W. Glass; and Mr. F. O. Townsend, H.M. Inspector of Factories. At her Royal Highness's request no fuss was made; she wanted to see the men and women at their work. Accompanied by Mr. Wates and Mr. Glass, the party inspected the sheet metal department, the stranding shop, submarine cable laying and picking-up gear, the paper cable department, the switchgear and transformer departments and the rubber cable works, where many thousands of miles of all types of rubber, synthetic rubber and rubber substitute cables have been made for the Services.

During the tour some of the oldest employees of the company and several departmental managers were presented to Her Royal Highness by Mr. Glass.

Electricity in the Textile Industry

Mr. R. H. Harral, chief engineer and manager of the Blackburn electricity undertaking, presiding over a joint meeting of Blackburn Mill Managers' Association and the newly-formed Engineering Society on April 7th, said that the average mill could be run more cheaply by electricity than by steam. The "mend and make-do" policy practised in the textile industry long before the war, could not apply in the post-war era, and it was obvious that considerable capital cost would have to be incurred if we were to be in the forefront of engineering efficiency.

In an interesting survey of electric drive in cotton mills, Mr. S. Birchall (B.T.H. Co.), said the shortage of goods would continue

for many years after the war, and industrialists could, with greater confidence, plan for productive efficiency as never before. Electrical manufacturers thought the time was opportune to review existing plant and, where necessary, replace or convert it so as to increase production. Although the first mill was electrified in this country in 1905, the number of electrically driven mills was still under 20 per cent. The field for the electric drive was still in converting from steam and many existing steam plants were worn out or working at low efficiency. After emphasising the need for co-operation between the electrical and the textile machinery manufacturers, Mr. Birchall recommended group driving as less costly initially because of the probable policy of conversions rather than new erections.

Patent Law Reform

In an interim report (Cmd. 6618, Stationery Office, 1d.) the Board of Trade Committee on the Patents and Designs Acts, deals with the pressing need for a modification of the procedure under which applications are at present made for the extension of the term of patents in cases where the patentee has suffered loss or damage due to the war. After outlining the present procedure the Committee says that it considers modification necessary and recommends (with two members dissenting) that jurisdiction shall be given to the Comptroller so that a patentee may, at his option, apply to the Comptroller or to the Court with a right to appeal from a decision of the Comptroller. It also unanimously recommends that the Rules Committee of the Supreme Court shall be invited to modify the Rules referring to the advertisement of applications for such extension so as to make it obligatory only to advertise in the "Official Journal (Patents)." The urgency of the matter is stressed.

Aluminium Development Association

The Aluminium Development Association has been formed by the leading British concerns in the aluminium alloy production and fabricating industry to develop new and extended uses for aluminium alloys by initiating or assisting in the production of prototypes, encouraging research and undertaking propaganda designed to inform the public of the many uses to which this metal can be put. Membership is open to users. The association's offices are at Union Chambers, 63, Temple Row, Birmingham, 2.

Cossor Action Settled

It is reported that the King's Bench action by Sir Louis Sterling against A. C. Cossor, Ltd., alleging wrongful dismissal, has been amicably settled out of court on terms which are stated to be mutually satisfactory. Sir Louis was formerly chairman and managing director of the company.

Reorganisation of the Coal Industry

Mr. Robert Foot, chairman of the Mining Association of Great Britain, has prepared a supplement to his recent "Plan for Coal." In this he proposes that there shall be an electoral body to appoint the members of the Central (Coal) Board (other than the chairman). In certain circumstances there shall be provision

for appeal by individual colliery undertakings against decisions by the Board and an arbitral tribunal shall be established by Parliament, to adjudicate upon matters raised by consumers and workers; to which the Coal Commission could refer allegations that coal was not being mined with due regard to the national interest; and to which the Minister of Fuel could refer for investigation and report any matter in which the Board appeared to be failing in its responsibilities. The exercise of the financial powers of the Board would be limited initially and increased only with the approval of the Arbitral Tribunal.

A.S.E.E. Branch Papers Competition

As a result of the competition for papers read before branches of the Association of Supervising Electrical Engineers during 1944-45, the following prizes have been awarded:—First: "District Heating," by Mr. J. F. Bridge (Manchester); second, "Recording of Maintenance," by Mr. C. Rhodes (Leeds); and third, "Post-War Domestic Installations," by Mr. F. S. Ibbs (Liverpool). These papers will be read by the authors at the Association's meeting at the Lighting Service Bureau, London, on May 15th.

Exhibition of Measuring Instruments

Sir Maurice E. Denny, Bt., chairman of William Denny & Bros., Ltd., is to open an exhibition of measuring instruments and methods of inspection at the Royal Technical College Examination Hall, Montrose Street, Glasgow, at 11 a.m. to-morrow (Saturday). The exhibition, organised by the Ministry of Production, Regional Board for Scotland, will remain open for a week. Lecturettes have been arranged at specified times dealing with "Control of Quality," "Standards of Measurement," "Air Operated Multi-gauges," and "Methods of Gear, Spline and Hob Inspection developed by the N.P.L."

French Industrialists' Visit

With the approval of the British and French Governments, the Federation of British Industries has invited a small party of representative French industrialists to visit this country in order to resume the friendly contacts between French and British industry which have been interrupted by the war. These representatives will arrive in this country in the near future for a short visit. It is hoped that this general contact between the industries of the two countries will facilitate individual contacts between specific industries at a later date.

American Anti-Trust Charges

The Westinghouse Electric Manufacturing Corporation and Westinghouse Electrical International Company were charged by the United States Government in a civil suit filed in the U.S. District Court at Newark, N.J., with maintaining international cartel agreements to divide areas for the manufacture and sale of electrical equipment in violation of the Sherman Anti-Trust Act and the Wilson Tariff Act. The complaint charges that "the defendants and two co-conspirators have conspired to grant to each other exclusive marketing areas and to restrain competition in such regions in the manufacture and sale of electrical equipment." The Siemens

Schuckertwerke A.G. and the Siemens and Halske A.G., of Germany, were named as the "co-conspirators."

According to the complaint, a 1919 agreement between Westinghouse and International which specifies exclusive selling rights throughout the world is "now in effect." Siemens Schuckertwerke are said to have allocated the United States to Westinghouse for the manufacture and sale of electrical equipment and Westinghouse and International to have allocated to Siemens Schuckertwerke Germany, Austria, Danzig, Latvia, Lithuania and Estonia as its exclusive territory.—*Reuter* (Newark, N.J.).

Restrictions on Heating

It is announced that the use of central heating in non-industrial establishments, including shops, offices, blocks of flats, and places of entertainment, and of alternative methods of heating (e.g., gas, electric and coal fires) in non-residential parts of these premises is now prohibited, except under permit, in England and Wales until October 31st. The restrictions do not apply to premises used wholly or mainly for industrial purposes, nor to institutions for the sick, aged and infirm, nor to schools, wartime nurseries, and children's homes. Private houses are not affected, except those with more than ten living rooms or bedrooms, which are subject to the central heating ban, but the public are asked to avoid any unnecessary use of fires in their homes before the autumn.

Civil Defence and Fire Service members, police, caretakers, and office staffs on night duty may have coal, gas or electric fires (but not central heating) between 10 p.m. and 8 a.m. in the rooms they occupy. Starting or refuelling of central heating and hot water plants between 9.30 p.m. and 6 a.m., except under permit, is still forbidden.

Fuel Position in Scotland

The Scottish Fuel Economy Committee is protesting against the direction of the Regional Controller withdrawing as from April 7th the 25 per cent. cut imposed on the gas and electricity consumption of Scottish industrial firms. At a meeting of the Committee it was stated that production was so inadequate, and industrial and household stocks so meagre that the restriction should not have been withdrawn without further consideration. Gas, electricity and industrial undertakings had only a few days' reserve, and most of the dumps of household coal had been used up.

Iron and Steel Institute

The annual general meeting of the Iron and Steel Institute (in which the Institute of British Foundrymen has been invited to take part) is to be held at the Institution of Civil Engineers, London, on May 9th and 10th, commencing at 10.30 a.m. on the first day and 9.45 a.m. on the second. The meeting will conclude with a luncheon for members at the Connaught Rooms at 1 p.m. on May 10th.

Portable Wavemeter

The portable wavemeter known as the "Redifou" Type 605A, which has been advertised by Rediffusion, Ltd., Broomhill Road, Wandsworth, London, S.W.18, is now available

from stock in limited numbers. It is of the absorption pattern, being tuned by a variable condenser fitted with a slow-motion drive and calibrated scale. Resonance is indicated by a microammeter connected to the anode of a midget valve with externally attached coils for range changing. The energising batteries, contained within the instrument case, are of an easily obtainable commercial type.

Science Masters Visit Lighting Service Bureau

About fifty science masters from public and secondary schools all over the country visited the Lighting Service Bureau on April 11th to hear lectures by Mr. E. B. Sawyer, acting manager of the Bureau, and by Mr. A. D. S. Atkinson. The visit was arranged as part of the three-day annual meeting in London of the Science Masters' Association. After the lectures, the party inspected the demonstration rooms and showed particular interest in the daylight and warm-white fluorescent lighting installations.

Trade Publications

H. Clarke & Co., Ltd., Atlas Works, Patricroft, Manchester.—Illustrated booklets: M/44 dealing with mica and "Micanite," and P/44 concerned with "Pirtold" laminated materials. Aerialite, Ltd., Castle Works, Stalybridge, Cheshire.—Priced list of a fairly comprehensive range of cables and flexibles.

Applicants for copies of these publications should write on business letter-headings.

Trade Announcements

The firm of Allan Arthur & Ure, electrical engineers and contractors, 107, Douglas Street, Glasgow, was dissolved by mutual consent of the partners on March 31st. Mr. Allan Arthur, M.Inst.C.E., M.I.E.E., is continuing at 107, Douglas Street, where, as Allan Arthur & Co., he will carry on the engineering and plant side of the business in which the firm has specialised for over forty years. Mr. Robert A. Ure, A.M.I.E.E., J.P., will continue business on his own account under the name of R. A. Ure & Co., at 17, Bothwell Street, Glasgow.

The Power Plant Co., Ltd., informs us that it has now opened the new Manchester office to which reference was made in our January 19th issue. The manager is Mr. J. F. Bradshaw and the address is Imperial Buildings, 19, Old Millgate, Manchester, 4 (telephone: Blackfriars 8581).

Change of Name

Simon Electric Floor Scrubbers, Ltd., has changed its name to Flexible Pressure Pipes, Ltd.

TRADE MARKS

APPLICATION has been made for the registration of the following trade mark. Objections may be entered within a month from April 11th.

PYROTRON. No. 632,175, Class 9. Electronic amplifiers; and electrical apparatus for indicating, recording and controlling temperatures.—Bowen Instrument Co., Ltd., 9, Newton Road, Leeds, 7.

Views on the News

Reflections on Current Topics

ELECTRICAL contractors, who were once considered the natural sellers of electrical appliances, have seen the business gradually getting into other hands—some of them very unsuitable hands. They have been much, though not wholly, to blame but many of them are now determined to recapture some of the trade. As in many other matters, the trend in the United States has been similar. The Wisconsin Power & Light Co. recently conducted an investigation into the sales channels for electrical appliances in its area. It found that while there were 63 electrical contractors and 51 electrical retailers selling appliances, there were also 207 hardware shops, 58 furniture stores, 55 plumbers, 49 departmental stores and 61 other establishments doing the same thing. In other words just under 19 per cent. of those in the business were "legitimate" traders. Nothing is available regarding the comparative volumes of the business.

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Members of the Tunbridge Wells Town Council unsuccessfully tried to secure that the Council's hundred temporary houses should be all-electric and the Housing Committee's half-and-half proposal was approved. The leader of the opposition to this proposal was responsible for a "nice derangement of epitaphs." Pointing out that the Council owned the electricity undertaking, he said that by permitting the installation of gas "we are not only fouling our own nest but are also being left to stew in our own juice."

* * *

At Eastbourne, I observe, a somewhat unusual reason for choosing electricity in preference to gas for the temporary houses there was put forward. The Housing Committee said that if gas were installed the cost of mains would fall on the Committee, whereas the capital charge for electricity mains would be borne by the Electricity Committee "as the services would have to be laid for the lighting." It is true that it was also estimated that the cost to the tenants for electricity would be slightly less than gas—a much better reason.

* * *

Considering the limited number of demonstration models available, it is surprising how often I come across the "Poplar" kitchen unit during my travels. Thousands of people must now have seen it, and it is still creating a tremendous amount of interest. Several alterations have been made in the original designs since it was first introduced nearly

two years ago, and even now the manufacturers, the Universal Boilers & Engineering Co., Ltd. (which is associated with Burnley Aircraft Products, Ltd.), are still incorporating improvements. The latest designs which I saw when I called at the company's works a few days ago have much more attractive doors, with invisible hinges and more substantial handles. The omission of the ironing board gives more working space, and I was pleased to see that provision has now been made to accommodate a 4-cu. ft. refrigerator instead of a 1½-cu. ft. model if desired.

Mr. H. L. Pipe, who handles distribution for the company, told me that production was being planned on the basis of 50,000 units a year and that factories to make them are being established in Scotland, the North-East Coast and elsewhere. In view of the interest shown abroad the company is going into the idea of exporting units in the form of components, a special locking device permitting one man to assemble perhaps as many as 500 a week.

* * *

The export market has also been kept in mind in connection with the company's revolutionary new type of washing machine, which incorporates an impeller device similar to a ship's screw in place of the usual agitator. The machines, the components of which will be made at Burnley, will be assembled at Glasgow and Walsall, as well as in Australia and perhaps South Africa, South America and Scandinavia. About a thousand machines a week will be made to start with, production being stepped up to 2,000-3,000 a week in a short while. Apart from the novel method of operation, the machine has a number of other interesting technical features, among them an exceptionally lightweight speed reducer involving entirely new principles, a neat form of clutch and an entirely automatic safety device on the wringer, which must really be foolproof.

Another large-scale development of the company is the manufacture of electric wash-boilers, a reputation for which was established before the war. With a big order book, the company has resumed volume production and is stepping up output as supplies become more readily available.

* * *

According to the *World's Press News*, the Ministry of Fuel and Power has issued a new poster illustrating a "two-cell electric fire," with the slogan "Don't use two, make one do." Was the idea prompted by the shortage of fuel or the shortage of batteries?

—REFLECTOR.

Interior Lighting

Educating Engineers and the Public

OPENING the discussion on Mr. R. O. Ackerley's paper on the interior illumination of buildings (*Electrical Review*, April 13th, p. 538) at the Installations Section of the Institution of Electrical Engineers, Mr. A. H. YOUNG called attention to the large number of existing premises in which the lighting should be overhauled and modernised, as distinct from new installations. Physicists and research workers were familiar with all the intricate details of the science of lighting, but rarely had an opportunity of putting their theories into practice. The practical engineer was inclined to take a great deal for granted, but, having acquired information, it was necessary for him to pass it on to the public.

Mr. HOWARD ROBERTSON (R.I.B.A.) suggested that more might have been said of æsthetic considerations, which were of great importance to architects. He also pointed out that whereas passing clouds caused variations in daylight, there was no similar relief from artificial lighting.

Supplementing Daylight

DR. C. C. PATERSON (G.E.C.) spoke of the need for higher intensities of lighting as one got older, and disagreed with the suggestion that artificial illumination should be varied. Fluorescent light to supplement daylight seemed to be one of the most promising outlets for the illuminating engineer.

MR. R. B. GILES, referring to education on illumination, said the electricity supply industry should first take the mote out of its own eye. There had been a great deal of assisted wiring but scant attention had been paid to standards of illumination.

MR. J. S. DOW (hon. secretary, Illuminating Engineering Society) referred to the author's method of evaluating the limits of glare and said he favoured the rather simpler rule that the illumination should not exceed 1 candle power per sq. in. for every ft.-candle used. The paper did not deal with reflected glare, and another factor not generally appreciated was discomfort glare. The object of the I.E.S. Code was to make lighting better and it was hoped to provide some simple recommendations supplemented by specific information with regard to particular cases.

MR. H. G. JENKINS (G.E.C.) referred to mixed colour units and said that high-voltage fluorescent lighting had peculiar attractions which at present could not be reproduced in the mains voltage type of fluorescent lamp.

MR. A. CUNNINGTON stated that the problems were so complex and varied so much from the conditions surrounding

industrial installations that books of tables were no substitute for experience. He mentioned an instance of the use of fluorescent lighting to supplement daylighting which concerned the work of compositors, by means of a photo-electric cell; the artificial daylight was switched on when required and all the previous difficulties had disappeared.

MR. W. J. JONES (E.L.M.A.) mentioned the tendency towards higher illumination levels in the future, and expressed the hope that the bogey of glare would be settled by the newer light sources because, as long as the old levels were maintained, glare would be one of the greatest difficulties.

MR. E. N. F. GRANT pointed out that in planning for the future engineers should have some idea as to what sizes of lamps might be available in the post-war period.

MR. FORBES JACKSON said that while the workshop and factory and even schools could be looked after by engineers who were reasonably competent for the job, the ordinary householder had no one to turn to for unbiased advice. Supply authorities should organise an advisory service and deal with lighting as they dealt with cooking.

MR. F. C. SMITH (Past-president, Illuminating Engineering Society) said that there were still far too many rule of thumb lighting engineers, and education was essential.

SIR HARRY RAILING (President of the Institution), referring to the lighting of the lecture theatre, said that the not very good illumination was due to war conditions.

Author's Reply

MR. ACKERLEY, replying to the discussion, said the great problem was to impart the information produced by the research laboratories, first of all to the practising engineer, and secondly to the public and to the specialists who were dealing with allied problems. He had not attempted to cover the æsthetic side. He did not think the eye became accustomed to good lighting and did not benefit from it. The position rather was that good lighting was appreciated and more was desired. As regards glare, he thought Table 2 in the paper was a very simple one and was likely to give better results than the method suggested by Mr. Dow. Automatic photo-electric control should make very much better lighting conditions generally. Shorter fluorescent lamps might be expected in the future, but exactly what length they would be remained to be seen. Some supply authorities were already giving lighting advice, but whether it was on a sufficiently extensive scale he did not know.

Steel-Cored Aluminium Lines

Sharing of Mechanical Load

AT last week's meeting of the Transmission Section of the Institution of Electrical Engineers, MR. E. W. W. DOUBLE read his paper on steel-cored aluminium power lines, to which reference was made in our last issue. The discussion was opened by MR. C. O. BOYSE (Callender's), who said the author had assumed throughout that the B.S.S. breaking loads were beyond question and there was no evidence in the paper to suggest that these results were not correct, but a great deal depended on the interpretation of the Commissioners' Regulations. Was the factor of safety a single ratio, or did it mean separate ratios for the aluminium and steel core? There was nothing in B.S. 215 about factors of safety at all. He had never been enthusiastic about pre-stressing, which might remove the inelastic stretch at an early stage, but that would not be of much advantage and it was merely a confession of inability to make some reasonably accurate allowance for it beforehand. The author's magnetic method of measuring tension might be used in connection with guys on high masts.

MR. E. AMBROSE (Highfield & Roger Smith) said the author's magnetic method was most ingenious and personally he did not see why a similar method should not be used for measuring stress in stay wires. As regarded pre-stressing, what was meant by "maximum design load"?

MR. S. WHITEHEAD (E.R.A.) said that experiments had been going on for some years which entirely confirmed the views expressed in the paper that the creep of aluminium wires did not become a serious problem, provided the load did not exceed 40 or 50 per cent. of the ultimate.

Yield and Creep

MR. W. J. NICHOLLS (C.E.B.) imagined that there was a real physical difference between the yield of aluminium and creep, as it appeared that yield began at a lower stress than what was commonly called yield. Had consideration been given to steel-cored aluminium cables with a coating on the steel core? It might be that the lack of adhesion between the aluminium and the steel had an appreciable effect on the yield of the whole conductor. Pre-stressing was a good idea but cost ruled it out. After an average 12 months' service a line not pre-stressed originally would give about the same results as a pre-stressed conductor.

MR. E. T. PAINTON (M.A.P.) pointed out that the author's magnetic method of determining stress confirmed the results obtained with the graphical method and justified the

old method of calculation. Creep was definitely limited and could be looked upon as an additional factor of safety. If by any chance the stress in the aluminium exceeded half the working load and the load was prolonged, then automatically that excess load would be taken off the aluminium and put on the steel, which was capable of taking it. The author strongly advocated the ideal of pulling the conductor up to the fullest possible tension (the design load), but there were mechanical difficulties with steel-cored aluminium cable and some other way of doing it would be preferable. The right solution was to find out either by measurement or assumption the amount of permanent stress to allow for, and then allow for it in the sagging.

Vibration and "Load Ratio"

MR. W. TUBB (J. L. Eve Construction Co.) said that the effect of vibration or slight flexing of the conductor which would occur in all weather conditions was likely to reduce the bond effect of the wires and yet probably cause further yielding of the aluminium so that the "load ratio" would still be uncertain. Pre-stressing beyond the maximum load was very desirable, but it did not appear to be a practical operation for the erector, and the manufacturer might find difficulties. It had been the practice of his firm to run out the conductor and tension up well above the erection figure and hold it overnight for, say, 15 hours. The conductor was then lowered to the correct sag. Without pre-stressing, most of the permanent set could be absorbed by holding a tension of, say, one quarter of the breaking load, and future creep could be covered by a small increase in ground clearance.

The author in the course of his reply remarked that he had regarded pre-stressing as a sort of ideal cure, but he agreed that it was not always necessary. The magnetic means for determining the tension of steel mentioned was a laborious process and many snags had been encountered, but it could be applied to guy ropes, as suggested. Nevertheless, he warned anyone trying to do so that they would be starting from scratch. At this stage it was not possible to evolve any general formulæ which would permit the correlation of the permeability of steel with the tensile stress. Load ratio was very high where the wires were loose and the indications were that what tension was carried by the aluminium was taken by the inner layers. According to the B.S.S. even if it were assumed that all the load was carried

by the steel most of the conductors would still be safe. He agreed that the graphical method of calculating load ratio in composite conductors was confirmed by the magnetic method of testing and for future purposes he recommended that the graphical method be adopted. Further light was required on what degree of creep might finally influence the sag of a composite conductor.

The chairman, Mr. H. W. GRIMMITT, agreed with Mr. Boyse that the term "factor of safety" was being used in a very loose way. If it were a factor of safety it should be defined as such; if it were not, it should be expressed as a ratio and not be called something which it was not. When the Commissioners' Regulations were revised, looseness of some of the terms would be clarified.

Post-War Installations

Some Comments and Suggestions

ELECTRICAL installations in post-war houses, schools and hospitals are the subject of a paper, illustrated with lantern slides and references to demonstration houses and Post-war Building Studies of the Ministry of Works, presented by MR. E. J. SUTTON to the Association of Supervising Electrical Engineers last Tuesday.

It has been recommended that the incoming service to the average small house or flat should be of 16 kW capacity, necessitating a 0.0225 sq. in. twin cable, the installation of which is the supply authority's responsibility. It is probable that incoming services to post-war flats will likewise become the responsibility of the supply authorities and the author suggests that they should also provide and install the requisite consumer's control unit. It is desirable to standardise the latter but, to avoid its being unnecessarily cumbersome, the author would prefer the meter to be separately housed. He is not sure whether socket outlets connected to a ring main is the best method in all cases, preferring to facilitate wiring extensions by the provision of cable channels concealed in the skirtings and door architraves.

In living rooms, particularly, no wall space exceeding 6 ft. in length should be without an outlet, which would mean that the normal five-room house (excluding kitchen and bathroom) should be provided with not fewer than fifteen general-purpose socket outlets. In the author's opinion, without manufacturing bias, it is more logical to produce an entirely new outlet with the fuse in the plug rather than up-rate the existing 5-A type. Three sizes to accommodate cartridge fuses of 600 W, 1 kW and 3 kW should suffice, the cartridges to be marked with load ratings instead of current values. Whether plug pins should be round or flat seems immaterial, but the author thinks the flat pin merits serious consideration. He makes an additional plea for a noiseless and much smaller switch for lighting circuits capable of insertion in the door architrave.

Internal distribution in multi-storey blocks of flats, which should be within the supply authority's jurisdiction instead of the land-

lord's as hitherto, is briefly mentioned before the author turns in greater detail to schools constructed on the standard lines outlined in Post-war Building Study No. 2, the illumination requirements being prescribed in Study No. 12.

Reference is made to hospital installations, indicating that there is room for the development of neater and more compact sub-main switchgear and busbar assemblies, and a need for more standardisation and reduction of overall dimensions.

Post-war electrical installation materials will to some large extent tend to be prefabricated in workshops and delivered to site ready for immediate erection, with the wiring installation supplied in measured lengths to a large extent.

I.E.E. Luncheon

THERE was a large gathering last week at the Waldorf Hotel for the annual luncheon of the Installations Section of the Institution of Electrical Engineers, an informal function without set speeches. MR. G. O. WATSON (chairman of the Section) presided and welcomed the guests who included a number of past-presidents and chairmen (past and present) of the technical sections.

Sir STANLEY ANGWIN (deputising for the President, Sir Harry Railing) said he had just returned from an extensive tour of the Dominions and some of the Colonies. It was undertaken in an endeavour to improve Empire communications, although the tour did also have some political influence. Wherever he had arrived he had found engineers on the landing ground waiting to welcome him, many of them being members of I.E.E., which was a happy augury and indicative of the way in which, even when purely technical aspects were being discussed, something usually transpired that was of interest to politicians. Thus in course of time engineers could help to improve the world's state without themselves becoming politically embroiled.

MR. H. L. KIRKE (chairman of the Radio Section) agreed that truth, when properly used, would be effective in guiding politicians. The Technical Committee of the Broadcasting Conference recently held in this country had been unanimous in appreciation of the value of such gatherings for discussing the standardisation of ways and means of common interest.

ELECTRICITY SUPPLY

Edinburgh Jubilee. New Leyton Tariff.

Bolton.—RATE CONTRIBUTION.—The Electricity Committee is contributing £10,000 towards the relief of the rates, according to the annual financial statement presented on April 11th.

Boston.—COLLECTION OF FIXED CHARGE.—A request by the Boston and District Electricity Supply Co., Ltd., that the Boston Corporation should collect the fixed charge for electricity supplied to tenants of its post-war houses by weekly instalments with the rent has been refused.

Brierfield.—PROPOSED PRICE INCREASE.—At the Council meeting on April 12th it was stated that the Electricity Committee had recommended an application to the Electricity Commissioners for sanction to increase the all-in tariff running charge from $\frac{1}{2}$ d. to $\frac{3}{4}$ d.

Cheltenham.—ENGINEER'S REPORT.—The borough electrical engineer and manager (Mr. R. W. Steel), in his report for the year ended March 31st, 1944, states that sales increased by 4.8 million kWh (15 per cent.) to a total of 36.2 million kWh, while the revenue from the sale of electricity advanced by £20,560 (10 per cent.) to £216,911. The net surplus was £7,312 (against £7,343). The average price obtained per kWh sold reached a new low level at 1.44d., the previous lowest being 1.48d. in 1941-42. The engineer points out that in spite of the economy campaign sales have increased by 123 per cent. since the last pre-war year, and says there is every sign of a large potential demand. To meet this a certain amount of reorganisation of the Department will be necessary.

Chesterfield.—ELECTRICITY CHOSEN.—The Rural District Council has decided in favour of the use of electricity for cookers, wash boilers and refrigerators in temporary bungalows on all sites.

Chichester.—ALL-ELECTRIC HOUSES.—At its meeting on April 4th, the City Council approved a recommendation by the Post War Planning Committee for the installation of all-electric domestic equipment in the 50 temporary houses to be erected on a site in Spitalfield Lane, Chichester.

Edinburgh.—UNDERTAKING'S JUBILEE.—To mark the jubilee of the electricity undertaking on April 11th, members of the Town Council and a number of guests visited the Portobello power station. Councillor W. Gerrard, convener of the Electricity Committee, speaking at a meeting after an inspection of the station, said that the capital value to-day was £8,000,000, as against an original outlay of £115,000 for Dewar Place station. Electricity had expanded over these years more rapidly than any other service, and the prospects for the future were very bright. At the present time there was a large programme of extensions laid down to meet increased demands, consisting of the laying of new mains and a new switch house at Portobello, which would cost approximately £600,000. He spoke appreciatively of the work of Mr. J. F. Field, the manager, and Mr. P. d'E. Stowell, his deputy. He also

congratulated Mr. Mears, a member of the staff who joined the undertaking in 1896.

Glasgow.—DISTRIBUTION WORKS.—The general manager has reported to the Electricity Committee on the necessity of incurring capital expenditure during the period ending May 31st, 1946, to the extent of £156,006 (mains and services, £82,000; substation equipment, £74,006). The Committee is applying for consent to exercise existing borrowing powers to the extent of £112,006, and to borrow a further £44,000. It is proposed, subject to consent, to meet out of the estimated revenue surpluses of the department in the years ending May 31st, 1945, and 1946, capital expenditure on lands and buildings for substations (£13,110) and meters (£24,000).

Guildford.—ELECTRICITY FOR BUNGALOWS.—In reply to an inquiry from the Guildford Rural District Council with regard to a supply of electricity for an estate comprising 50 bungalows proposed to be erected at Chilworth, the borough electrical engineer has stated that for lighting and small domestic appliances the cost to the tenant, including the fixed charge of £1 16s. per annum, would be approximately 1s. 2d. per week. Including cooker, refrigerator and wash boiler, the total overall cost is estimated at not more than 3s. per week.

Leeds.—POWER CHARGES.—The Electricity Committee has had an interview with the local branch of the Federation of British Industries which is objecting to the Committee's decision to increase electricity charges to power consumers by 5 per cent. and to abolish the 5 per cent. discount to power consumers.

Leyton.—NEW TARIFF.—Following consideration of a report submitted by the borough electrical engineer and manager (Mr. A. E. Morgan) the Corporation has introduced a new domestic all-purpose tariff to meet immediate requirements for an attractive rate for "all-electric" temporary houses utilising electric water heating in addition to the usual purposes. The introduction of the new tariff also serves a long-term policy of making provision for anticipated post-war development in the use of electricity in the home by offering a low-rate domestic tariff. A leaflet containing particulars of the new tariff shows that the fixed charge is on a sliding scale, based on size of house, with a minimum of 10s. per quarter, and the running charge is $\frac{1}{2}$ d. (plus 15 per cent.) per kWh. The tariff was introduced on April 1st for immediate application in respect of 100 "all-electric" emergency hutments which have been erected in the borough. New consumers will have the option of this tariff as an alternative to the present lighting and heating flat rates, and existing consumers can change over to the new rate at their option. Ultimately, it is intended that the flat rates together with the optional all-purpose domestic rate shall supersede the present variety of tariffs available.

Lowestoft.—HALF OF EACH.—The Housing Advisory Committee has recommended that half of the temporary houses shall have electric

cookers, wash boilers and refrigerators and the other half gas.

Reading.—**INCREASE IN CHARGES.**—Subject to the consent of the Minister of Fuel and Power, the Council proposes to increase electricity charges by 1d. on Scale A and 1d. on other scales. It is estimated that these changes will provide an additional revenue of over £20,000 in a full year, but as it is not proposed to make the increases until Michaelmas there may be a moderate loss on the 1945-46 year's working of the undertaking.

Rothsay (Bute).—**PURCHASE NEGOTIATIONS.**—The Town Council has approved generally an amended offer from the North of Scotland Hydro-Electric Board for the purchase of the burgh's electricity undertaking, and has remitted the matter to a sub-committee to continue negotiations with the Board.

Scotland.—**SUPPLIES IN GRAMPIAN AREA.**—Lord Airlie, chairman of the North of Scotland Hydro-Electric Board, speaking at Edinburgh on April 12th, referred to remarks by Mr. W. Shearer at the recent annual meeting of the Scottish Power Co. regarding the need for a new source of power in the vicinity of Inverness and Easter Ross. The Board, Lord Airlie said, had recently completed a number of surveys, and it was hoped to publish a scheme very soon. The Grampian Co. was informally told about it some time ago. Mr. Shearer also thought that the Tummel-Garry scheme would not help the Grampian area in the north. One of the Board's duties was to construct an electricity "grid" in that area, and part of the output of the Tummel scheme would help the north in this way.

TUMMEL-GARRY OBJECTIONS.—Twenty-seven objections against the Tummel-Garry project and one against that at Gairloch have been lodged with the Secretary of State for Scotland. As already announced, an inquiry into the objections will be held in Edinburgh on April 25th.

Swinton and Pendlebury.—**BULK SUPPLY FOR TROLLEY-BUSES.**—The Lancashire United Transport and Power Co., Ltd., has applied to the Electricity Department for a bulk supply of electricity to the bus depot in Partington Lane to be used in the operation of the trolley-bus service.

Overseas

New Zealand.—**STATISTICS FOR 1943-44.**—At the end of March last year the capacity of generating plant in New Zealand aggregated 480,715 kW, including 95,861 kW of standby plant; this compares with 460,921 kW (95,990 kW standby) a year before. A total of 2,170.2 million (against 2,036.4 million) kWh was generated, equalling 1,325 (1,242) kWh per head of the population. The number of retail consumers at the end of the year was 465,303 (460,768) and for bulk supply 101 (98).

An analysis of sales shows that electricity supplies in the principal classes were as follows (in million kWh): domestic and commercial 1,111.4 (1,042.6); dairy water-heating 106.3 (109.9); electric motors 427.3 (408.0); street lighting 11.9 (10.7); tramways 55.6 (53.3); and electric railways 15.8 (15.2). The number of electric cookers installed increased from 124,569 to 128,439; water heaters from 145,476 to 149,875; and milking machines from 30,826 to 31,244.

Revenue amounted to £8,986,711 (£8,394,623) and working expenses and capital charges were £7,575,847 (£7,172,980), appropriations of net surplus, including taxation, amounting to £1,042,898 (£910,251). The net capital outlay during the year was £1,739,715 (£443,446), making the total to date £46,208,557 (£44,510,475). The number of persons engaged in the industry at March 31st, 1944, was 3,721 against 3,694 a year before and salaries and wages aggregated £1,323,925 (£1,247,854).

Ulster Proposals

Points of Agreement Clarified

THE future of the generation of electricity in Northern Ireland has again been discussed by representatives of the Ministry of Commerce and the Belfast Corporation as a result of which certain points mentioned in the original heads of agreement have been clarified. The following memorandum has been issued to remove any doubts which may have been expressed as to the scope, interpretation and effect of certain paragraphs of the heads of agreement:—

(1) In the application of the safeguards provided by Section 13 of the Electricity Supply Act, 1926 (should it ever be found necessary to invoke those provisions) the calculation of the cost of Belfast's requirements shall be related solely to the area of supply of the Corporation. This is the assurance provided by paragraph 5 of the heads of agreement that Belfast can never be charged more per kWh than it would have cost the Corporation to generate for its own requirements.

(2) Paragraph 1 of the heads of agreement which refers to the Central Electricity Board and the Electricity Commissioners restricts the powers to be exercised by the proposed new authority to powers concerning only generation and main transmission.

(3) Under the provisions of the heads of agreement the new authority would have no power to acquire the entire undertaking of a county borough, only the generating station, excluding any part (as in the case of Belfast) for transforming, converting or distributing electricity.

The signatories also decided to take the opportunity of drawing attention to the results to be anticipated from the adoption of their recommendations. Completely co-ordinated operation of generating stations should ultimately result in an appreciable saving in the total overhead costs. Reduction of the quantity of plant required to be held as stand-by would result in a saving of possibly 30,000 kW of generating capacity, which in turn would represent a saving in capital expenditure of upwards of £1,000,000. The new authority would give full consideration to the possibilities of hydro-electric development.

Frequency Modulation

A LECTURE on "The Fundamental Principles of Frequency Modulation" is to be given by Dr. Balth Van Der Pol at a meeting of the Radio Section of the Institution of Electrical Engineers on Wednesday, April 25th, at 5.30 p.m. Dr. Van Der Pol is making a special visit from Holland to give the lecture.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

A. Reyrolle & Co., Ltd., report that after providing for depreciation, renewals and taxation, the net profit, including interest on investments and loans, amounted to £114,771 for 1944, as compared with £117,532 for 1943. General reserve again received £40,000 and £25,000 is provided for development expenditure. A final dividend of 7½ per cent. on the ordinary shares makes 12½ per cent. (same) while a first and final dividend of 7½ per cent. is to be paid on the £189,330 new ordinary shares. The carry-forward is £119,411 (£134,597).

In a statement accompanying the report Mr. Norbert Merz, the chairman, says that the company has acquired an interest in Morphy-Richards, Ltd., the purchase price being paid by an issue by A. Reyrolle & Co. of £11,606 ordinary shares. Work in hand, owing to cancellation of certain contracts from Government Departments, has shown a reduction, but the directors look forward to a large demand for the company's normal production in coming years.

The Automatic Telephone & Electric Co., Ltd., reports a net trading profit for 1944 of £279,206, against £255,437 for the preceding year. With £20,594 (£25,515) dividends from subsidiaries, etc., this makes £299,800 (£280,952), as stated in our issue of March 23rd. After providing for depreciation and other charges the net profit is £226,678 (£212,312). Income tax on the year's profits is £128,907 (£127,478) and war contingencies reserve receives £30,000 (£20,000). The final ordinary dividend is 7 per cent. which, with the 3 per cent. interim dividend and a bonus of 2½ per cent., again makes 12½ per cent. for the year. On the deferred shares a first and final dividend of 10 per cent. and a bonus of 2½ per cent. (same) have been declared, and £124,934 (£130,348) is carried forward.

In a statement circulated with the report and accounts, the chairman, Sir Alexander Roger, mentions some of the company's contributions to the war effort, including the distant reading compass (described in the *Electrical Review* of March 16th), the automatic pilot, piezo crystals, aircraft wiring and many other forms of electrical equipment associated with modern aircraft. All this has been in addition to the company's vital role of telecommunication engineering.

On the subject of taxation, while recognising that E.P.T. forms a valuable "cushion" and that the promised post-war refund will form a useful addition to reserves for reconstruction, he speaks of the urgent need for a re-examination of the taxation structure if British industry is not to find itself at a financial disadvantage *vis-à-vis* its overseas competitors.

Sir Alexander points out that the company's production is peculiarly suitable for export, containing about 80 per cent. wages and overheads and 20 per cent. material. Immediately before the war it was executing orders for no fewer than sixty-two overseas countries. Large quantities of telephone equipment will be required abroad in the next decade, and a substantial part of the demand may come

from countries overrun by the enemy. This will call for credit assistance beyond the capacity of individual companies, and it is therefore disappointing to find that the Government export credits scheme will not, in practice, be available for long-term credits for this type of equipment.

Dealing with telecommunication research, the chairman contends that the whole Empire and Commonwealth should combine their activities. He therefore urges the formation of a British Commonwealth Research Association as a focus of knowledge on communication matters.

Enfield Cable Works, Ltd.—For the sake of simplicity the directors propose that the name of the company shall be altered to Enfield Cables, Ltd. The full accounts for 1944 show a profit, including interest and dividends on investments, of £214,815 against £152,215 in the previous year. The increase is mainly accounted for by over-reservation against uncompleted contracts in 1943 and by the fact that last year was the first full year since the purchase of the light engineering factory referred to in the last report. After meeting various charges including £37,409 (£28,958) for depreciation, setting aside £53,161 (nil) for reserve for taxation and writing off £3,900 from the goodwill of Cosway (Sales), the net profit is £115,894 (£117,206). The ordinary dividend is maintained at 12½ per cent. and £16,270 (£15,376) is carried forward.

Switchgear & Cowans, Ltd.—Referring to the company's wartime production, Mr. Hugh Burroughes, the chairman, stated at the annual general meeting on April 12th that a large number of aerodromes, aircraft, ships and war factories were equipped with the company's products, some being normal products, namely switchgear, but quite a large proportion being entirely new and requiring a considerable amount of technical adaptability to produce successfully. New types of mining gear had been developed and were in service in many collieries. All possible steps had been taken to meet the demands which would be made on the company during the change-over from war to peace conditions.

The Brush Electrical Engineering Co., Ltd., has declared a final dividend of 6 per cent., making 10 per cent. for the year; this compares with 9 per cent. for 1943 and 8 per cent. for 1942. The net profit for 1944 was £147,257 against £175,002 in the preceding year. General reserve has been increased by £40,000 (£25,654) and £11,560 (£11,532) is carried forward. Provision for taxation is £50,000 (£93,000), which is £82,500 for 1945-46, less £32,500 over-provided in previous years.

H.T.A., Ltd.—The 1944 accounts of the company, whose name was changed from Hall Telephone Accessories (1928), Ltd., last February, show a substantially smaller gross trading profit—£530,250, against £832,608 in the preceding year. The net profit is £61,791 (£54,626) and the ordinary dividend is maintained at 10 per cent., plus a bonus of 2½ per cent., and £12,585 (£5,536) is carried forward.

Major Oscar M. Guest, M.P., chairman and managing director, states that the lower profit reflects the gradual reduction in the volume of munition production. The company's Welsh factories, with the approval of the Minister of Agriculture, have undertaken a considerable programme of agricultural machinery orders for delivery to U.N.R.R.A.

Ericsson Telephones, Ltd.—In a statement circulated with the report and accounts and presented at the company's annual meeting the chairman, Major-General Sir Harold A. Wernher, says that since the company's plant was switched over to war production a wide variety of apparatus has been manufactured, mainly of a specialised character, such as radio and telecommunication equipment. Output last year was well maintained. The company's plant and organisation will be ready for a rapid change back to normal peacetime activities.

The Electric Supply Corporation, Ltd., in its accounts for the year ended December 31st last, shows a net profit of £61,234 (against £58,818). After payment of the preference dividend and a final ordinary dividend of 6½ per cent., making 10 per cent. (same) for the year, £40,968 (£37,860) is carried forward.

A consolidated revenue account gives revenue from the sale of electricity as £389,788 (£354,351) making, with other revenue and dividends and interest, a total of £424,208 (£386,011). The net balance after meeting various charges, including £243,943 (£215,884) for the purchase of electricity, generation and distribution, is £64,643 (£60,286).

London Associated Electricity Undertakings, Ltd., reports a net profit for the year ended December 31st last of £238,211 (against £244,423). To this are added £615 (£1,960) brought forward and £24,000 (£16,000) transferred from the stockholders' reserve account, making £262,826 (£262,383). Preference dividends take £75,400 and after payment of a dividend of 4 per cent. (same) on the ordinary stock £1,058 is carried forward.

At the company's annual meeting last week the Earl of Lytton (chairman) said that the most anxious years for Central London Electricity, Ltd., were 1941 to 1943. Sales of electricity fell from the 1938 total of 432 million kWh to 303 million in 1943 and the number of consumers decreased from 86,000 to 53,000. Charges were increased in 1940 and again in 1943 but, notwithstanding the strictest economies, these did not meet the loss of revenue. The cost per kWh was greatly increased owing to the fixed charges falling on a much smaller output and to the progressive increases in the price of coal. The company was not compensated by an increase of load from war factories to offset the loss of commercial and domestic load. For 1942 and 1943 a readjustment of sinking fund contributions was granted by the Electricity Commissioners subject to the funds being restored to normal at the earliest opportunity and the payment of dividends being subject to the Commissioner's consent until this had been done.

The amount of war damage was estimated at £500,000. Bulk supply stations were damaged on 55 occasions, 139 transformer stations were damaged and 1,424 cables were put out of action. Supplies to consumers who needed

them were, however, never interrupted for more than short periods and the London Power Company never failed to supply constituent companies and the C.E.B.

With 1944 there came a recovery and sales rose to 348 million kWh, the number of consumers increasing to 76,684. Revenue improved to £487,000 and this enabled full contributions to be made to sinking funds and previous deductions were also restored. The chairman added that as soon as circumstances permitted, which the directors hoped would not be long, prices to consumers would be reduced and the statutory ordinary dividends restored.

The Cambridge Electric Supply Co., Ltd., records a total revenue of £231,659 (£210,312) and a net revenue of £47,322 (£49,581). After providing for interest charges, consumers' rebates and taxation, the net profit was £34,967 (£35,298). A final dividend of 4½ per cent. is to be paid, making 7 per cent. for the year.

The West Devon Electric Supply Co., Ltd., is paying a first and final dividend of 5 per cent., as last year. The net profit, including £2,500 (nil) dividends from subsidiaries, is £30,512 (£26,036).

Imperial Chemical Industries, Ltd., in a preliminary statement, report that, after providing for taxation and obsolescence, the net income for 1944 was £6,972,988, as compared with £6,685,345 for 1943. A final dividend of 5 per cent. makes 8 per cent. (same) for the year.

Pinchin, Johnson & Co., Ltd., whose net profit last year was £526,661, against £573,237 for 1943, are paying a final ordinary dividend of 7½ per cent. This maintains the total distribution for the year at 10 per cent.

The Telegraph Construction & Maintenance Co., Ltd., reports a net profit for 1944 of £50,710 (against £51,488) after providing £264,004 (£323,642) for taxation. £28,000 (£30,000) is reserved for contingencies and the final dividend is 5 per cent., again making 10 per cent. for the year.

The Ever Ready Trust Co., Ltd., recommends final dividends of 7 per cent. on the ordinary stock and deferred shares, again making 10 per cent., for the year ended March 31st last. A preliminary statement gives the revenue balance as £31,834 (against £31,762).

Sangamo Weston, Ltd., propose to pay a dividend of 15 per cent. for 1944. The net profit for the year is £28,379 against £30,560 for 1943, after providing £31,944 (£54,121) for taxation.

Heatrae, Ltd., announces a first and final dividend of 12½ per cent. (same). The net profit for the year to February 28th last was £15,192, against £11,312 for the previous year.

Veritys, Ltd., have declared an interim dividend of 7½ per cent., the same as last year.

The Oriental Telephone & Electric Co., Ltd., states that gross revenue from interest for the year ended December 31st last was £31,542 (against £31,903) and the net profit was £20,482 (£19,431). The ordinary dividend is again 4 per cent. and £78,724 (£81,050) is carried forward.

The Cawnpore Electric Supply Corporation, Ltd., has been notified by the United Provinces Government of its intention to acquire the Company's undertaking in 1947.

New Companies

Oldham & Son (Export Sales), Ltd.—Private company. Registered April 5th. Capital, £1,000. Objects: To carry on the business of exporters, importers, merchants, factors, shippers, transport agents, dealers in machinery tools and things required in connection with the business of manufacturers of, and dealers in, miners' lamps, colliery requisites and primary and secondary batteries, mining, mechanical and electrical engineers, etc. First directors: J. Oldham, Gerrards, Gee Cross, Hyde, Cheshire; G. Oldham, Ferndale, Gee Cross, Hyde; and E. C. Oldham, Cambridge House, Hyde Road, Gorton, Manchester. Registered office: 36, Hyde Road, Denton, Lancs.

Midland Coil Winding Co., Ltd.—Private company. Registered April 3rd. Capital, £100. Objects: To carry on the business of electrical and wireless engineers and manufacturers, coil winders, etc. Directors: W. J. Taylor, 162, Hawthorn Road, Birmingham, 23; N. C. Sprason, 14, Stowell Road, Birmingham, 22 C; and F. W. Locke, 8, Orton Avenue, Walmley, Sutton Coldfield (all directors of N. V. Electric and Musical Instruments, Ltd.). Registered office: 4, Lancaster Street, Birmingham, 4.

Fishers Radio Service, Ltd.—Private company. Registered April 6th. Capital, £4,000. Objects: To acquire the business of radio service agents and electrical engineers carried on at 33, High Street, Whitchurch, Salop, as Fisher's Radio Service. Directors: H. T. Fisher, Eastcote, Tarporley Road, H. L. Fisher, Greenhays, Newport Road, E. J. Fisher, Westways, Newport Road, all of Whitchurch, Salop. Registered office: 33, High Street, Whitchurch, Salop.

Accumulator Contracting Co., Ltd.—Private company. Registered March 26th. Capital, £1,000. Objects: To acquire the business of electrical contractors carried on at 70, Anlaby Road, Hull, as the Accumulator Charging Co. Directors: E. J. Saner, Westwood Lodge, Beverley, E. Yorks, and Wm. C. C. Barnes, Enfield, Thearne, Beverley, E. Yorks. Registered office: 70, Anlaby Road, Hull.

T. W. Sampson & Co., Ltd.—Private company. Registered March 28th. Capital, £5,000. Objects: To carry on the business of electrical, wireless, electro-medical and general engineers and contractors, etc. Directors: J. W. Chadwick, 75, Louth Road, Sheffield, and E. Oxley, 62, Sacey Avenue, Sheffield. Secretary: A. M. Dyson. Registered office: Electron Works, Pitt Street, Sheffield.

Kennedy Stark & Co., Ltd.—Private company. Registered in Edinburgh April 11th. Capital, £3,000. Objects: To acquire the business of Kennedy Stark and Co., 187, Pitt Street, Glasgow, and to carry on business of electrical and mechanical engineers, contractors and suppliers of electricity, etc. First directors: W. C. Rigg, 10, Townhead Terrace, J. Gemmell, 15, Craigielea Drive and A. Ewing, 91, Lonsdale Road, all of Paisley.

P. R. Mallory & Co., Ltd.—Private company. Registered March 21st. Capital, £10,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical and radio goods, etc. Subscribers: D. C. Tewson, and

F. W. Edmonds, 18, Austin Friars, E.C.2. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Breen Electrical Co., Ltd.—Private company. Registered in Edinburgh, March 23rd. Capital, £10,000. Objects: To carry on the business of electricians, electrical engineers, engineering, radio and television, electrical, sanitary, gas and water engineers, etc. Directors: A. K. Breen and Eileen Breen, both of 44, Mobhi Road, Glasnevin, Dublin.

Companies' Returns Statements of Capital

Madras Electric Tramways, Ltd.—Capital, £300,000 in 150,000 preference and 150,000 ordinary shares of £1 each. Return dated October 18th. 125,000 preference and 100,000 ordinary shares taken up. £135,240 paid on 92,500 preference and 42,740 ordinary shares. £89,760 considered as paid on 32,500 preference and 57,260 ordinary shares. Mortgages and charges: £95,500.

Electroflo Meters Co., Ltd.—Capital, £21,000 in 10s. shares. Return dated October 2nd, 1944. All shares taken up. £11,000 paid on 22,000 shares. £10,000 considered as paid on 20,000 shares. Mortgages and charges: Nil.

Unity Heating, Ltd.—Capital, £30,000 in 5,000 preference and 25,000 ordinary shares of £1. Return dated December 19th, 1944. All shares taken up. £30,000 paid. Mortgages and charges: Nil.

Northern Electrical Co. (Grimsby), Ltd.—Capital, £8,000 in £1 shares. Return dated October 31st, 1944 (filed November 17th, 1944). 7,249 shares taken up. £7,249 paid. Mortgages and charges: Nil.

Increases of Capital

Aerialite, Ltd.—The nominal capital has been increased by the addition of £58,900 beyond the registered capital of £41,100. The additional capital is divided into 37,000 6 per cent. cumulative redeemable preference shares of £1 and 87,600 ordinary shares of 5s. The 37,100 ordinary shares of £1 and 10,000 "B" shares of 2s. in the original capital have been consolidated into 152,400 ordinary shares of 5s.

Wireless-Electric, Ltd.—The nominal capital has been increased by the addition of £5,000 in 5,000 ordinary shares of £1 each beyond the registered capital of £1,000.

Mortgages and Charges

Bowers & Barr, Ltd.—Two charges on (a) freehold property at Hall Plain, and (b) freehold warehouse at Row 71, both in Great Yarmouth, both dated February 6th, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Palace Electrical Co., Ltd.—Mortgage on moneys under contract, registered March 22nd, 1945, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

C. A. Besley, Bailey & Co., Ltd.—Satisfaction in full on March 7th, 1945, of mortgage dated March 18th, 1933, and registered March 30th 1933, originally securing £400.

STOCKS AND SHARES

TUESDAY EVENING.

POLITICS has assumed unusually important proportions in Stock Exchange markets. Investment, and speculation also, are taking a cautious view of the manner in which the political outlook is likely to develop at the end of hostilities. The possible advent to power of a Labour Government is viewed with a certain degree of apprehension. So far as the shares in the electricity groups are concerned, the only difference that this makes to prices is a withdrawal of support which had previously been in evidence, the result being that here and there, small declines have occurred. This is not the case with the electricity supply companies' shares, the prices of which are as firm as ever. In the manufacturing and equipment group, the tone is a little easier. Sellers coming to market find that there is not quite so much demand for their shares as was the case a month ago.

The Late President Roosevelt

The shock occasioned by the news of the unexpected death of President Roosevelt has left little mark upon prices in most of the Stock Exchange departments. Some of the dollar stocks were disposed to ease off, and in the Home industrial groups the tendency was called a little easier, by way of precaution against a possible outbreak of selling. The sales did not materialise and prices were accordingly restored to their previous levels. Brazilian Tractions, now ex dividend, are lower at 27. Montreal Light & Power have been wanted, and the price moved up to 25½.

Price Fluctuations

Most of the changes in price during the past week have been in favour of holders. For the sake of convenience, here is a list of those in which improvements have occurred:

	s.	d.		s.	d.
Elec. Fin. & Sec.	62	0	Northampton	51	6
London Assoc.	27	0	West Glos.	27	6
Mid. Counties	44	3	Yorkshire Elec.	46	6
North Eastern	36	0			

De la Rue, after their brisk advance to 11½, came back to 11¼. The decline is attributed to a natural desire to take profits on the part of some of the buyers who got in 10s. or so more cheaply just before the recent rise started. British Insulated at 113s. 9d. are easier, and Murex at £5 are similarly lower. English Electric eased off to 55s. Siemens hardened to 37s. In the radio group, the tendency is towards slightly lower prices.

Enfield Cables

Enfield Cable Works, Ltd., which proposes to change its name to Enfield Cables, Ltd., is maintaining the 12½ per cent. dividend annually paid since 1940. In 1938 the

previous ordinary capital of £500,000 was raised by a capital bonus of 60 per cent. to £800,000, the figure at which it now stands. There is also £200,000 in 7½ per cent. preference shares. The balance sheet shows the company to be in a strong financial position; the shares give a yield of £3 19s. per cent. at the present price of 63s. 3d. ex dividend.

Cable & Wireless

The half-yearly dividend on Cable & Wireless 5½ per cent. preference stock is payable next month. This has not prevented a further decline in the price of the stock to 110. The quotation went ex dividend yesterday, Monday. At the present price, the yield on the money comes to 5 per cent. As already explained, a tremor of nervousness was aroused by the suggestion that Cable & Wireless, after the war, might be turned into an official or semi-official board. This, if carried out, might call for repayment at 100 of the 5½ per cent. preference stock and its replacement by some other security giving a lower yield and costing less annual interest to the combine. What foundation there may be for this, it is impossible to say.

Brush Electrical

The Brush Electrical Engineering Company has declared a dividend of 6 per cent., making 10 per cent. for the year, the best performance for a very long time, although in years gone by the company paid a regular annual 10 per cent. on its ordinary stock. Brush fell upon bad times, and from 1938 to 1940 inclusive the ordinary shareholders went without dividends. Then, in 1941, 6 per cent. was paid, followed by a rise of 1 per cent. in each of the two following years. The price of the shares, which fell to 1s. 3d. in 1940, is now 11s., at which the return on the money is 4½ to 5 per cent. Various conversions and capital alterations have left the ordinary stock at £723,722. In addition, there is £391,489 in 5½ per cent. cumulative preference shares. The price of the latter is 27s. middle. Options over 129,000 ordinary shares expired on September 30th, 1943.

London Associated

The ordinary shares of London Associated Electricity Undertakings give the lowest yield in the London group, and the reason, as already suggested, is that investment looks for a gradual return to the dividend of 7 per cent. that the company used to pay before the cut was made to 4 per cent. At the company's meeting last week the chairman mentioned that war damage is estimated at half a million pounds. The company went through a bad time during the raids, but recovery has definitely set in and, as soon as it is possible to reduce the price of electricity to the customers, the prospect of an increased dividend will be brought nearer.

Reinstatement in Employment

Obligations Upon Former Employers

THE approaching end of the European war, coupled with the fact that many Service men and women are being discharged on grounds of ill-health, lends urgency to the consideration of reinstatement in their former employment of returning members of the Forces. The matter appears to be simple on the face of it, but unfortunately many employers, including electrical contractors, have had to employ assistants who are efficient and they are now loth to part with their services. It is therefore necessary to discover to what extent the electrical contractor is affected by the Reinstatement in Civil Employment Act, 1944.

I think the best way to handle this subject is to find first of all what employers are entitled to relief and, secondly, what employers are liable to conform with the Act: in other words what employers are compelled to find employment for their assistants who left them to join the Forces. I will deal with the subject not from a patriotic point of view but strictly from a legal aspect.

Definition of Former Employer

A former employer is one who employed the person concerned within four weeks immediately preceding his enrolment in the Forces. It is possible that a business has changed hands during the war. In such circumstances the present owner is liable to employ the assistant who was formerly employed in the business. In other words the new man takes over the obligation of the former owner of the business. Of course it must be assumed that the employee would have been taken over by the new master if he had still been there. The Act applies to all male persons who, after the twenty-fifth day of May, 1939, entered upon a period of whole-time service in the armed forces of the Crown, and to female persons who, after the said date, entered upon a period of whole-time service in any of the capacities mentioned in the first schedule—the Women's Royal Naval Service, Queen Alexandra's Imperial Nursing Service, the Auxiliary Territorial Service, etc., and women employed in the Dental Corps and the Nursing Section of the Royal Air Force. It also applies to persons who, after the tenth day of April, 1941, entered upon a period of whole-time service in Civil Defence in accordance with the National Service Acts, 1939-1942.

The employee must apply in writing to his former employer within about a month after he leaves the Services and he must also state when he will be available for work. This

By F. E. Sugden,
A.C.I.S., Barrister-at-Law

application remains in force for thirteen weeks and may be renewed from time to time if the ex-service person is suffering from sickness. The four weeks period is specified because upon discharge from the Forces a man or woman is given four weeks pay from the date of discharge.

Settlement of Disputes

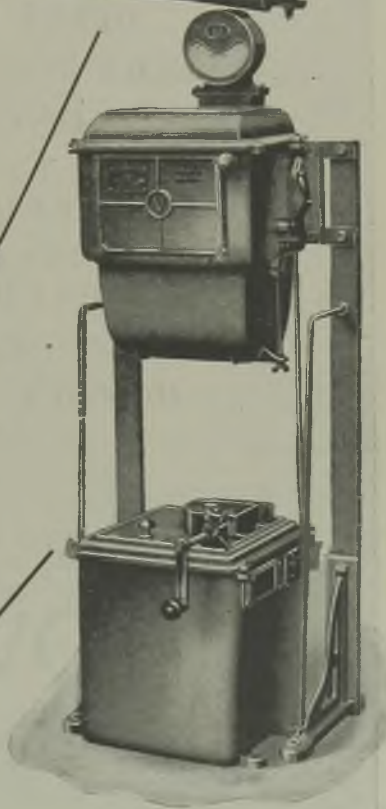
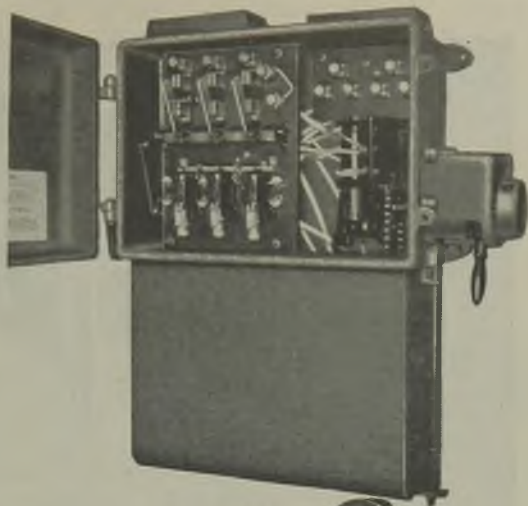
The electrical contractor may have, as I have said, satisfactorily filled the post by another person and the man who has left might possibly not be considered suitable. If the contractor objects to taking back a former employee the question or any other allied point in dispute is referred to a Reinstatement Committee, consisting of a chairman selected by the Ministry of Labour and National Service, a person also selected by the Ministry of Labour from a panel representing the employers, and a third person similarly appointed to represent the employees. In addition there is an assessor to advise the Committee on the merits or otherwise of the case; he will have expert knowledge and will probably be appointed by an appropriate trade association.

Thus if the person is, or claims to be, one to whom the Act applies and his employer disputes this, within a prescribed time they may apply to the Reinstatement Committee for determination of the question. Where the Committee is satisfied that the fault lies with the employer and that his assistant is liable to reinstatement, it may order that employment shall be made available to the assistant on a given date, in such occupation or on such terms and conditions as it may think fit, or it may make an order requiring that the employee shall be paid by way of compensation for any loss suffered by reason of the fact that he has not been reappointed on a due date. That no doubt will refer to any prospective loss of wages. This is governed in more detail by the second schedule to the Act.

Right of Appeal to Umpire

Should the employer still be aggrieved by the Committee's decision, he will have a right of appeal to an umpire or deputy umpire at the instance of (a) any organisation of employers of which the employer was a member when he made the application to the Reinstatement Committee; (b) an association of employed persons of which the applicant was a member also on the same day; (c) either the employer concerned or the applicant without leave in any case in which the

*control
for
slip-ring
motors
from*

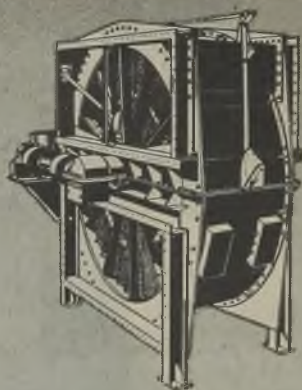


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decision of the Committee is not unanimous. Failure to comply with the directions of the Reinstatement Committee or the umpire makes an employer liable to summary conviction in the local police court for disobeying a Ministry of Labour Order. A penalty of £100 is laid down and the Court may also compel the delinquent to pay to the employee, by way of compensation, any loss suffered

or likely to be suffered by him by reason of the refusal to employ him. As we say in law, the latter is a very sweeping statement; it might be construed to mean that the employer's refusal to employ a person on grounds of deficiency will have an adverse affect upon his future employment. I must say that due regard is paid to the reasonability or otherwise of re-engaging an employee.

Canadian Overseas Trade

Both Imports and Exports Expand in 1943

THE Canadian Government has resumed the issue of statistics relating to the import and export trade of the Dominion, and those for 1943 have recently reached this country.

Increases were the rule and were substantial in the radio group besides being marked in power plant (except small motors). As usual, the United States was by far the largest supplier,

IMPORTS

Class of Goods	1943 (\$000)	Inc. or dec. on 1942	Class of Goods	1943 (\$000)	Inc. or dec. on 1942
<i>Batteries, primary (B. and C.)</i>			<i>Magnetos and parts for i.e.</i>		
<i>for radio</i>	8	+	<i>engine manufacturers*</i> ..	26	+
From United Kingdom ..	1	+	<i>Spark plugs, other magnetos,</i>		
United States ..	7	+	<i>etc.</i> ..	41	+
<i>Batteries, primary, other</i>	167	—	From United Kingdom ..	4	—
From United Kingdom ..	3	+	United States ..	36	+
United States ..	164	—	<i>Switches, switchboards and</i>		
<i>Batteries, storage</i>	513	+	<i>circuit breakers</i>	2,301	+
From United Kingdom ..	14	—	From United Kingdom ..	28	—
United States ..	499	+	United States ..	2,259	+
<i>Hearing apparatus</i>	196	+	Switzerland ..	13	—
From United Kingdom ..	5	+	<i>Telegraph apparatus</i>	703	+
United States ..	191	+	From United Kingdom ..	84	+
<i>Dynamos and parts</i>	3,262	+	United States ..	618	+
From United Kingdom ..	308	+	<i>Radio receiving sets</i>	2,279	+
United States ..	2,954	+	From United Kingdom ..	33	+
<i>Lamps, carbon filament*</i>	2	—	United States ..	2,245	+
<i>Lamps, metal filament</i>	282	—	<i>Self-contained lighting outfits</i>		
From United Kingdom ..	1	—	<i>and parts</i>	1,093	+
United States ..	281	—	<i>Radio receiving set parts*</i>	1,473	+
<i>Torches, flashlights, side and</i>			<i>Radio valve parts*</i>	2,559	+
<i>tail lights</i>	298	—	<i>Other radio apparatus</i>	13,248	+
From United Kingdom ..	14	—	From United Kingdom ..	451	+
United States ..	284	—	United States ..	12,797	+
<i>Lighting fixtures and appliances</i>	903	—	<i>Radio valves</i>	2,736	+
From United Kingdom ..	31	+	From United Kingdom ..	31	+
United States ..	871	—	United States ..	2,705	+
<i>Arrestors, choke coils, etc.*</i>	42	+	<i>Telephone apparatus</i>	2,167	+
<i>Electricity meters</i>	366	—	From United Kingdom ..	16	—
From United Kingdom ..	3	—	United States ..	2,151	+
United States ..	363	—	<i>Transformers and complete</i>		
<i>Motors valued at less than \$10*</i>	83	—	<i>parts</i>	228	—
<i>Motors and complete parts,</i>			From United Kingdom ..	2	—
<i>other</i>	3,417	+	United States ..	226	—
From United Kingdom ..	63	—	<i>Turbo-generator sets, 700 HP</i>		
United States ..	3,353	+	<i>and over, of a kind not</i>		
<i>Rheostats, controllers, etc.</i>	1,511	+	<i>made in Canada, and</i>		
From United Kingdom ..	6	—	<i>parts</i> ..	723	+
United States ..	1,495	+	From United Kingdom ..	648	+
<i>Electrical instruments and ap-</i>			United States ..	71	—
<i>paratus of precision of a</i>			<i>Electric dry shavers*</i>	54	—
<i>kind not made in Canada</i>	944	+	<i>Electrical apparatus, n.o.p.</i>	4,213	+
From United Kingdom ..	37	+	From United Kingdom ..	134	—
United States ..	907	+	United States ..	4,075	+
<i>Electric irons*</i>	14	—	Switzerland ..	4	—
<i>Sockets, outlets, etc.*</i>	345	+	<i>Vacuum cleaners*</i>	14	+

* Mainly from U.S.A.

* Mainly from U.S.A.

The values of the principal electrical goods imported in that year are shown in the accompanying table with notes of increases or decreases compared with 1942. It will be seen that

the only line in which the United Kingdom made any noteworthy advance being radio.

In the export of electrical goods Canada made further progress in 1943 and virtually

all classifications except cables, stoves, heaters and cookers showed increases compared with 1942, some by as much as two-thirds. Egypt,

British Africa and the British West Indies were among markets which increased their takings during the year.

EXPORTS

Class of Goods	1943 (\$000)	Inc. or dec. on 1942	Class of Goods	1943 (\$000)	Inc. or dec. on 1942
<i>Batteries, storage</i>	412	+ 200	<i>Porcelain insulators</i>	81	— 123
To Russia	14	+ 14	To South Africa	11	— 8
" India	30	+ 27	" S. Rhodesia	22	+ 22
" South Africa	31	+ 13	" New Zealand	24	— 14
" United Kingdom	69	+ 67	" Trinidad	9	+ 7
" Palestine	68	+ 68	<i>Dynamos, generators and</i>		
" Egypt	84	+ 45	<i>motors</i>	2,004	+ 771
<i>Batteries, other</i>	177	+ 80	To United Kingdom	346	— 90
To Venezuela	16	+ 16	" India	401	+ 391
" Colombia	28	+ 28	" New Zealand	108	— 19
" United States	83	— 4	" Australia	211	+ 185
<i>Radio apparatus, other</i>	36,186	+ 14,390	" Egypt	190	+ 152
To United Kingdom	5,200	+ 3,730	" United States	234	+ 227
" United States	27,488	+ 8,002	<i>Electric stoves</i>	44	— 106
" Russia	1,464	+ 1,413	To South Africa	12	— 74
" New Zealand	944	+ 689	" S. Rhodesia	12	—
" South Africa	270	+ 255	" New Zealand	7	— 13
" India	283	+ 282	<i>Other domestic cooking and</i>		
" Australia	387	+ 96	<i>heating devices</i>	11	— 18
<i>Radio receiving sets</i>	3	— 56	To Newfoundland	3	+ 2
To Newfoundland	2	— 2	" Bermuda	1	—
<i>Telegraph and telephone</i>			" United States	5	+ 5
<i>apparatus</i>	112	— 55	<i>Spark plugs, magnetos, etc.</i>	301	+ 164
To South Africa	6	+ 6	To United Kingdom	10	— 21
" United Kingdom	57	+ 50	" South Africa	208	+ 194
" United States	21	+ 12	" Newfoundland	11	+ 5
" Egypt	8	+ 8	" New Zealand	21	— 19
<i>Insulated copper wire and cable</i>	1,438	— 1,418	" B. East Africa	11	+ 11
To Australia	80	— 307	<i>Electric apparatus, n.o.p.</i>	1,838	+ 735
" Mexico	46	— 182	To United Kingdom	789	+ 749
" Egypt	57	— 13	" Brazil	33	— 16
" Venezuela	26	— 49	" Chile	38	+ 2
" Peru	26	+ 13	" Mexico	78	+ 26
" United Kingdom	262	+ 250	" New Zealand	65	— 67
" New Zealand	113	— 240	" Australia	51	+ 36
" United States	615	— 570	" India	70	— 47
<i>Vacuum cleaners</i>	2	— 18	" United States	300	+ 158
			" South Africa	48	+ 10

Italian Power Improvement

INDUSTRIAL production in liberated Italy will be increased considerably within the next few weeks as additional electrical energy becomes available, it was announced last week by the Allied Commission. The increased production will result directly from a larger allocation of power for civilian use.

Production of superphosphate fertiliser, carbon bisulphide, cotton and woollen textiles, sewing thread and other items will be started, according to the Industry Sub-Commission. At the same time, operation of mercury, sulphur, pyrite and lignite mines will be improved principally in the area north of Rome between Terni and Florence. These activities will give employment to several thousand workers. While many of the factories which will start or increase production have been requisitioned for military purposes, some of their output will go into civilian channels immediately, and this proportion is expected to continue to increase.

The bringing into production of these manufacturing and mining operations is made possible by the improved electric power output in the area served by the Central Italy grid system, it is pointed out by the Public Works and Utilities Sub-Commission. One large power plant shortly being added to the system will increase the power output by approximately 25 per cent.

The Central Italy grid covers the area from the Garigliano River (above Naples) to Florence in the north and Ancona and Rimini in the north-east. In one important industrial area electric power available is being increased by 50 per cent. in April to 33,500 kW.

Installed electric generating capacity for Central Italy will soon be increased to 285,000 kW, an increase of 40 per cent. in two months, bringing it to a level more than five times what it was when this region was liberated. This increased capacity, however, does not yet compare with the pre-war capacity of 1,292,335 kW.

American Television Prospects

TELEVISION is ready for the American public and its general use awaits only the lifting of wartime restrictions, according to Dr. Allen B. Du Mont, of New York, president of Du Mont Laboratories, Inc. He says that regular programmes are being transmitted successfully within limited areas, mostly from New York City, and that the clarity of a television picture is now as good as that seen on the average motion picture screen. The cost of television will not be beyond average reach; sets will retail from \$100 upwards.—*Reuter's Trade Service* (New York).

Forthcoming Events

Friday, April 20th. — *Bath.* — Pump Room, 7.15 p.m. I.E.E. Bristol Students' Section. "Protection of AC Circuits and Plant," by J. Fitzpatrick.

Saturday, April 21st. — *London.* — Connaught Rooms, 1 for 1.30 p.m. Junior Institution of Engineers. Annual luncheon.

London. — School of Tropical Medicine, Keppel Street, W.C.1, 11 a.m. and 2.30 p.m. Society of Instrument Technology. "Electrical Tachometers," by E. B. Moss; "Electrical Non-Destructive Testing of Materials," by G. R. Polgreen and G. M. Tomlin; and "Determination of Steam Wetness," by G. K. Burditt.

Monday, April 23rd. — *London.* — Institution of Electrical Engineers, 5.30 p.m. Informal discussion on "Electrical Aids to Public Speaking," to be opened by P. G. A. H. Voigt.

Liverpool. — Royal Institution, Colquitt Street, 5.30 p.m. I.E.E. Mersey and North Wales Centre. Annual general meeting and short papers on "Some Notes on Coal Mining," by E. W. Ashby; "Speed Control of DC Motors with the Grid-Controlled Mercury Arc Rectifier," by A. R. Davies; and "Costing of Engineering Work," by D. J. Pearce.

Birmingham. — James Watt Institute, 7 p.m. I.E.E. South Midland Students' Section. "An Introduction to Circuit Diagrams," by A. J. Lund.

Birmingham. — Birmingham Electric Club. "Research in the Electrical Industry," by H. Warren, M.Sc., M.I.E.E.

Cardiff. — I.E.E. Western Centre Installations Group. "Modern Electric Lift Practice," by L. S. Atkinson.

Wednesday, April 25th. — *London.* — Institution of Electrical Engineers, 5.30 p.m. Radio Section. "The Fundamental Principles of Frequency Modulation," by Dr. Balth Van Der Pol.

Edinburgh. — Heriot-Watt College, 6 p.m. I.E.E. Scottish Centre. Annual general meeting and paper on "Electrical Aspect of Farm Mechanisation," by C. A. Cameron Brown.

Loughborough. — At Loughborough College, 2.30 p.m. I.E.E. East Midland Sub-Centre. "Energy Conversion in Electronic Devices," by Dr. D. Gabor.

Thursday, April 26th. — *London.* — Institution of Electrical Engineers, 5.30 p.m. Thirty-sixth Kelvin Lecture. "Electric Currents in the Atmosphere," by Sir Edward Appleton.

Cardiff. — I.E.E. Cardiff Students' Section and Electrical Association for Women. Discussion on "Electricity in the Post-War Home."

Friday, April 27th. — *London.* — At Institution of Electrical Engineers, 6 p.m. Television Society. "Beam Tetrodes," by S. Rodda.

London. — Room 19, Livingstone House, Broadway, Westminster, 6.30 p.m. E.P.E.A. Southern Divisional Meter Engineers' Group. "Power-factor Correction," by E. L. Fairclough.

Newcastle-on-Tyne. — Neville Hall, 6.30 p.m. I.E.E. North-Eastern Students' Section. Annual general meeting.

Saturday, April 28th. — *Barnsley.* — Queen's Hotel, 4 p.m. Association of Mining Electrical and Mechanical Engineers (Yorkshire North-West Branch). Annual general meeting.

Manchester. — Midland Hotel, 3 p.m. Institution of Factory Managers (N.W. Branch). "Training for Industrial Administration," by Dr. A. Roberts.

Huddersfield. — I.E.E. North Midland Students' Section. Problems afternooon.

Monday, April 30th. — *Birmingham.* — James Watt Institute, 6 p.m. I.E.E. South Midlands Centre Radio Group. "High-frequency Dielectric Materials," by Prof. Willis Jackson.

Tuesday, May 1st. — *London.* — Institution of Electrical Engineers, 7 p.m. London Students' Section. Discussion on the reports "Education and Training for Engineers" and "Part-Time Further Education."

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.

A KT.-GES. Brown, Boveri & Cie.—"High vacuum hot cathode tubes for large powers." 3354/43. February 20th, 1942. (568300.)

British Thomson-Houston Co., Ltd.—"Evacuated electronic apparatus." 13226/42. September 19th, 1941. (568259.) "Electrical insulating material." 9735/42. July 17th, 1941. (568293.) "Electric motor control systems." 11383/42. August 22nd, 1941. (568348.)

W. Brooke and H. T. Baldwin.—"Protective control systems for electric motors." 10837. July 3rd, 1943. (568336.)

Brookhirst Switchgear, Ltd., and R. C. Harris.—"Electrical resistances." 14076. August 28th, 1943. (568306.)

Electric Transmission, Ltd., and K. Dannenberg.—"Electrical circuit opening devices." 15131. September 15th, 1943. (Addition to 563849.) (568373.)

G. R. Fountain, Ltd., A. E. C. Snell and H. J. Houlgate.—"Telephone systems." Cognate applications. 885/40 and 12787/40. January 15th, 1940. (568287.)

A. J. Gunn and Dowsing Co. (Electrical Manufacturers), Ltd.—"Dish and like washing machines." 15763. September 25th, 1943. (568345.)

W. C. Holmes & Co., Ltd., E. M. Lake and F. B. Holmes.—"Apparatus for the electrical precipitation of suspended particles from gases." 15717. September 24th, 1943. (568343.)

Mavor & Coulson, Ltd., and J. B. Mavor.—"Conveyors for conveying material such as coal." 1943. February 5th, 1943. (568299.)

Mitchell Engineering, Ltd., and T. S. Blenkinsop.—"Water-tube steam boilers." 11279. July 12th, 1943. (568273.)

Morgan Crucible Co., Ltd., and H. Barry.—"Insulated flexible electric conductors." 15825. September 27th, 1943. (568374.)

Philips Lamps, Ltd., T. Holmes and W. P. Hutchinson.—"Carbon coated resistors." 15069. September 14th, 1943. (568285.)

W. W. Triggs (Farnsworth Television & Radio Corporation).—"Colour television system." 8416. May 26th, 1943. (568326.)

Westinghouse Electric International Co.—"Refrigerating apparatus." 11619/43. August 6th, 1942. (568337.)

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.—May 24th. Sydney County Council. Portable sub-standard electrical indicating instruments. Spec. 751.

Batley.—April 30th. Town Council. Cables. (See this issue.)

Bury.—May 7th. Electricity Department. Meters and p.i. cables. (See this issue.)

Cleethorpes.—April 23rd. Electricity Department. Switchgear, transformers and cable. (March 23rd.)

Glasgow.—April 30th. Corporation. Supply and erection of electrically-driven centrifugal pumps. Manager, Sewage Department, 50, John Street, Glasgow, C.1.

Grimsby.—Electricity Department. May 1st. Switchgear, transformers and cables. (See this issue.)

Liverpool.—April 27th. Electricity Department. H.v. and l.v. switchgear for a period of two years. (April 13th.)

Louth.—May 11th. Electricity Department. Cables, transformers and switchgear. (See this issue.)

Manchester.—April 30th. Electricity Department. Extensions to 33,000-V switchgear at the Barton generating station and Benchill substation. (April 13th.)

Plymouth.—May 5th. Electricity Supply Department. L.v. underground network disconnecting boxes. (April 13th.)

Orders Placed

Birmingham.—Electricity Committee. Accepted. Repairs to main turbine.—G.E.C. Modifications to transformers.—Electric Construction Co. Extension to ash and grit disposal plant.—International Combustion.

Chesterfield.—Electricity Committee. Accepted. 500-kVA transformer (£400).—Yorkshire Electric Transformer Co.

Hull.—Electricity Committee. Accepted. Cooling tower (£70,866).—Mitchell Construction Co.

Newcastle-on-Tyne.—City Council. Accepted. Electrical repairs to Council houses (£120).—R. H. Patterson. Renewal of the electrical installation at Northumberland Baths and the City Hall (£872).—Falconar, Cross & Co.

Sheffield.—Electricity Committee. Contracts renewed for twelve months. Cables—W. T. Glover & Co. Transformers—Electric Construction Co., Hackbridge Electric Construction Co., and Bonar, Long & Co. Switchgear—Crompton Parkinson and A. Reyrolle & Co.

Warrington.—Electricity Committee. Accepted. Two 50-kVA transformers (£310).—Electric Construction 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.

Birmingham.—Factory extensions, Partons Road, King's Heath; John Gibbs, Ltd.

Bishop Auckland.—Canteen kitchen at Langley Dale; J. Wilson, Coulson Street, Spenny-moor, Co. Durham.

Bolton.—Works additions, Shaw Street; John Greenhalgh & Son.

Works additions, Riverdale Mill, Hacken Lane; Edwards Bros., Ltd.

Bootle.—Extensions, Merton Road School (£4,250); borough engineer.

Burnley.—High school for girls, Ivy Bank estate; J. L. Beckett, borough engineer.

Chesterfield.—Works additions, New Beetwell Street; Broomhead Bros., Ltd.

Durham.—Central kitchens at High Spenn; county architect, Shire Hall, Durham.

Edinburgh.—Permanent houses (106) in Ferry Road Drive; city architect.

Gateshead.—Crematorium; borough engineer.

London-Lewisham.—Extensions to Town Hall (£7,301); borough engineer, Council Offices, Town Hall, Catford, S.E.6.

Middlesex.—Maternity ward block at Chase Farm Hospital; county architect.

Newport (I.O.W.).—Boiler house and electricity substation for Isle of Wight Creameries, Home Mill; V. Aldridge, architect.

South Shields.—Rebuilding damaged houses, Cornwallis Square (£9,250); North-Eastern Housing Association, Northumberland Road, Newcastle-on-Tyne.

Reinstatement of offices and buildings; G. Thornton & Co., Porchester Street, South Shields.

Moslem seamen's club; A. Ridley, Dene House, Dean Road, South Shields.

Stockport.—Extensions to works and offices; H. Tatham, mill furnisher, Royal George Street.

Stretford.—Sawing machine house, Trafford Park Road; J. Rowlinson.

Machine shop, Elevator Road; G. Mason & Co., Ltd.

Works additions, Westinghouse Road Rubber Regenerating Co., Ltd.

Hydraulic pump house, Mosley Road; Chas. Corry, Ltd.

Torquay.—Partial reinstatement after fire, Burlington Cinema, Union Street; Associated British Cinemas, Ltd.

Workington.—Adapting Bankfield as town hall (£8,000); borough engineer.

York.—Nurses' hostel and admission block to Naburn Mental Hospital (£57,000); C. J. Minter, city engineer, Guildhall.

Works additions, Skeldergate Bridge; H. Richardson & Co., Ltd.

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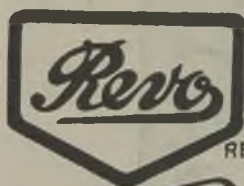


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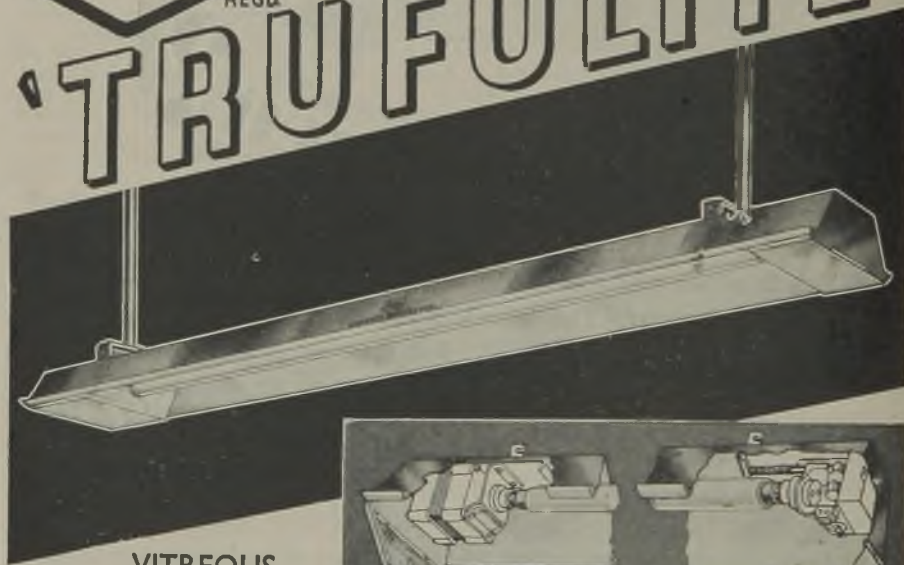
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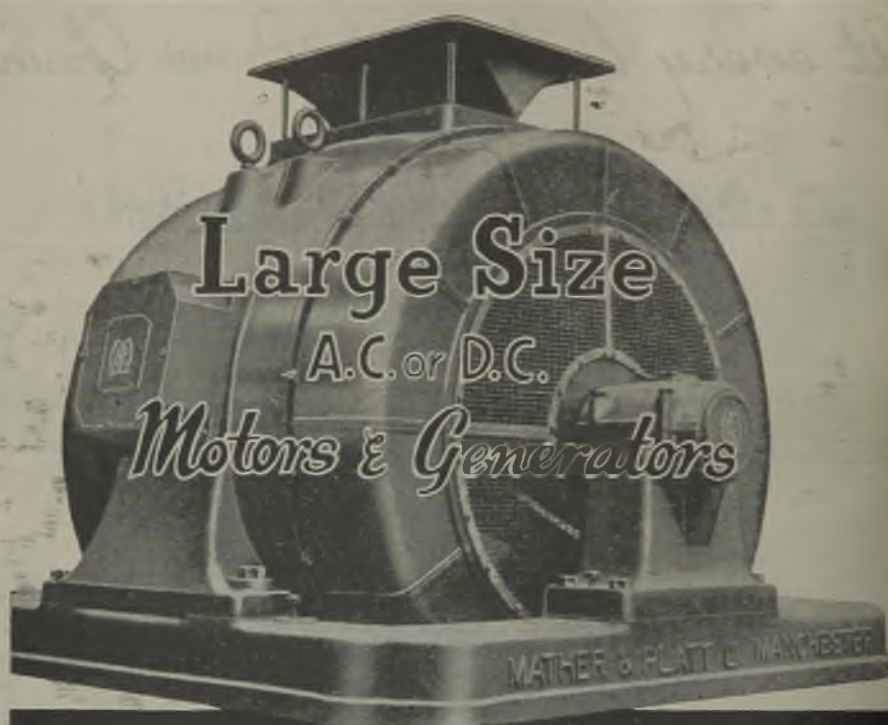


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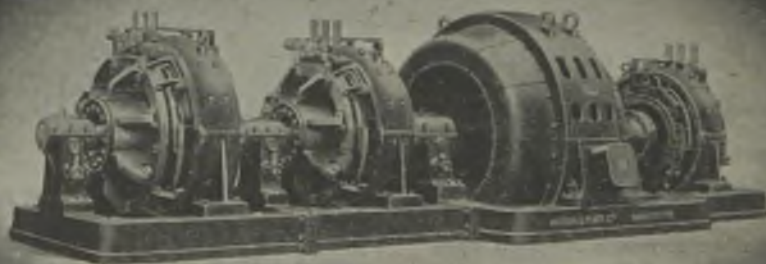
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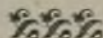
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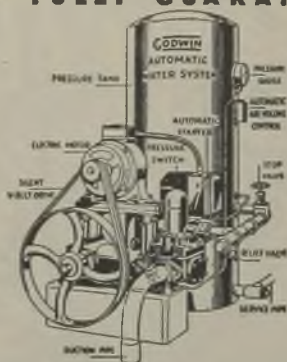
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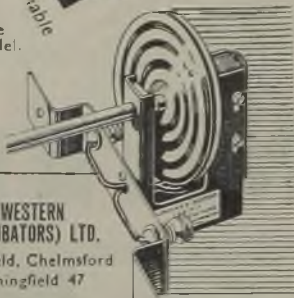
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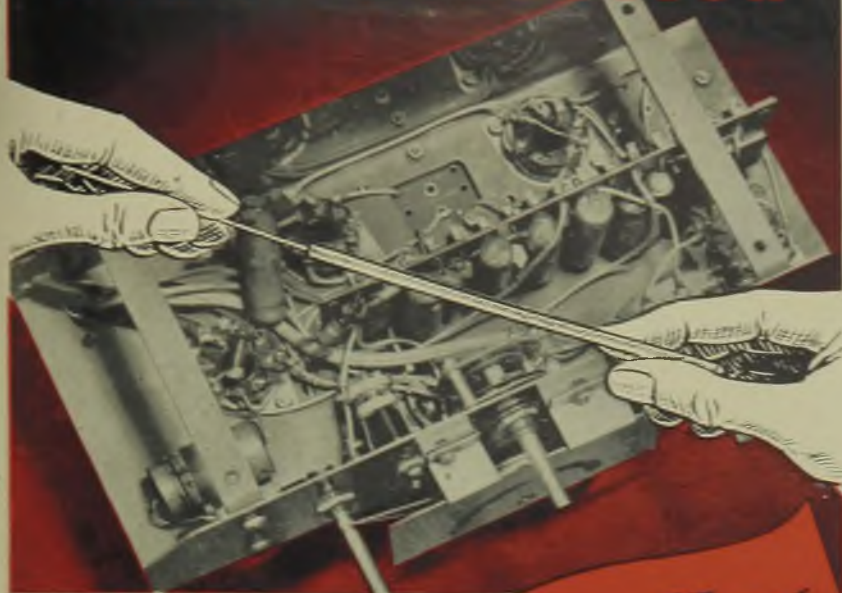
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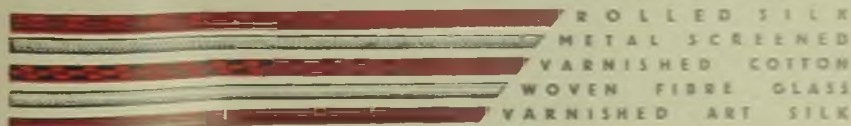
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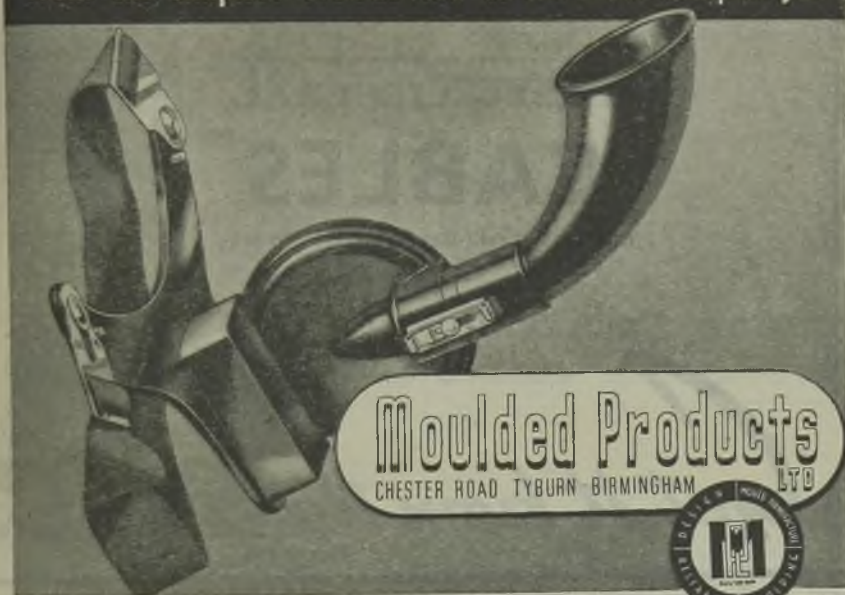
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ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First Post on Monday**, at Dorset House, Stamford Street, London, S.E.1.

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.

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.

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF LOUTH

Electricity Department

THE Louth Corporation invite Tenders for the Supply of the following Cables, Transformers and Switchgear:—

- (a) E.H.P. Cables;
- (b) L.P. Cables;
- (c) E.H.P. Truck Type Switchgear;
- (d) L.P. Switchgear;
- (e) Transformers.

Particulars and Specifications may be obtained on application to the Borough Electrical Engineer, Electricity Department, Cannon Street, Louth.

Tenders, enclosed in plain sealed envelopes and endorsed as stated in the Specification, must be delivered to the undersigned not later than noon on Friday, 11th May, 1945.

The lowest or any Tender will not necessarily be accepted.

ERNEST BAILEY.

Town Clerk.

Town Hall,
Louth.

1811

COUNTY BOROUGH OF GRIMSBY

Electricity Department

TENDERS are invited for the supply of—

	Specification
E.H.P. Switchgear for Substations (2)	No. 425
L.P. Switchgear for Substations (2)	No. 428
Transformers for Substations (3)	No. 429
E.H.P. and L.P. Cable (5,000 yds.)	No. 430

Specifications and forms of tender may be obtained from Mr. G. W. Parker, Engineer and Manager, Electricity Works, Moss Road, Grimsby.

Tenders to be received by the undersigned not later than first post 1st May.

L. W. HEELER.

Town Clerk.

Municipal Offices, Grimsby.
9th April, 1945.

1793

BOROUGH OF BATLEY

Low Tension Paper Insulated Lead Sheathed Steel Tape Armoured Cable

THE Council of the Borough of Batley invite tenders for the supply and delivery of Paper Insulated Lead Sheathed Steel Tape Armoured Cables of various sizes. Particulars may be obtained from the Borough Electrical Engineer, Electricity Works, George Street, Batley.

Tenders endorsed "Low Tension Cables" must be addressed to the undersigned in plain sealed envelopes bearing no mark to indicate the sender, and delivered not later than 12 noon, Monday, April 30th, 1945.

THOS. E. CRAIK, Esq.,

Town Clerk.

Town Hall,
Batley.

1809

COUNTY BOROUGH OF BURY

TENDERS are invited for the supply and delivery, for a period of 12 months, of (a) Meters, (b) Paper Insulated Cables, required in the Electricity Department.

Particulars and forms of tender can be obtained from the Engineer and Manager, Electricity Department, Market Street, Bury.

Sealed tenders on official forms must reach the undersigned not later than noon on Monday, the 7th May, 1945.

(Signed) **EDWARD S. SMITH.**

Municipal Offices,

Bank Street, Bury.

10th April, 1945.

Town Clerk.

1806

SITUATIONS VACANT

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

CITY OF LEEDS

Electricity Supply Department

Appointment of Deputy City Electrical Engineer and Manager

APPPLICATIONS are invited for the post of Deputy City Electrical Engineer and Manager at a commencing salary of £1,100 per annum, with maximum salary of £1,300 per annum.

The person appointed will be required to assist the City Electrical Engineer and Manager in the operation and administration of the undertaking and to give his whole time to the duties of the post.

Candidates (preferably corporate members of the Institution of Electrical Engineers) should have had a sound mechanical and electrical engineering training, and be experienced in the construction, operation and control of a large electricity supply undertaking.

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

Applications, stating age, qualifications and particulars of training and experience, together with copies of not more than three recent testimonials, forwarded in sealed envelopes and endorsed "Deputy City Electrical Engineer and Manager," must reach the undersigned not later than Saturday, 12th May, 1945.

Canvassing in any form, either directly or indirectly, will be a disqualification.

F. NICHOLLS, M.I.E.E., F.I.F.,

City Electrical Engineer and Manager.

1. Whitehall Road,
Leeds, 1.

1807

BUYER required for light engineering works in Lanarkshire. Must be thoroughly conversant with suppliers of all materials, including pressings, die-castings, stampings, etc. Post-war opportunity for energetic man who can buy effectively in the right market. Reply, stating age, qualifications and salary required, to—Box 146, Dorlands, 18/20, Regent Street, London, S.W.1. 1790

SPALDING URBAN DISTRICT COUNCIL

Electricity Department

APPPLICATIONS are invited for the position of Lady Demonstrator in the above department. Candidates must have had a good education, hold the E.A.W. diploma or certificate or other approved qualifications, and have a thorough knowledge of domestic electrical appliances. They must be competent to conduct lectures, cookery demonstrations and advise on the selection and use of electrical appliances. Preference given to one who can carry out small repairs to plugs and flexibles on small appliances.

Salary in accordance with the East Midland Provincial Council scales, Grade E (£170-10-210), plus war bonus.

Applications, giving full particulars, to the undersigned in sealed envelope endorsed "Demonstrator" not later than May 7th.

FRANK R. C. ROBERTS,

9. Winsover Road, Spalding. Engineer and Manager. 1810

BATTERSEA POLYTECHNIC, LONDON, S.W.11

THE Governing Body invite applications for the appointment of a Lecturer in Electrical Engineering with qualifications in telecommunications and light-current engineering, particularly electronics. Salary according to the London Burnham Scale. Further particulars may be obtained from the Clerk to the Governing Body, by whom applications should be received not later than May 2nd.

G. F. O'Riordan, Principal. 1752

BOROUGH of Luton Electricity Department: Junior District Engineer. Applicants should be corporate members of the I.E.E., or of equivalent standard, and should have had experience of urban and rural E.H.T. transmission and L.T. distribution. It would also be a recommendation if the applicant had experience with oil-filled cables. Salary is in accordance with the N.J.B. Schedule, Class H, Grade 9a, at present £326 p.a. Write, quoting D.1174XA, to Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia St., Kingsway, London, W.C.2, for application form, which must be returned completed by 26th April, 1945. 1784

CITY of Bradford Electricity Department. Clerk of Works required, possessing the necessary qualifications, to supervise carrying out of large power station extensions, including civil engineering works. Candidates must also be capable of setting out work. Salary and conditions of employment in accordance with National Joint Board Agreement, at present £485 per annum (Class H, Grade 7). Selected candidate to pass medical examination and contribute to superannuation scheme under provisions of Local Government Superannuation Act, 1937. Applications in writing (no interviews), stating date of birth, full details of qualifications and experience (including a list in chronological order of posts held), with copies of not more than three recent testimonials, and quoting Reference No. 538, should be addressed to the Ministry of Labour and National Service, Appointments Office, Lloyds Bank Chambers, Vicar Lane, Leeds. 1799

JUNIOR Laboratory Assistant. Applications are invited from persons capable of assisting in the analysis of coal and the testing of oil, water, etc., also calculations connected therewith. A knowledge of the working and care of the instruments would be an advantage. Salary according to age and experience. Please write, giving particulars of age, experience and references to—Mr. H. F. J. Thompson, M.I.E.E., General Manager and Engineer, Electric House, 204, Lavender Hill, Battersea, S.W.11. 1797

ENGINEER required by the Government of Iraq to take charge of the Central Technical Section of the Directorate of Municipalities for two years in the first instance. Salary between I.D.120 and I.D.130 a month, according to qualifications and experience. High cost of living allowance, at present I.D.24 a month (I.D.1 = £1). The post is not pensionable, but there is a provident fund. Free passages. Candidates should hold a university degree in engineering or be corporate members of the Institutions of Civil, Mechanical or Electrical Engineers, and have had not less than 10 years' experience in the running and maintenance of oil engine-driven electrical generating and waterworks pumping plant, together with experience in the control of technical and clerical staff. Write, quoting C.2378A, to Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for application form, which must be returned completed by 26th April, 1945. 1783

ELECTRICAL wholesalers require Trade Counter Assistant. Must be conversant with all types of electrical material for installation purposes.—London Electrical Co., 92, Blackfriars Road, S.E.1.

ENGINEER with experience of works and production organisation, and control of personnel, required by important company in the electrical industry in the London area, in the capacity of Assistant Works Manager. Good prospects, salary and pension for man with the required qualifications, which should include an engineering degree.—Box 1746, c/o The Electrical Review.

MILFORD Haven Urban District Council. Technical Electrical Assistant. Applicants should be Graduate Members of I.E.E. or of equivalent standard, and who have had experience on the distribution side of an electricity authority with E.H.T. and L.T., A.C. and D.C. distributing systems; experience with change-over an advantage. Salary £384 p.a., in accordance with Grade 5, Class B, of the N.J.B. Schedule, with promotion to Grade 3 at the end of five years' satisfactory service. Appointment subject to the Superannuation Acts and to medical examination. Write, quoting D.1175XA, to Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia street, Kingsway, London, W.C.2, for application form which must be returned completed by April 30, 1945. 1824

PROGRESSIVE company in the London area, intending to specialise in electrical measuring instrument manufacture as soon as the present restrictions on employment are removed, invite applications for the post of Senior Design Draughtsman. Applicants must have wide theoretical and practical experience in the development of electrical and electronic apparatus. Excellent opportunity for really first-class man. Write, giving details of experience, salary required, etc.—Box 1785, c/o The Electrical Review.

REPRESENTATIVE required in South Wales area by leading firm of Electrical Manufacturers. Knowledge of electric lamps, cables, batteries, etc., an advantage. Replies to—Box 1813, c/o The Electrical Review.

REQUIRED by old-established company manufacturing small wires and cables, Sales Representative for the Midlands. Qualifications required: Past experience in handling of these manufactures, connection amongst electrical apparatus manufacturers, both domestic and industrial. Practical experience in wire and cable manufacture would be considered an advantage. Write, giving age and full details, to—Box 6946, c/o The Electrical Review.

SALES Engineer. Permanent progressive position in London for a man with a knowledge of A.C. and D.C. motors. Apply, in first instance, to—Higgs Motors Ltd., Birmingham, 6. 1820

SALES Engineer required by electrical instrument manufacturers for the London area. Write, stating experience, age, salary required and when available, to—Box 1714, c/o The Electrical Review.

SALES Representative for all Great Britain required by prominent manufacturers of transformers, rectifying and battery charging equipment. Permanent and remunerative post for right applicant. Present staff have been advised of this appointment. Previous sales experience necessary in the above type of equipment. The above appointment would carry salary, commission and expenses commensurate with qualifications. Apply to—Managing Director, c/o Messrs. Enoch Cox & Co. Ltd., Berrington Chambers, Wolverhampton. 1748

WORKS Superintendent. Progressive company, employing 1,500, manufacturing light electrical mechanical equipment, S.W. London district, requires man with extensive experience in similar capacity. Applicants must be competent to control labour all grades, have thorough knowledge latest manufacturing methods and layout. Capable of supervising large quantity production on economical basis to give results. Write, giving full details and salary required, to—Box 1782, 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.

HOVE Borough—Technical Assistant Engineer.

SITUATIONS WANTED

ADVERTISER (36), present position aircraft industry finishing, desires permanent responsible position. Wide knowledge sales, development, installation, public supply, instrument manufacture, testing and inspection. Salary £300-£400.—Box 6950, c/o The Electrical Review.

A qualified Electrical and Mechanical Engineer, with extensive experience in executive positions, wishes to contact a company who can offer a post requiring initiative and ability.—Box 6940, c/o The Electrical Review.

ADVERTISER (30), wide experience Sales and Office Administration, desires change. Full details, salary, etc.—Box 6944, c/o The Electrical Review.

CHARGHAND, disengaged, seeks berth, distance no object.—Box 6947, c/o The Electrical Review.

CHARTERED Electrical Engineer (35), electrical contracting 10 years, consumers engineer, London supply undertakings 5 years, commercial manager, provincial supply undertaking 4 years, wide experience control of technical sales, sales planning methods, sales personnel and manual staff, design, layout and specifications for any applications of electricity, general management experience with negotiations for large contracts, requires responsible post-war appointment in London area.—Box 6954, c/o The Electrical Review.

DEMONSTRATOR holding E.A.W. diploma, with 20 years' experience in the industry, would like position where initiative and business capacity useful. Interested in selling domestic appliances. Would travel abroad.—Box 6905, c/o The Electrical Review.

ELECTRICAL Engineer (30), B.Sc. (Hons.), experience instrument development, seeks responsible position.—Box 6945, c/o The Electrical Review.

ELECTRICIAN, fully exp. all branches installation work, used to estimating, costing and control labour, seeks position in supervisory capacity.—BM/L.E.K. London, W.C.1.

ENGINEER (32), experienced several branches electrical industry, installations, maintenance, production, sales, at present representing well-known motor manufacturer, present salary £500, will consider position with responsibility and offering the highest prospects, London area.—Box 6924, c/o The Electrical Review.

EXECUTIVE Engineer seeks situation as production manager or similar. Practical experience of autos, capstans, milling and drilling. A sound knowledge of production methods as applied to the light electrical and mechanical industry. London or near.—Box 6935, c/o The Electrical Review.

EXPERIENCED Representative and Sales Engineer, resident in Bristol, seeks appointment in Western Counties for electrical manufacturers.—Box 1771, c/o The Electrical Review.

FLUORESCENT Lighting Auxiliaries, Design and Production Engineer seeks change. Capable taking full control.—Box 6922, c/o The Electrical Review.

FOREMAN Maintenance Electrician, over 30 years' experience, 20 years present post, armature and stator winding, all types, power, lighting, etc., desires change, on Tyneside.—Box 6920, c/o The Electrical Review.

GRAD.I.E.E., ex R.E.M.E. Officer (30), seeks executive post in London. Excellent education, thorough works and drawing office apprenticeship, light and medium switchgear, motors and generators, remote control work. Considerable liaison and literary experience. Min. sal. £600.—Box 6930, c/o The Electrical Review.

HIGHLY qualified, Diploma, Electrical Engineer, M.Sc., 15 years' exp. motors, generators, instruments, own patents, ideas, wishes change position or be consulting eng., full or part-time, to electrical firm interested development all kinds electrical machines and instruments.—Box 6964, c/o The Electrical Review.

MAINTENANCE Electrician, fully conversant, seeks engagement.—Box 6948, c/o The Electrical Review.

PRACTICAL Electrical Engineer, business experience, welcomes offers, suggestions for employment, home, abroad, now or future. Present situation retarding, natural initiative, age 34, married.—Box 6952, c/o The Electrical Review.

PURCHASING Manager desires change. Electrical and radio manufacturing materials, 14 years' experience buying and material control.—Box 6931, c/o The Electrical Review.

TECHNICAL Lighting Engineer requires change, capable of preparing complete lighting schemes for war applications, factories, public lighting, etc., electrical and lighting experience and technical correspondence.—Box 6925, c/o The Electrical Review.

WORKS Electrical and Mechanical Engineer (46), fully competent to undertake complete factory or works plant and machinery installation, modernisation, etc., desires appointment with view to taking charge on completion. Full proof of past experience available. Salary, minimum, £650. Southern or South-East England preferred.—Box 6914, c/o The Electrical Review.

YOUNG man (17) with quite a good preliminary knowledge of electrical and mechanical engineering, including radio, seeks remunerative position, very keen on being trained for position. Write—Box 6941, c/o The Electrical Review.

FOR SALE

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

NORTH-EASTERN ELECTRIC SUPPLY COMPANY LIMITED

REDUNDANT Plant, without guarantee, for disposal at North Tees Power Station, Haverton Hill, can be inspected upon application being made in writing to the Company's Head Office as below.

Two Turbine-driven Weir Boiler Feed Pumps

Specification: Capacity 250,000 lbs. per hour working with a steam pressure of 450 lbs. per sq. inch gauge against a feed range pressure of 600 lbs. sq. inch gauge when exhausting against a back pressure of 1 to 5 lbs. per sq. inch gauge. These pumps were installed in 1921 as stand-bys to the electrically driven pumps, and have not, therefore, had extensive use.

Three Mather & Platt Motor-driven Boiler Feed Pumps

Specification: Capacity 220,000 lbs. per hour against 600 lbs. pressure with 2,930 r.p.m. These pumps are without motors.

Offers are invited and should be addressed to the Company, Carlisle House, Newcastle-upon-Tyne, 1, and marked "for the attention of the Stores Supervisor," and should be despatched not later than Friday, 4th May.

For the North-Eastern Electric Supply Co. Ltd.

H. E. NELSON, Secretary.
1795

GEORGE COHEN, SONS & CO. LTD.,

for

GUARANTEED ELECTRICAL
PLANT.

MOTORS, GENERATORS,
SWITCHGEAR,
etc.

WOOD LANE, LONDON, W.12.
Telephone: Shepherds Bush 2070

and
STANNINGLEY, NEAR LEEDS.

Telephone: Pudsey 2241.
Established 1834.

TRANSFORMERS

THE Northwood Electric Light & Power Co. Ltd. have for disposal the following:—

- 5 B.E.T. 40-kVA, indoor, 2,700 volts primary, 415 volts secondary, delta/star.
- 1 B.E.T. 20-kVA, indoor, 2,700 volts primary, 415 volts secondary, delta/star.
- 2 B.E.T. 200-kVA, indoor, 10,600 volts primary, 2,800 volts secondary, star/star.

All for 3-phase, 50-cycle supply, with plus and minus taps on primary side.

The Transformers can be inspected by arrangement, and offers should be addressed to the company at Station Parade, Northwood, Middlesex. 1801

ECONOMISERS IN STOCK

TWO Green's Economisers, 208 tubes, 250 lbs. W.P.

Guaranteed re-insurable and first-class condition only, low prices. Quotations per return. Installations delivered and erected complete.

BURFORD, TAYLOR & CO. LTD.

7, Commercial Street, Middlesbrough Telephone 2622. 65

280-h.p. PETTER VERTICAL 4-CYLINDER "ATOMIC" DIESEL ENGINE, new 1934. No. 220497, 300 r.p.m., complete with bedplate, outer bearing and pulley, starting compressor with engine and air bottle, cooling tanks and streamline filter, first-class condition.

120-h.p. RUSTON & HORNSBY VERTICAL TWIN-CYLINDER DIESEL ENGINE, No. B.222, 333 r.p.m., complete as above, first-class condition.

60-h.p. DAVEY PAXMAN VERTICAL TWIN-CYLINDER SPRING INJECTION DIESEL ENGINE, No. 23477, new 1933, 370 r.p.m., complete with bedplate, electric type flywheel, tanks, compressor, etc.; 41-kVA CROMPTON PARKINSON Alternator, 365 volts, 3-phase, 50 cycles, available for this machine.

45-h.p. PETTER VERTICAL SINGLE-CYLINDER "ATOMIC" DIESEL ENGINE, new 1933, 375 r.p.m., complete with tanks, flywheel, bedplate, starting bottle, etc., overhauled and ready for despatch; 29-kW, 460/230-volts D.C. Generator available for this engine.

37½/42-h.p. CROSSLEY VERTICAL SINGLE-CYLINDER ENCLOSED "COMPRESSORLESS" DIESEL ENGINE, No. 103235, new 1935, 500 r.p.m., complete with tanks, filter, shaft extension, pulley and bearing, air bottle, etc., overhauled and ready for despatch.

6-h.p. LISTER VERTICAL SINGLE-CYLINDER PETROL ENGINE, 350 r.p.m., complete with petrol tank, twin flywheels and pulley, overhauled.

ALL LYING AT YATE.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL
1817

WATER TUBE BOILERS IN STOCK

Two	25,000 lbs. evaporation,	175 lbs. W.P.
Three	20,000 lbs. "	175 lbs. "
One	12,000 lbs. "	200 lbs. "
One	12,000 lbs. "	160 lbs. "
One	9/10,000 lbs. "	200 lbs. "

We install complete, including brickwork. Economisers, Pumps, Piping Valves, Generating Sets and Motors in stock. Please send us your enquiries; we can give immediate delivery.

BURFORD, TAYLOR & CO. LTD.,
Boiler Specialists, Middlesbrough.
Telephone: Middlesbrough 2622.

32

ELECTRIC MOTORS AND DYNAMOS

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

For Sale or Hire. Send your enquiries to:—

BRITANNIA MANUFACTURING CO. LTD.,
22-26, BRITANNIA WALK,
CITY ROAD, LONDON, N.1.

Telephone: 5512-3 Clerkenwell.

13

SLIP-RING A.C. MOTORS, 400/3/50-CYCLES

H.P.	R.P.M.	
200	970	BRUSH, with oil starting gear (NEW 1937).
160	720	L.D. & M. with E.A.C. oil starting gear.
90	1,450	BRUSH, with oil starting gear (NEW 1942).
85	730	CROM PARK with ALLEN WEST oil starting gear.
75	720	BROOK, with oil starting gear.
40	720	B.T.H., with ELLISON oil starting gear.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL
1781

BURDETTE & CO. LTD.

Stock

Reconditioned A.C. and D.C. Motors and Starters Equal to New.

STONHOUSE STREET, CLAPHAM, S.W.4.

Day and night service.

MACaulay 4555.

17

250-kW BELLISS/SIEMENS ALTERNATOR SET:

Belliss vertical enclosed V-valve engine, 120 lbs. pressure, 375 r.p.m., direct coupled to Siemens 3,000/3,300-volts, 3-phase, 50-cycles alternator, complete with switchboard, Korting jet Condenser, valves and gauges.

150-kW BELLISS/MATHER & PLATT GENERATING SET: 215-h.p. vertical enclosed compound engine, 150 lbs. pressure, 450 r.p.m., direct coupled to 150-kW MATHER & PLATT 250-volts D.C. Generator with switchgear, overhauled and ready for despatch (2 available).

75-kW BELLISS/ELECTROMOTORS GENERATING SET: 115-h.p. vertical enclosed compound engine, 180/200 lbs. pressure, 525 r.p.m., direct coupled to 75-kW, 220/110-volts D.C. Generator with switchgear, overhauled and ready for despatch.

50-kW BROWETT LINDLEY/BRUSH GENERATING SET: 70-h.p. vertical enclosed compound engine, 150 lbs. pressure, 600 r.p.m., direct coupled to 50-kW, 110-volts D.C. Generator with switchgear, overhauled and ready for despatch.

6.5-kW READER/ELECTROMOTORS GENERATING SET: 10.5-h.p. vertical single-cylinder engine, 60/70 lbs. pressure, 800 r.p.m., direct coupled to 6.5-kW, 220-volts D.C. Generator with switchgear, overhauled and ready for despatch.

INSPECTION AT YATE.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL
1816

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G-POWER UNITS

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3-kVA

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

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

30-kVA

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

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

Several others.

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

THE ELECTROPLANT CO.

(Est. 1912).

PALACE OF ENGINEERING, WEMBLEY, MIDDX.
1787

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 0898.

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TRANSFORMERS

THE Colne Valley Electric Supply Co. Ltd. have for disposal the following:—

3 Hackbridge 40-kVA, indoor, 2,870 volts primary, 425 volts secondary, delta/star.

2 Hackbridge 20-kVA, indoor, 3,300 volts primary, 415 volts secondary, delta/star.

2 Hackbridge 10-kVA, indoor, 3,300 volts primary, 415 volts secondary, delta/star.

All for 3-phase, 50-cycle supply, with plus and minus taps on primary side.

The Transformers can be inspected by arrangement, and offers should be addressed to the company at Love Lane, Pinner, Middlesex.

1802

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

A number of D.C. Generators, 100 kW, 500 volt, 250 r.p.m., Crompton, for coupling. First class. Low prices.—The Electrolap Co., Wembley, Middx. 1788

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

A C. and D.C. Motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 4422). 6781

A C. Motors, 1/50th h.p. to 10 h.p., from stock. Also D.C.—The Johnson Engineering Co., 66, Great Portland Street, London, W.1. Tel.: Museum 6373. 57

A ERIAL Cables, all sizes quoted for; good deliveries against Government contract numbers.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6955

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

BEST English Cables, 1/.044 up to 127/103, deliveries against M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6956

CARBONS, large stocks assorted sizes, solid and core.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6957

EXHAUST Fans, new, 14", 1-phase, 200/250 v., 1,900 cu. ft./min., £11 15s.—Southern Ignition Co. Ltd., 190, Thornton Road, Croydon. 75

FOUR identical 150-kW "Weir Sulzer/E.C.C." Diesel-driven Generating Sets, 220 volt D.C.—Stewart Thomson & Sons, Fort Rd., Seaforth, L'pool, 21. 74

KEGHLEY Electric Lift, capacity 2½ tons, cage 17' x 7' x 9', length of travel 35', with four sets of landing gates, suitable for 440-volts D.C. supply. Can be inspected working at Norwich.—Box 1796, c/o The Electrical Review. 18

INSU-Glass covered Plain or Enamelled Instrument Wires, No. 18 s.w.g., No. 40 s.w.g., stock deliveries.—Saxonia, Roan Works, Greenwich, S.E.10. 29

LEAD-covered and Armoured Cables, P.I. and V.I.R., various special lines at low prices.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6958

LESLIE Dixon & Co. for Dynamos, Motors, Switchgear, Chargers and Telephones.—214, Queenstown Road, Battersea, S.W.8. Telephone, MACaulay 2159. Nearest Rly. Sta., Queen's Road, Battersea (S.R.). 18

MASSON Scott London Heavy Duty Hogging Machine for grinding bones, thermoplastics, wood, etc., fitted with 30" dia. x 15" wide vee-shaped rotor with 12 cutting blades, speed 1,250 r.p.m., vee-rope driven from 60 h.p. Mather & Platt double squirrel cage motor, 400/440 volts, 3-phase, 50 cycles, 1,425 r.p.m., with starter. All new 1942, capacity 3½ tons per hour.—Newman Industries Limited, Yate, Bristol. 1818

MEGGER, 500 v., combined voltmeter, leather case, £14.—Doxey, 107, Bannercross Rd., Sheffield. 6937

MOTOR Generator Sets and Convertors, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, City Road, London, N.1. Telephone, Clerkenwell 5512. 5513 & 5514. 28

NAMEPLATES, Engraving, Diesinking, Stencils, Steel Punches.—Stillwell & Sons Ltd., 152, Far Gosford Street, Coventry. 14

ONE Electric Lighting Set, complete, consisting of 5 h.p. oil engine, dynamo, switchboard and battery of 52 cells, in new condition, and cooling tank, 80 galls. What offers?—Box 1822, c/o The Electrical Review. 18

ONE 48-kW and one 150-kW Steam Generating Sets, 220 volts D.C., each mounted on single C.I. bedplate fitted with Browett-Lindley compound high-speed engines, suitable for 100 lbs. per sq. inch working pressure; and Siemens open type multi-polar compound wound Dynamos, together with G. Ellison switchgear and panels. The whole in first-class running order. Inspection invited: North London locality. Reasonable prices accepted to save warehousing.—Biggs, Wall & Co. Ltd., Hampden Works, London, N.10. Telephone: Tudor 2009/10. 1734

PANEL and Tubular Heating, 230/250 v., thermostatic control, sufficient 6-7 rooms, £100. Apply in writing to—"H.Q." c/o Geo. J. Smith & Co. Ltd., 154, Fleet Street, E.C.4. 1791

PHONE 98 Staines. 60-kW Crude Oil Set, 220 v. D.C.; 7½-hp Crude Oil Set, 110 v. D.C.; 35-kW Tangye ditto, 220 v. D.C.; Weir Service Pump, 6,300 gals. per hour; 30-hp. National Oil Engine; Fuel Oil Tank, 28' x 6' 6".—Harry H. Gardam & Co. Ltd., Staines. 60

PORCELAIN Cleats, 2 and 3 groove, various sizes ex stock, price list.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6959

PORCELAIN Insulators, various sizes in stock, galv. spindles.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6960

PORTABLE Engine-driven Welding Sets, output 75/350 amps., brand new, Government licence to purchase, delivery stock.—Gladiator Welder Sets Ltd., 18, Leicester Road, Sale, Manchester. 69

QUANTITY Stranded Naked Bronze, Aluminium and Copper Telephone Wires in coils. Samples available, 1s. 3d. per lb. to clear. Also quantity of Tagbled Mixed Gauges Short Coils Resistance Wires at scrap price.—Pattison, Siddals, Derby. Phone 45249. 6938

ROTARY Converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 16

SEVERAL Telescopic Tower Ladders ready for essential work. Extensions, Trestles and Steps to order.—Shaftesbury Ladders Ltd., 453, Katherine Road, E.7, Grange Road 3363. 15

SPECIAL line, Bell and Telephone Wires, also screened wires, large quantity, cheap.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6961

STAFF Time Checking and Job Costing Time Recorders (all makes) for quick cash sale. Exceptional condition. Write—Box 528, Smiths, 100, Fleet Street, London, E.C.4. 31

SWITCH and Fuse Units, Conduits and fittings, works requirements stocked.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6962

SWITCHBOARDS suitable for dynamos and alternators, all sizes from 100 amp. up to 1,500 amp.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 25

THREE Plating M/G Sets, output 500 amps., 10 volts, input 400 volts, 3-phase, 50 cycles, squirrel cage motors with starters, regulators and exciters.—Newman Industries Limited, Yate, Bristol. 1707

TRANSFORMER Lead in Wire, 7/38 and 14/38 s.w.g.—Insu-Glass finished, various colours, stock.—Saxonia, Greenwich, S.E.10. 34

TRANSFORMERS, single and three-phase. All types up to 10 kVA.—Woden Transformer Co. (Types, Bilston 41959), Moxley Road, Bilston, Staffs. 12

TR.S. Cables and Flexibles, Welding Cables, supplied to M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6963

TWO English Electric Rotary Convertors, in excellent order, 7,000 volts, 2 phase, 50 cycles, incoming supply D.C. voltage 400/440. These rotaries are complete with their transformers and C.D. panels.—W. Wesson & Co. Ltd., Victoria Iron & Steel Works, Moxley, Wedsbury. 1814

5-kVA Motor Alternators, date 1939, input 100 volt D.C., output 5 kVA, 230/150, 22 amps.; two available.—Electric Machinery Co. (M/cr) Ltd., New Islington, Accrington, Manchester. 1800

6 Transformers, 6,600/200, s.p.h., 50 c., 50 to 150 kVA.—Box 1819, c/o The Electrical Review. 18

61-kW Turbo-Generating Set, 110 volt D.C., £40.—Stewart Thomson & Sons, Fort Road, Seaforth, Liverpool, 21. 55

71-kW Steam-driven Generating Set, Ashworth Parker vertical engine coupled to L.D.M. compound wound 230-volt generator, £120.—Stewart Thomson & Sons, Fort Road, Seaforth, Liverpool, 21. 54

68-kW, 220-v., 770-revs. C.I. three-bearing Generator, J. P. Hall, with switchboard.—Greenhalgh Bros., Burtons Field Mill, Atherton, Manchester. 1710

100-hp, 400/350, S.R., 730-revs., Louvre Vent., B.T.H. (ball bearings), with Ellison C.I. gear.—Greenhalgh Bros., Burtons Field Mill, Atherton, M/cr. 1711

100-volt Generating and Storage Plant, suitable for country house, 8-h.p. Pelapone engine, generator and 54-cell battery, capacity 342 ampere-hours at the 10-hour rate; full working order. Available for inspection Sussex.—Box 1805, c/o The Electrical Review. 18

170-kW, 400/350, 428-r.p.m. Wright & Wood Alternator with switchboard; 112-kW, 400/350, 500-r.p.m. Greenwood & Batley Alternator with switchboard. For immediate disposal ex site.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 1815

250-kVA Alternator, 400 volts, 3-phase, 50 cycles, 750 revs., with direct coupled exciter.—Midland Counties Electrical Engineering Co. Ltd., Grice Street, Spon Lane, West Bromwich. 86

332-amp. (42-h.p.) Motor, 110 volts D.C., 770 r.p.m., compound wound, with pulley, slide rails, etc. Makers, Thos. Parker Ltd. Offers to—Newman, Hender & Co. Ltd., Woodchester, Glos. 1803

500 yds. (two drums with 250 yds. each) of new .01 SWA Cable, 3-core, V.I.R., by Enfield. Price, 250 yds. reeled on drum (returnable), £51. Large stock of surplus DWA Cable. Ask for special list.—Berry Hill Plant Division, Cheadle, Staffs. Phone 2181. 1789

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A.C. Generator, 250 v., 50 cycles, single-phase, 5 amps., or one near.—Runbaken Electrical Products, 2, Glebe-lands Road, Sale, Cheshire. 1755

ACETATE and other thermoplastic scrap; polythene and P.V.C. in any form; also scrap cable and insulated wire; urgently wanted.—Elton Levy & Co. Ltd., 18, St. Thomas Street, S.E.1. 30

COIL Winding Machines wanted for essential work.—Box 63, c/o The Electrical Review.

ENAMELLED Copper Wire wanted. Please state quantity, make, gauge and price.—Box 61, c/o The Electrical Review.

ENGINEERING Technical Books (new or secondhand) wanted in any quantity. Attractive cash offers. Call—Third floor, 356, Oxford Street, W.1, or "Stoneleigh," St. George's Avenue, Weybridge. 62

MASSELEY Showcard Outfit wanted, full details and price to—Hill, 12 Sipson Lane, Harlington, Mdx. 6939

ONE compound wound D.C. Generator, 3-bearing type, 230 volts, 120 kW, speed 500-750. One 4-wire, 400-volts, 3-phase, 50-cycles Alternator, with direct coupled exciter, 3-bearing machine, 200 kVA, speed 500-600-750, if possible complete with control switchboard.—Box 67, c/o The Electrical Review.

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ARGENTINE: Post-war Exports. Well-connected Agent recently returned to this country, with partner competent engineer in the Argentine, wishes to contact British firms manufacturing all classes of electrical equipment, engineering lines, cables, hardware, etc. Excellent opportunity for firms to anticipate early resumption of trading with thoroughly competent representatives in leading South American country. Highest credentials, full particulars.—Box 46, c/o The Electrical Review.

COMPANY with facilities in Bristol and service engineers shortly available require Refrigerator Agency for South-West England, and certain Electrical Accessories.—Box 1770, c/o The Electrical Review.

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MANUFACTURERS' Agents, covering the whole of Great Britain and Colonies, are desirous of contacting manufacturers with a view to sole selling rights (either commission or buying), post-war arrangements considered.—Box 23, c/o The Electrical Review.

NORTH-West England: Agent, recently left the Services, requires lines suitable for distribution to the wholesale trade. Extensive personal connection in Lancashire, Yorkshire, Cheshire, etc.—Box 6910, c/o The Electrical Review.

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PARTNERSHIPS

BUSINESS man, age 43, extensive pre-war London connection as Electrical Contractor, licence to trade, wire, shopfitting, elec. contracting, invites one or two participants as active partners with finance.—Box 6942, c/o The Electrical Review.

COMPANY MEETINGS

LONDON ASSOCIATED ELECTRICITY UNDERTAKINGS LTD.

Lord Lytton's Review

THE Annual Meeting of London Associated Electricity Undertakings was held in London on the 11th April. In moving the adoption of the report and accounts for the year, the Earl of Lytton, chairman of the company, said:

The last published accounts of Central London Electricity were those for the year 1939. The ban on publication has now been lifted, and I am able to tell you how that company has fared during the war.

Central London Electricity Years 1940-1943

The years 1941 to 1943 were most anxious and difficult. Sales of units fell from 432 million in 1938 to 363 million in 1943, a reduction of 129 million, or 30%. The number of consumers fell from 86,000 to 53,000, or 39%. Consequent loss of revenue was met as far as possible by increases in tariffs in 1940 and again in 1943. Notwithstanding the strictest economies, the increased charges did not meet the loss of revenue. The cost per unit was greatly increased owing to the fixed charges (in the case of generating costs 40% of the total) falling on a much smaller output and to progressive increases in the price of coal. In 1938 it was 21s. 2d. per ton; in 1944 it was 45s. 4d., an increase of 116%.

The company was not compensated by an increase of load from war factories to affect the loss of commercial and domestic load. The pre-war load of 178,000 kW fell to 111,000 kW, or 37%.

For 1942 and 1943 a readjustment of Sinking Fund contributions was granted by the Electricity Commissioners, subject to the funds being restored to normal at the earliest opportunity and payment of dividends being subject to the Commissioners' consent until this had been done.

Bulk supply stations were damaged on 55 occasions: 139 transformer chambers were damaged; 1,424 cables were put out of action. The amount of war damage is estimated at £600,000.

Supplies given by C.L.E. to consumers who needed them were never interrupted for more than short periods, and the London Power Company never failed to supply constituent companies and the Central Electricity Board.

The Year 1944

1944 showed a recovery over the preceding year. Units sold increased to 348 millions, and the number of consumers to 76,684. Revenue increased by £487,000. This enabled full contributions to Sinking Funds to be made for that year, and the balance of revenue, together with carry forward from the preceding year, was sufficient for the deductions made from the Sinking Funds in the two previous years to be repaid, thus restoring them to normal and recovering freedom of action in the future.

The balance sheet shows a very liquid position. Cash in hand and on loan to subsidiaries at short notice total £13 million. No. 2 Reserve Fund stands at £20,000. There has been no increase in capital issued. The dividend paid on Ordinary Capital was 3% for 1944. Balance carried forward is £1,790.

L.A.E.U.

Dividends received from Central London Electricity amount to £215,175, as compared with £226,824 last year. The reduction is due to the restoration of Sinking Funds to normal. The directors propose to transfer £24,000 from Stockholders' Reserve Account, and recommend a dividend of 4%. Stockholders' Reserve Account stands at £35,000.

Future Prospects

As soon as circumstances permit, which the directors hope will not be long, prices to consumers will be reduced and statutory dividends on Ordinary Stock restored.

The report and accounts for the year were adopted. 1786

SWITCHGEAR & COWANS LIMITED

Enhanced Position in Industry

Mr. Hugh Burroughes' Statement

THE Thirty-fourth Ordinary General Meeting of the above company was held on April 12th at the registered offices of the company, Elmsmore Road, Old Trafford, Manchester. Mr. Hugh Burroughes (chairman of the company) presiding.

The Secretary (Mr. John Lincoln Rowbotham) having read the notice convening the meeting and the report of the auditors, the Chairman said:—

The directors' report and accounts for the year 1944 have now been in your hands for some time; I therefore propose, with your approval, to take them as read. (Agreed.) As you will have observed, the profit is slightly less than that earned last year, and the dividend we recommend—namely, 20%—is the same as for 1943.

Last year we transferred £9,000 to general reserve; this year we propose to transfer to this account £2,324, thus bringing the general reserve total to £60,000, which is 50% of the issued share capital, and we carry forward a sum of £20,392.

New Types of Mining Gear

For the past few years I have been unable to say much about your company's activities, but I am now able to tell you that your company has played a not unworthy part in war-time production. I am pleased to say that a large number of aerodromes, aircraft, H.M. ships and war factories are equipped with our products—some being our normal products, namely switchgear, but quite a large percentage being entirely new to us and requiring a considerable amount of technical adaptability on our part to produce successfully. New types of mining gear have been developed and are in service in many collieries.

You will, I am sure, appreciate that we, like many others, had to surmount considerable difficulties in changing over from peace to war production. We had our difficulties accentuated by enemy action—which, however, did not keep us out of action for very long. Your company has maintained and even enhanced its position in industry in spite of all difficulties, and this could not have been achieved unless we had retained the loyal support and co-operation of everyone, including management, staff and employees. This we had, and we are very glad to register our appreciation.

What is the post-war position? This question, which concerns us all, is impossible to answer in any definite manner, but I can say that as far as it is possible to safeguard the future, we have taken all possible steps to meet the demands which will be made upon us during the change-over from war to peace conditions. This should not be so difficult as the change-over from peace to war. We shall, of course, have our difficulties, but so far we have met them, and I look forward to the future with every confidence.

I have therefore pleasure in proposing the following resolution: "That the balance sheet, statement of account and report of the directors be adopted."

Mr. J. E. Chamberlain (managing director) seconded, and the resolution was carried unanimously.

The Chairman proposed "that a dividend at the rate of 20% per annum (less income tax at 10s. in the £) be paid on the 480,000 issued Ordinary shares of 5s. each in the company for the year ended 31st December, 1944, and that such dividend be paid on 12th April, 1945."

Mr. R. A. Chalmers, O.B.E., A.F.C., seconded the resolution, which was approved.

Mr. R. A. Chalmers, the retiring director, was re-elected, and the auditors, Messrs. Carter, Chaloner and Kearns, were re-appointed, the proceedings terminating with a hearty vote of thanks to the chairman for presiding. 1794

COMPANY MEETINGS—Continued**AUTOMATIC TELEPHONE & ELECTRIC****"George" and Other Aircraft Equipment**

THE 25th Ordinary General Meeting of the Automatic Telephone & Electric Co. Limited was held at Liverpool on April 19th.

The following is an extract from the statement of the Chairman, Sir Alexander Roger, K.C.I.E., circulated with the report:—

The profit on trading is £279,206 compared with £255,437, and net profit is £226,678 compared with £212,312. The directors recommend a final dividend of 7% on the Ordinary Stock, making 10% for the year, plus a cash bonus of 2½%, and a dividend of 10% on the Deferred Stock and shares, plus a bonus of 2½%.

You will have noticed during February the release of details regarding the distant reading compass, which has provided a degree of reliability and adaptability under operational conditions which has proved a tremendous factor in the success of bombing. This amazing aid to air navigation was designed for mass production by your company. Among other items are the automatic pilot known affectionately as "George," aircraft radio, Piezo crystals, aircraft wiring and many other forms of electrical equipment.

Due to E.P.T., the sum available for dividends and reserves has not increased to any great extent. This is symptomatic of British industry and illustrates the heavy financial burdens which have to be carried. I, with chairmen of other companies, have been expressing the urgency of a re-examination of our taxation structure if British industry is not to find itself at a financial disadvantage vis-a-vis its overseas competitors.

It is disappointing that the Government export credits scheme will not be available for long-term credits for our type of equipment. Our great export trade was largely financed by capital and credits raised in this country, and it is difficult to see how exports can be maintained even on pre-war level. It is desirable that the Empire and Commonwealth should combine their research activities in telecommunication. I urge the formation of a British Commonwealth Research Association. 1804

EDUCATIONAL NOTICES**LATEST A.M.I.E.E. RESULTS**

IN the recent Examinations held by the Institution of Electrical Engineers 477 Candidates sat who had taken B.I.E.T. courses. Of these 457 were successful in passing the examinations. We believe this record of 457 successes out of 477 entrants has never before been approached by any oral or correspondence tutorial organisation, and indicates the very high efficiency of the modern system of Technical Training which we have laid down.

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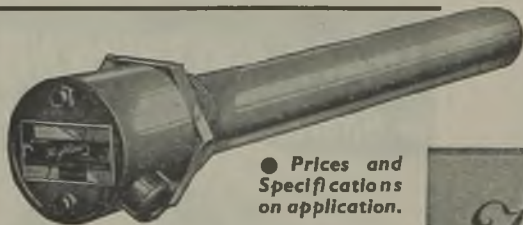
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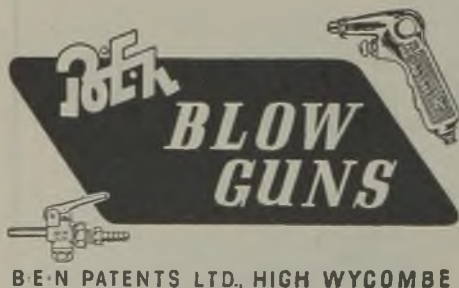
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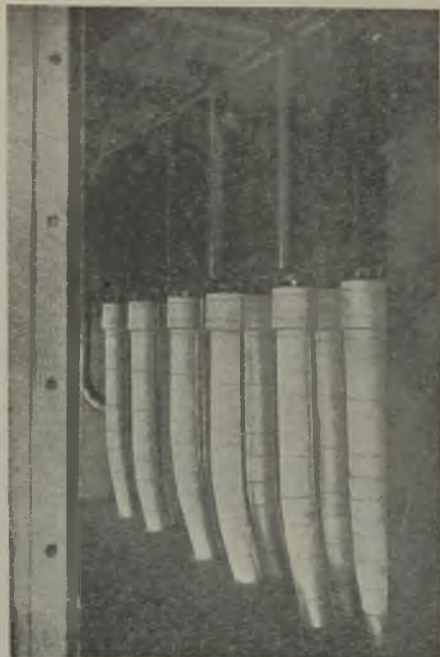


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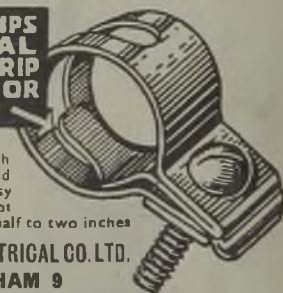
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