

# ELECTRICAL REVIEW

FOUNDED  
1872

Vol. CXXXVI. No. 3516

APRIL 13, 1945

9d. WEEKLY

*Let's  
see...*



Royal "EDISWAN" Lamps

THE EDISON SWAN ELECTRIC CO. LTD.



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

BY APPOINTMENT

**BABCOCK & WILCOX LTD.**  
**MANUFACTURE**  
**COMPLETE STEAM RAISING PLANTS**  
**OF EVERY DESCRIPTION**  
**FOR LAND AND MARINE SERVICE**

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Complete Equipment for

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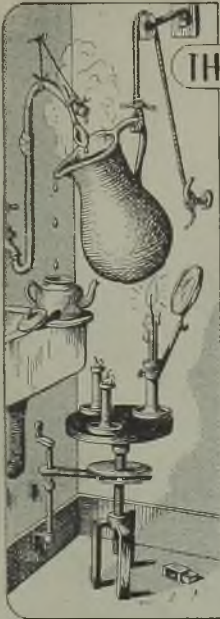
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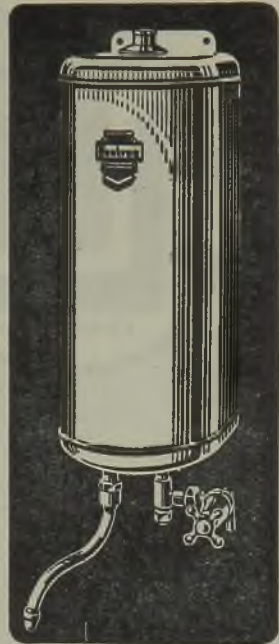


**THE VALUE OF CONTRAST**

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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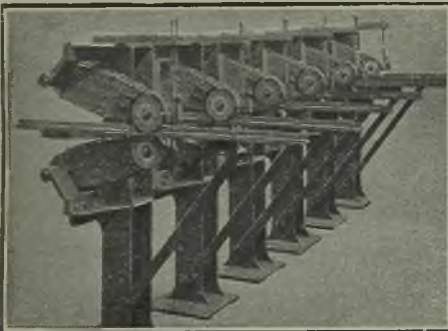
GRAMS : HEATRAE, NORWICH

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

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SIZES FROM 1/4 to 3/8" HOLE

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



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**ELECTRICAL  
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*that fulfils its  
promise of a  
good job*

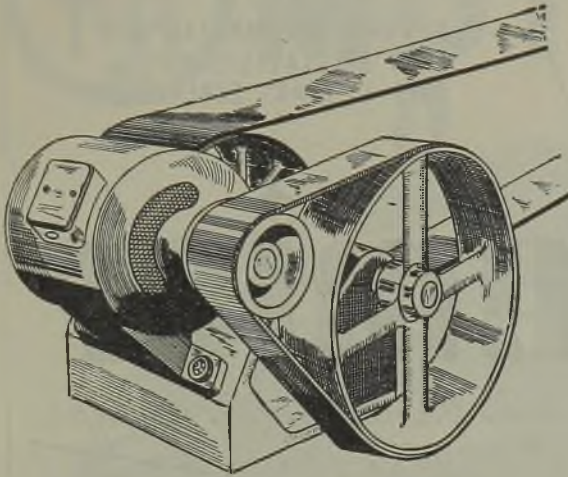
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*for every purpose*  
**FACTORIES, MINES, SHIPS,  
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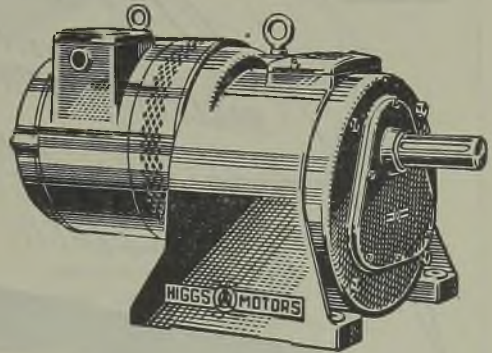
**BOOTLE  
LIVERPOOL**



**1915**

TO

**1945**



*Thirty years of high speed progress in low speed drives*

Birmingham, Bristol, Dundee, Glasgow, London, Manchester,  
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DESIGNED AND MANUFACTURED  
BY SPECIALISTS WITH  
OVER 35 YEARS EXPERIENCE

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*still stands as the unequalled name for...*

*Fine-Quality*

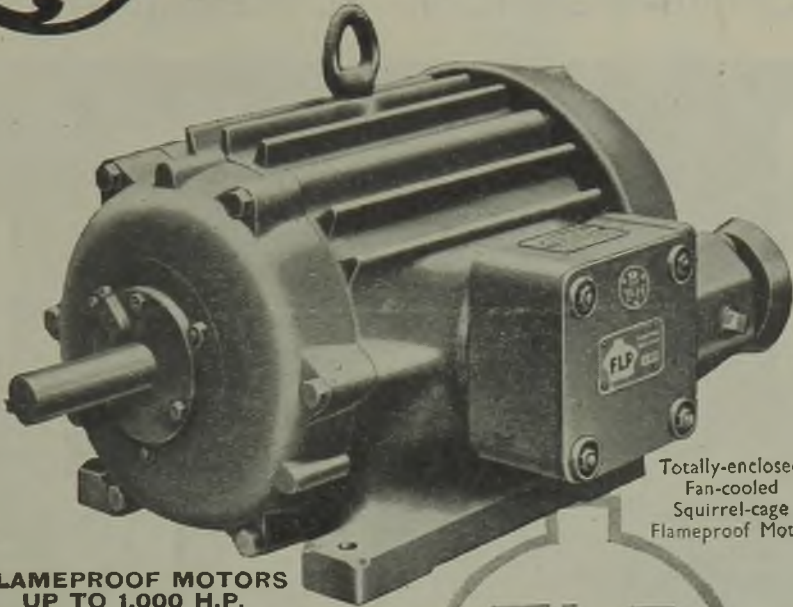
DOMESTIC  
ELECTRIC HEATING APPLIANCES...

- ★ KETTLES · FIRES
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# FLAMEPROOF MOTORS



Totally-enclosed  
Fan-cooled  
Squirrel-cage  
Flameproof Motor

**FLAMEPROOF MOTORS  
UP TO 1,000 H.P.**  
(Squirrel-cage from  $\frac{1}{2}$  H.P.)  
(Slip-ring from 5 H.P.)

and  
**AN EXTENSIVE RANGE OF  
FLAMEPROOF CONTROL GEAR**

For use in collieries, oil refineries, paint and varnish works, spray booths, and any situation where inflammable gases or liquids may be present.



*All-steel cylindrical frame motors and gate-end control gear are available for underground conveyor drives, etc.*

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FOR ALL ESSENTIAL PURPOSES  
COMMUNICATIONS—POWER—LIGHTING



**W**E are actively engaged in all the manufacture of V.I.R. and synthetic insulated cables to meet the urgent requirements of war. Our Research Laboratories have been associated with the development of synthetic materials as cable insulants for many years before the war, and the experience thus gained has been applied to the manufacture of our cable products.

*V.I.R. and synthetic insulated cables  
produced by this Company are being  
used for all essential war purposes.*

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

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

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# CANNING



## ELECTRO ZINCING

by

### THE GALVANAX PROCESS

is approved by the A.I.D. when a zinc coating is specified as a substitute for Cadmium plating owing to a shortage of the latter metal.

For fast deposits on wrought iron and steel it is unequalled in colour, simple to operate, and has excellent throwing power besides providing efficient protection from rust.

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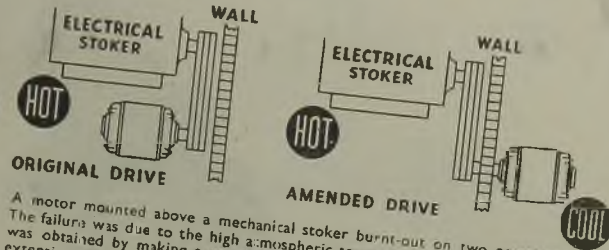
**GREAT HAMPTON STREET  
BIRMINGHAM 18**



# Motor Maintenance Points & Problems

Keep this page. It may prove of service to your Maintenance Engineers

## OVERHEATING



A motor mounted above a mechanical stoker burnt-out on two occasions. The failure was due to the high atmospheric temperature. A satisfactory solution was obtained by making a vee belt drive through the wall, using a special shaft extension, since when there have been no further troubles.

## ECONOMICAL MOTOR SPEEDS

The following table compares 5 h.p. motors as to performance and cost at various speeds. It also shows the standard speed range as offered on three-phase, 50 cycles supply. 1,500 r.p.m. motor based on 100% for cost and weight.

| MOTOR SPEEDS<br>(Syn.) | 5 HORSE POWER |       |       |      |      |      |      |
|------------------------|---------------|-------|-------|------|------|------|------|
|                        | 3,000         | 1,500 | 1,000 | 750  | 600  | 500  | 375  |
| Relative Cost ...      | 98%           | 100%  | 125%  | 145% | 175% | 200% | 310% |
| Number of Poles ...    | 2             | 4     | 6     | 8    | 10   | 12   | 16   |
| Efficiency ...         | 84%           | 85%   | 84%   | 83%  | 82%  | 81%  | 79%  |
| Power Factor ...       | 90            | 86    | 81    | 74   | 73   | 72   | 70   |
| Weight ...             | 85%           | 100%  | 130%  | 160% | 200% | 240% | 440% |

## STARTING TORQUE

When a motor such as a "Star-Delta" type is quoted as having 33 per cent. torque, this means that the motor can develop one-third of its full-load running torque, at starting.

The full-load torque is obtained by calculation from the equation—

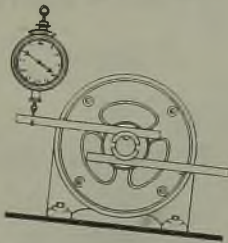
### FULL LOAD TORQUE—

$$\frac{\text{H.P. of Motor} \times 5250}{\text{Speed}}$$

The torque of the motor is obtained in the manner shown diagrammatically here, the pull being read in lbs.-feet from the scale, assuming the torque bar to measure one foot from the shaft centre.

### Then PERCENTAGE TORQUE—

$$\frac{\text{Motor torque}}{\text{Full Load Torque}}$$



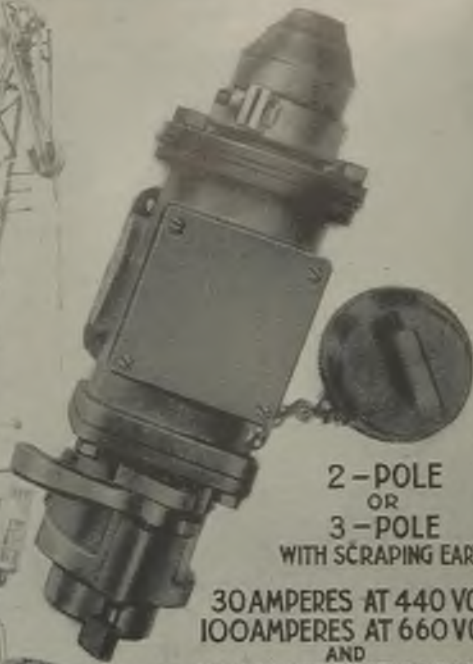
# BROOK MOTORS LIMITED

EMPRESS WORKS • HUDDERSFIELD

Technical Advisers at

LONDON • BRISTOL • MANCHESTER • GLASGOW • BIRMINGHAM  
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# WEATHERPROOF PLUGS AND SOCKETS FOR INDUSTRIAL PURPOSES



2 - POLE  
OR  
3 - POLE  
WITH SCRAPING EARTH

30 AMPERES AT 440 VOLTS  
100 AMPERES AT 660 VOLTS  
AND  
250 AMPERES AT 660 VOLTS



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ASK FOR PAMPHLET No. 1064

# FERRANTI

*Leaders in design*

## THE SINGLE-DISC POLYPHASE METER

*of tomorrow  
can be  
obtained  
from  
Ferranti  
to-day.*

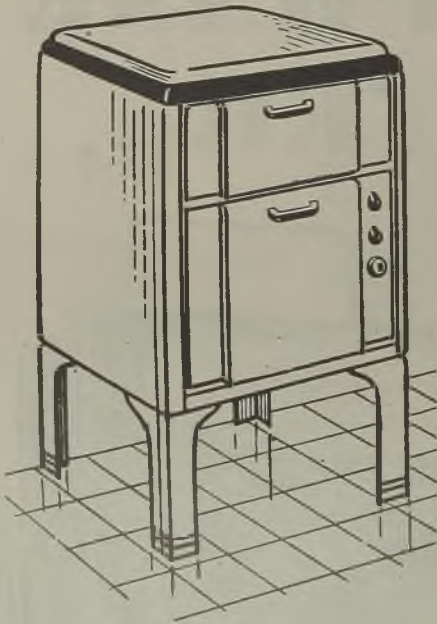
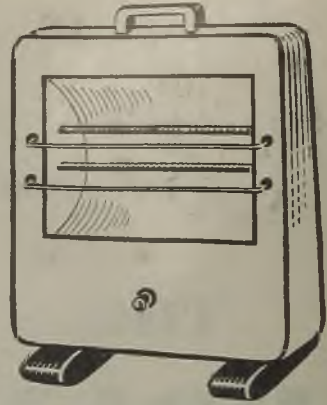


FM83

FERRANTI Ltd., Hollinwood, Lancs.  
LONDON OFFICE: KERN HOUSE, KINGSWAY, W.C.2

# Belling

**ELECTRIC FIRES  
AND COOKERS**



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

\*

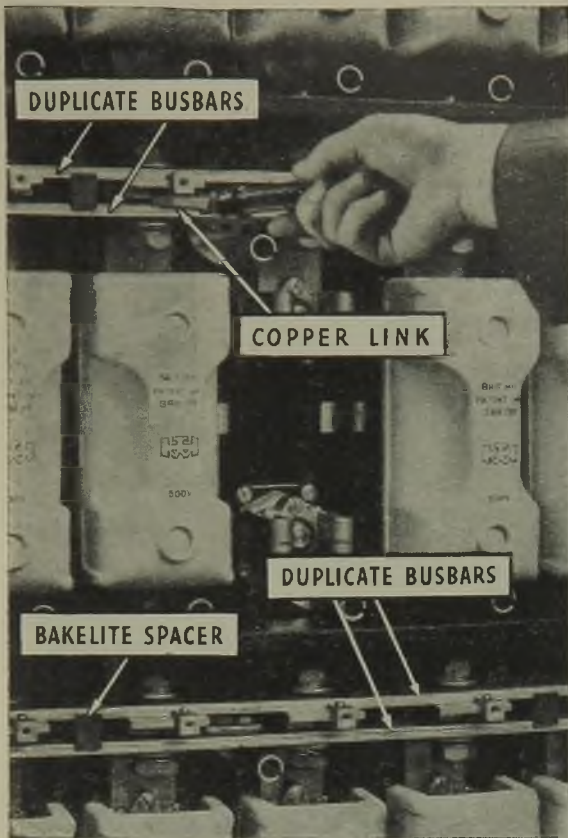
**“YOU CAN’T BEAT  
A BELLING”**

\*

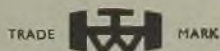
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Duplicate Busbars in HENLEY Selective type Distribution Pillars make it a simple matter to change over a circuit without interrupting the supply. A copper link is inserted between the busbar connector and the busbar to be connected in the circuit. The link completing the original circuit is then withdrawn. Both the insertion and withdrawal are effected by means of the insulated handle provided.



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*specialy protected with*

### SIEMENS

### PATENTED SHEATH

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**NO UNDERWATER JOINTS, ANY QUANTITY SUPPLIED IN ONE LENGTH**

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INDUSTRY



*The*  
**ELECTRIC**

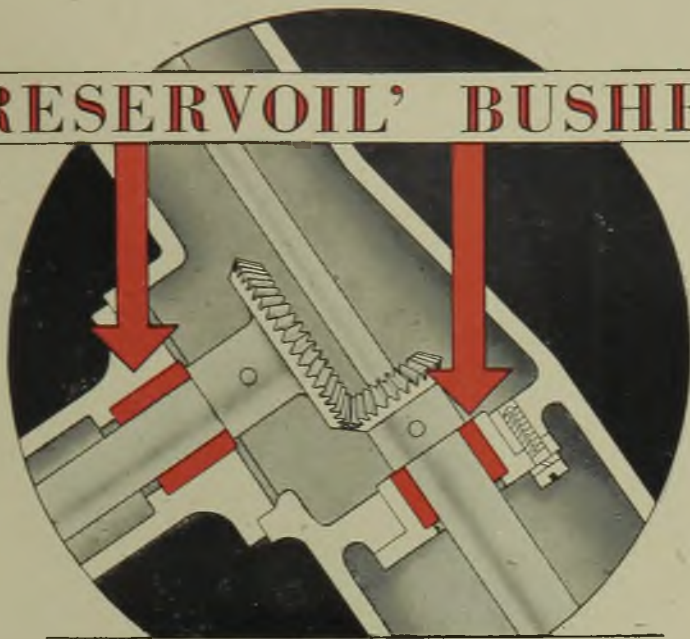
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Wherever they are used, 'Reservoir' bushes contribute their outstanding advantages, the sponge-like bronze structure has a considerable capacity for oil, which is fed evenly to the bearing surfaces and sometimes suffices for the life of the machine.

These bushes are made in an extensive range of sizes, all controlled in quality and to close limits.

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product

THE MORGAN CRUCIBLE COMPANY, LTD., LONDON, S.W.11  
*Specialists in Powder Metallurgy since 1912*



**MODERN DESIGN  
TOTALLY ENCLOSED**



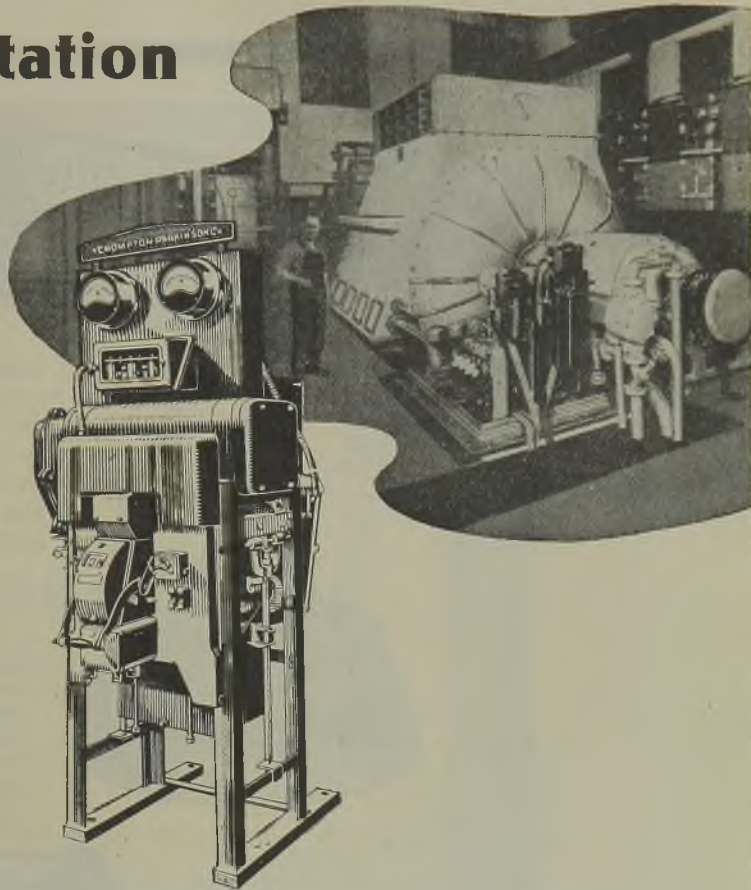
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## Testing Station



.. behind

## Crompton Switchgear.

The Crompton Short-Circuit Testing Station issues a certificate of rating up to 350 mVA at 11kV; also for maximum standard low voltage ratings, through the Association of Short-Circuit Testing Authorities of which Crompton Parkinson are members. The Station has been designed to provide tests

in strict accordance with the appropriate standards and to produce more severe conditions than are likely to arise in service. The rated performance and dependable operation of Crompton Switchgear is thus assured. Crompton Switchgear is made for ratings up to 350 mVA.



**CROMPTON PARKINSON**  
LIMITED

# IGRANIC MAGNETIC DEVICES

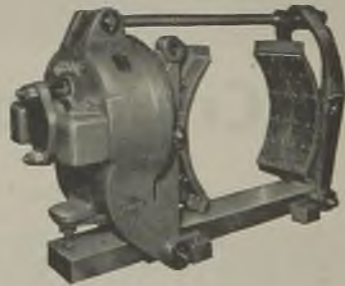


Illustration above shows  
Igranic Lifting Magnet.  
Below, Igranic Type "M"  
Magnetic Brake.

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

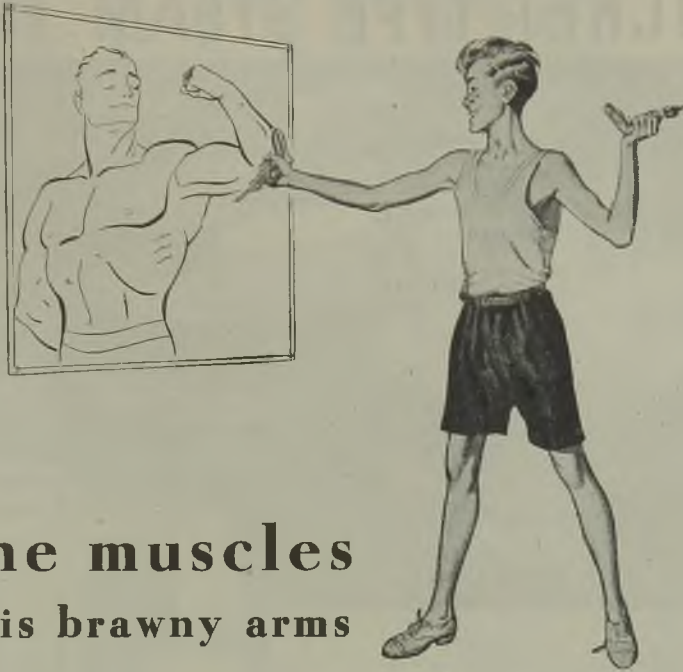
Igranic Magnetic devices include :

- Magnetic Brakes
- Magnetic Clutches
- Lifting Magnets
- Magnetic Separators
- Magnetic Solenoids, etc.



*Write for  
Detailed  
Leaflets*

**IGRANIC ELECTRIC CO. LTD.**  
**LONDON & BEDFORD**



## ... the muscles of his brawny arms

ONE of the grave disadvantages of Desoutter Tools is that they don't develop a boy's muscles. The heart of many a growing lad leaps to hear that he will be allowed to use a Power Drill. In his mind he sees those brawny lumps of humanity boring their way through massive chunks of concrete, their great muscles rippling and shuddering from wrist to neck and all down the back and front. He sees himself the pride and envy of his pals. He sees great cricket balls appearing all over his arms. But Desoutter brings disillusion. He can handle a Desoutter all day and every day for months on end, but the old bicep still looks like a very small grey mouse.



Specialists in Lightweight, Pneumatic & Electric Portable Tools.

# DESOUTTER

Desoutter Bros. Ltd. (Dept. R), The Hyde, Hendon, London, N.W.9. Telephone: Colindale 6346-7-8-9

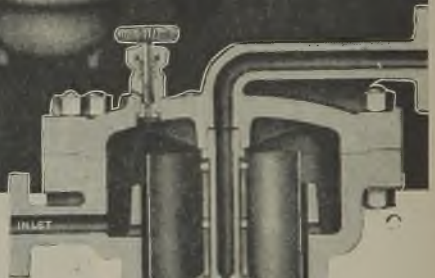
# BUCKET TYPE STEAM TRAPS



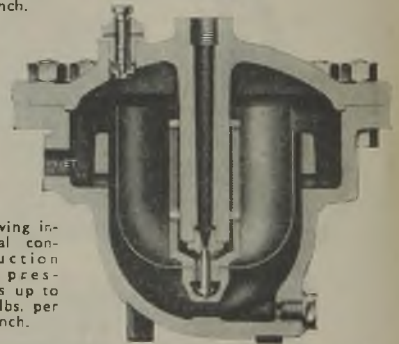
The "Blakeborough" Bucket Type Steam Trap embodies the best features necessary to ensure certainty of operation over long periods without attention. The materials used have been carefully selected for maximum service and special attention has been given to the design of the valve face and renewable seat, and to the provision of correct angles for maximum discharge coefficient and reduced erosive action at this vital point.

The trap is simple in construction; is absolutely tight when closed; does not dribble; gives quick discharge and clean cut-off. The internal parts are easily accessible, and maintenance costs very low. An automatic valve is fitted, which prevents air-lock.

The Steam Trap is supplied in cast iron for pressures up to 150 lbs. per sq. inch, 425° F.; in cast steel for pressures up to 450 lbs. per sq. inch, 800° F., also 900 lbs. per sq. inch, 800° F.—this last pattern being of slightly modified construction, with lever mechanism to multiply the effective forces and ensure correct action with adequate discharge area.



Showing internal construction for pressures above 450 lbs. per sq. inch.



Showing internal construction for pressures up to 450 lbs. per sq. inch.

## BLAKEBOROUGH

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# NALDERS

## FREQUENCY METERS

### PRECISION TYPE

Illustration shows an example of an N.C.S. Frequency Meter of Precision type, complying with B.S.S. No. 89—1937 for short-range precision accuracy, being within 0.1% of the mean value of the frequencies shown on the scale.

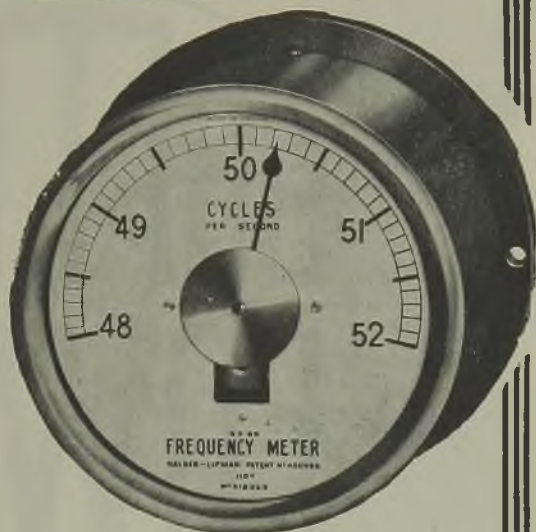
These instruments are independent of voltage and temperature variations over wide limits and develop no self-heating errors. Low v.a. consumption.

Supplied with 90, 150, or 200 deg. scales.

### INDUSTRIAL TYPE

Industrial Type Frequency Meters are also available in all sizes from 4" to 12" diameter dials with 90 deg. scales (approx.).

*Nalder Lipman Patents*



N.C.S. PRODUCTS include all types of Measuring Instruments, Indicating or Recording, Switchboard or Portable. Also Protective Relays, Synchronisers, Circuit Breakers, Earth Leakage Trips, etc. Every unit is designed for maximum operating efficiency, reliability and durability, prices being competitive without sacrifice of quality.

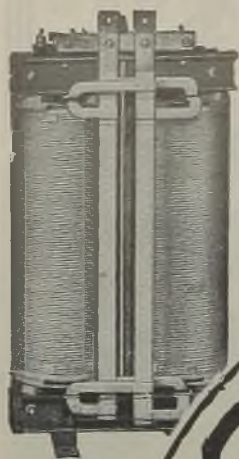
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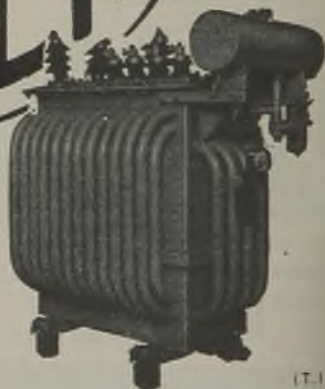
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*Nae man can tether  
time or tide.*

BURNS  
(*Tam o' Shanter*)

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the all-pervading influence of time has been expressed in classic prose and poem.

Time cannot be impeded; but it is the better utilised when faithfully recorded. To which end the Ferranti Clock keeps precisely accurate time year after year.

**FERRANTI**  *Clocks*

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IT WON'T BE LONG NOW

We expect to commence business there soon. Kindly look out for a further detailed announcement later. Meanwhile, send your

**ORDERS and ENQUIRIES**  
to our WAR-TIME ADDRESS:  
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**J. M. WEBBER & Co., LTD.**  
ESTD. WHOLESALE DISTRIBUTORS TO THE  
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The Electrical industry has proved LUX efficiency, safety and certainty in action. Complete Fire protection, without mess.

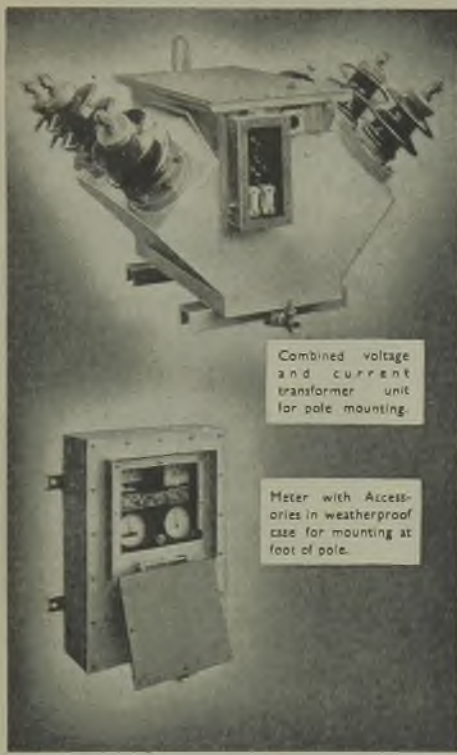


**THE WALTER KIDDE CO. LTD.**  
LUX WORKS BELVUE RD.  
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# Outdoor Metering Equipment

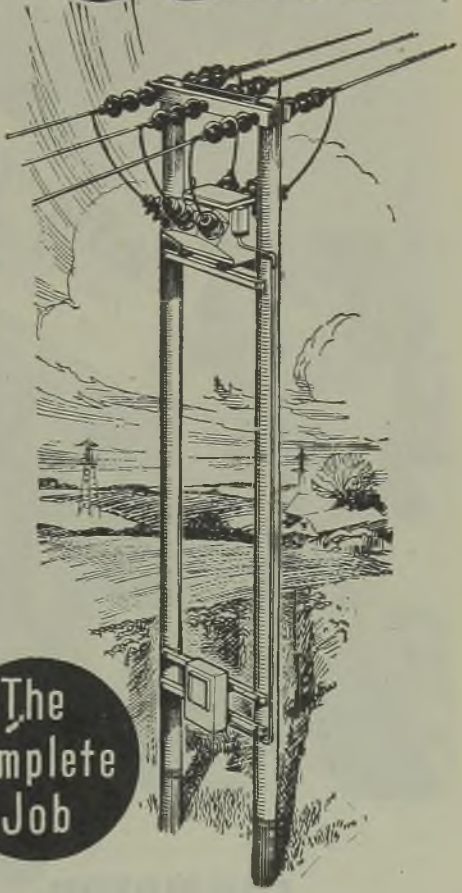
specialy designed & developed by

# C&H



Combined voltage and current transformer unit for pole mounting.

Meter with Accessories in weatherproof case for mounting at foot of pole.



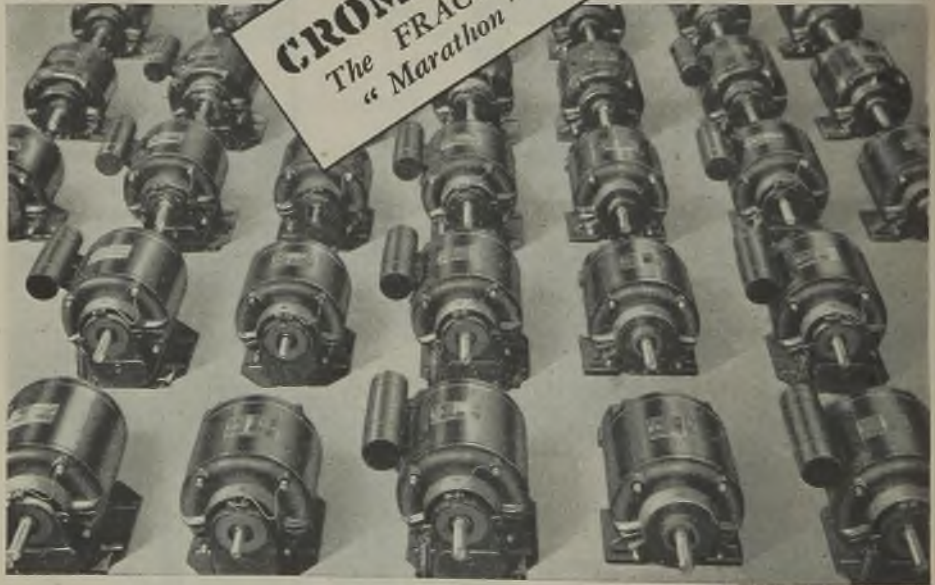
The Complete Job

These are views of a typical 11 KV equipment.  
 It is also available for 3.3 KV, 6.6 KV, 22 KV, and 33 KV systems.

MANUFACTURERS:  
**CHAMBERLAIN & HOOKHAM LTD. BIRMINGHAM**



**CROMPTON "MINORS"**  
The FRACTIONALS with the  
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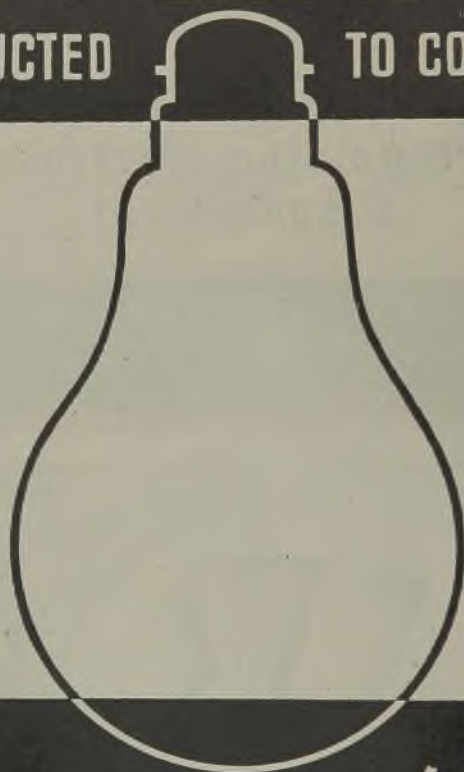
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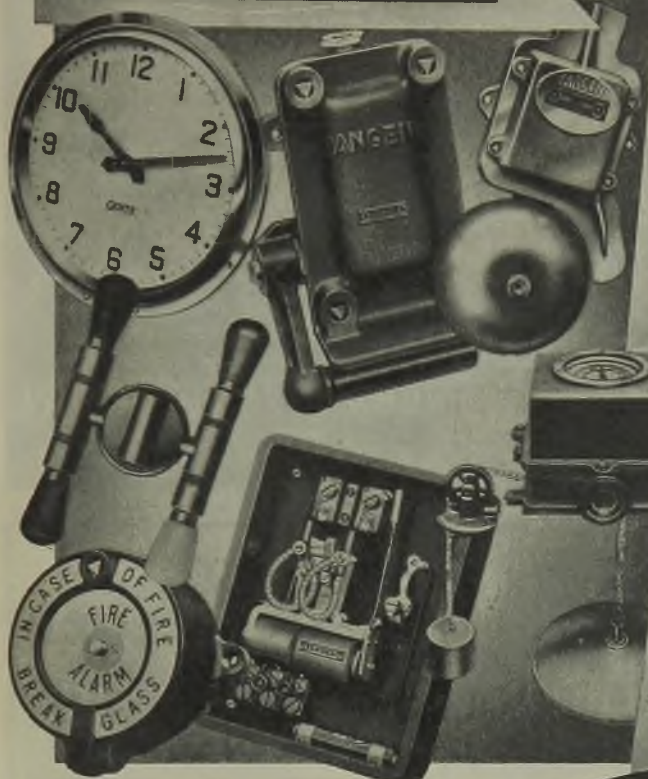


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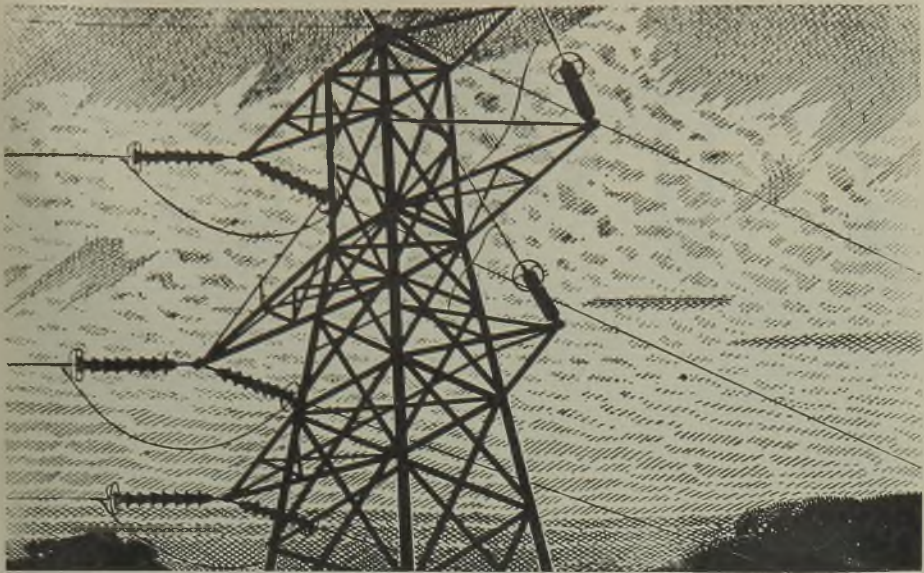
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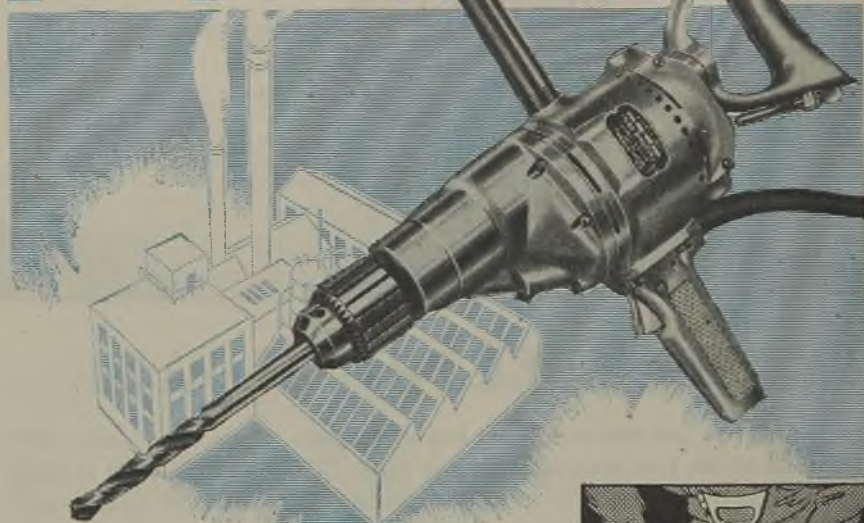


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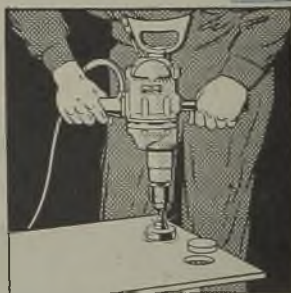
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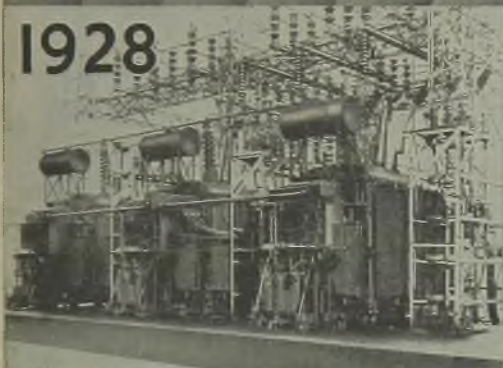
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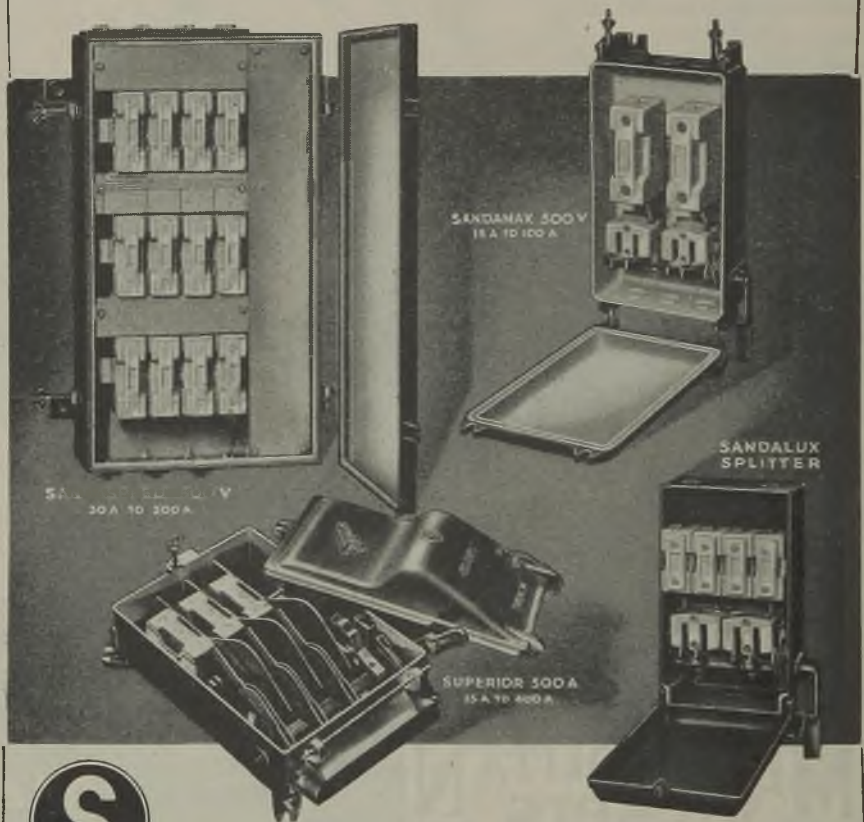
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# ELECTRICAL REVIEW

April 13, 1945

## Contents:—

|  | Page |
|--|------|
| Editorial.—Without a Grid . . . . .      | 519  |
| Generation in Northern Ireland . . . . . | 521  |
| Industrial Heating . . . . .             | 525  |
| Power Line Tension . . . . .             | 526  |
| Correspondence . . . . .                 | 527  |
| Personal and Social . . . . .            | 529  |
| Power Stations for Russia . . . . .      | 531  |
| English Electric Bombers . . . . .       | 533  |
| Indian Appliance Market . . . . .        | 534  |
| Cable Insulation . . . . .               | 535  |
| Power Companies . . . . .                | 536  |
| Demand-Related Cost . . . . .            | 537  |

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| <i>Contents continued:—</i>                |  | Page |
|--|--|------|
| Lighting Installation Design . . . . .     |  | 538  |
| Commerce and Industry . . . . .            |  | 539  |
| Views on the News . . . . .                |  | 542  |
| Liverpool: 1941 and After . . . . .        |  | 543  |
| Electricity Supply . . . . .               |  | 544  |
| Financial Section . . . . .                |  | 546  |
| Forthcoming Events . . . . .               |  | 550  |
| Coal Mining . . . . .                      |  | 551  |
| New Patents . . . . .                      |  | 553  |
| Contract Information . . . . .             |  | 554  |
| <i>Classified Advertisements</i> . . . . . |  | 71   |
| <i>Index to Advertisers</i> . . . . .      |  | 80   |


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# ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872



Vol. CXXXVI. No. 3516.

APRIL 13, 1945

9d. WEEKLY

## Without a Grid

### How Northern Ireland Safeguarded Supply

AT the beginning of the war electricity supply in Northern Ireland was at a great disadvantage in comparison with other parts of the United Kingdom. The industrial district of the Province, which includes one of the largest shipbuilding works in Europe and was consequently a likely target for air attack, depended for its electricity on one power station at Belfast. Although the latter was loose-linked through a 33-kV network with two other stations, at Londonderry and Larne, these were too small relatively and too remote to provide any significant stand-by.

#### No Reserve Capacity

In consequence, the possibility of prolonged cessation of local supply could not be guarded against, as it effectively was in England, Scotland and Wales by drawing on the reserve capacity of upwards of 140 interconnected stations. Nor could damaged equipment be replaced from a central pool which, by spreading the risk over many stations, needed to be only a small proportion of the whole capacity.

Clearly the risk to the war programme was one that could not be accepted and the authorities decided that a new capital station should be built to carry a large part of the essential load of the Province. This extension of generating capacity was proportionately very much greater than that necessary under grid conditions, for which only two new stations were called for. Moreover, these two stations were not required for the dispersal of generating plant, but on account of the dispersal of industry—a very different matter.

In view of the urgency of the work under war conditions, the construction of Ballylumford station involved many abnormal difficulties. There was, for example, the necessity of taking plant that was most readily obtainable for the initial section, thus introducing two sets of steam conditions under one roof. Good fortune in obtaining a suitable site was temporarily offset by such obstacles as lack of road access, fresh water and electricity. As a large proportion of plant and materials had to be shipped from English and Scottish ports during the height of the U-boat menace and dock congestion, delivery became a major problem, entailing frequent re-routing from the manufacturers' works. Again, special road vehicles had to be brought by sea to transport the 72-ton transformers and 80-ton alternators from Belfast docks to the site.

#### Modern Design in Rush Job

The above outlines only a few of the additional worries incurred by making a rush job in wartime. In addition there was the more normal co-ordination of seventy separate contracts and the working to the two key dates that affected the commissioning of the station, *viz.*, the beginning of boiler erection and the installation of the turbine-house crane. In spite of all this the station incorporates a number of features representative of modern trends, one of which is the absence of all oil from its interior except what is required for lubrication and operating the turbine governors.

Conditions in Northern Ireland are not,

of course, suitable for grid operation. The present instance, however, illustrates the gravity of the hindrance to the war effort that would have been entailed if similar work had had to be carried out under independent operation in the much wider areas now served by the grid. On the other hand, it adds to the number of epics of the time that have demonstrated how British engineers are able to match their efforts to the occasion.

**Ambient Temperatures** ATTENTION was drawn in Mr. J. A. Harles' chairman's address to the I.E.E. North-Eastern Centre to a tendency to increase standard ambient temperatures. This would be a retrograde step, since the difference between maximum permissible and ambient temperatures provides the margin within which a manufacturer has to allow for heating losses. Any reduction is, therefore, likely to lead to inefficiency in design and may prevent the use of new synthetic insulating materials. Users can help by specifying ambient temperatures that give the best general results rather than those that may ultimately lead to higher values as standard or that would require the supply of non-standard equipment. The introduction of special ventilation methods may often prove to be a better alternative.

**A Good Record** ALREADY the Incorporated Association of Electric Power Companies has put forward proposals to the Ministry of Fuel and Power for the future organisation of the electricity supply industry in which its members would continue to play an important part. But recent political speeches, notably those of Labour members of the present Government, have created a need for a further statement showing how much the companies have contributed to the advancement of electricity in the past and how much more they are prepared to do when the existing restrictions are relaxed or removed. This statement has now been published by the Association in the form of the 24-page booklet which is reviewed on another page of this issue. The companies' outstanding claim is that they, more than any others, have been responsible for the very large measure of rural electrical development which has been achieved, which can hardly be denied.

**Time and Money** AN inference to be drawn from the recent construction of power stations in about half the usual time—Earley, Castlemeads, Lynfi and Ballylumford (described in this issue)—is that some modification is called for in the popular description of an engineer as one who can make something for half the cost that would be incurred by anyone else. These are certainly fine feats of engineering and indicate the need for a time factor in the equation, since a "rush job" may be more expensive than those in which orthodox procedure has been adopted. In wartime, cost is not a prime consideration, but neither is it always under normal conditions, when the value of time saving may be only indirectly related to the cost of a particular piece of apparatus.

**Gearing Up** As an example of justifiable disregard of cost in favour of speed in engineering, supply undertakings have not hesitated to incur the heavier expenditure entailed in hurrying on extensions to serve consumers, especially those in rural areas, when a slower development would have been cheaper. Another aspect was brought out during the discussion last week at the I.E.E. Installations Section. The value of time saved through the use of electrical methods of process heating of the most appropriate kind in each case cannot often be readily assessed in terms of the first cost of the apparatus or its operation. The beneficial effects may be most manifest in such incidental ways as the saving of floor space.

**Smokeless Air** DAMAGE by smoke and the cost of the associated waste of fuel represent an annual social and economic loss which, in the view of the National Smoke Abatement Society, far exceeds the cost that would be incurred by its elimination. While general legal enactment in that direction may not be practical politics, the rebuilding of bombed central areas of cities will provide opportunities of introducing obligatory "smokeless zones." There seems no valid reason for the exclusion of the worst offenders, domestic premises. The defence of having adopted the "best available means" would no doubt be valid. Can anyone doubt what that is?

# Generation in Northern Ireland

## The New Ballylumford Power Station

AT the outbreak of war more than four-fifths of the public supply of electricity in Northern Ireland was generated at the Harbour power station of Belfast Corporation and no material aid in emergency would have been obtainable from the three other small stations in the area. The Ministry of Commerce, acting on the advice of its consulting engineers, Messrs. Kennedy & Donkin, decided, in addition to extending the existing Larne station, to build a new capital station at Ballylumford, on the tip of Islandmagee, Co. Antrim, opposite Larne Harbour.

### A Good Site

The new site offered the advantages of ample supplies of cooling water from the sea, a short sea route for coal from South Scotland, economic potentialities for plant extensions, good foundation subsoil, and proximity to the networks of Belfast Corporation and the Electricity Board for Northern Ireland.

The extension at Larne consisted of a 7,200-kW turbo-alternator purchased from the London Power Co. and three new 40,000-lb. per hr. boilers in an advanced stage of manufacture in England. The plant was in commission by the end of 1941—nine months after the start of construction. In order to get the new Ballylumford station going as soon as possible, a 30,000-kW Metro-Vick turbo-alternator, and two 150,000 lb. per hr. Babcock & Wilcox stoker-fired boilers with Green's tri-tube economisers and Howden's regenerative air heaters were diverted from the Harbour power station for which they had originally been ordered. Instructions to proceed with the work were given by the Ministry on May 7th, 1941, and the first sod was cut in July and the turbine was started up in December of the next year. A month previously construction of the 110-kV trans-

mission system to link up with Belfast had been completed.

In order to meet the demand expected in 1944-45, the Ministry of Commerce conferred with the Heavy Plant Committee. It was decided to order a second generating unit comprising a 31,500-kW (m.c.r.) turbo-alternator (incorporating a 1,500-kW 3.3-kV house set) and three 150,000 lb. per hr. boilers (overload 180,000 lb. for three hours). Boiler stop-valve steam conditions are 625 lb. per sq. in. and 835 deg. F., compared with 240 lb. and 800 deg. for the first unit.

### High-head Boilers

The three new boilers are also of Babcock & Wilcox make but are of the high-head instead of the C.T.M. type. Flue gases from two are discharged into a common brick stack, 250 ft. high by 17 ft. internal diameter, and from the other into a steel chimney, 120 ft. by 8 ft. 6 in. They are equipped with Bailey water-cooled front and side walls, multi-loop



Reinforced concrete jetty showing two coal-handling cranes and conveyor system

self-draining superheaters, steel-tube flash-welded economisers and duplicate Davidson forced- and induced-draught secondary-air fans.

The f.d. fans are driven by AC variable-speed motors and the i.d. fans by 3.3-kV two-speed motors through variable-speed couplings—hydraulic for two units and B.T.H. eddy-current for the third; the latter is believed to be the first of its kind used in a power station. One set of secondary-air fans is driven by single-speed motors and has

inlet regulator control; the others are coupled to two-speed motors. Air-heaters on the two latest boilers are of the Howden parallel-flow type, which can be cleaned while the boilers are steaming. Soot-blowers are electrically operated by means of B.T.H. automatic equipment. Individual central supervisory control is provided on all boilers. The stokers are driven through single-speed gear boxes by variable-speed AC motors of Laurence, Scott & Electromotors make.

Seaborne coal is delivered at a jetty at any tide by ships up to 2,000 tons and discharged to a B. & W. belt conveyor and taken by duplicate rising conveyors to a distributing tower, from which it is sent directly to the boiler-house bunkers, which have a capacity of 450 tons per pair of boilers, or to a coal store with a present capacity of 22,000 tons. Ash is handled by a John Thompson plant. The rear stoker hoppers discharge into belts submerged in water forming part of a series of conveyors which deliver to reinforced concrete hoppers. Grit is disposed of by a pneumatic conveyance plant.

#### Generating Plant

The new Metropolitan-Vickers turbo-alternator is similar to the first in that the turbine is a 3,000-RPM two-cylinder machine, but it has 23 stages in the high-pressure

at 31,579 kVA as compared with 37,500 kVA.

The turbine exhausts to Metro-Vick twin condensers having a combined heating surface of 27,000 sq. ft. and designed to maintain 29 in. vacuum at m.c.r. when feed heating and supplied with 24,000 gal. per min. of circulating water at 55 deg. F. Circulating water is obtained from Larne Lough through intakes incorporating two Brackett band screens and chlorinated to prevent mussel growth by intermittent dosing. Two 150-HP Drysdale pumps driven by 400-V Metro-Vick motors are provided for the No. 1 set and two 130-HP pumps driven by 3.3-kV motors for the No. 2 set.

#### Feed Heating System

Five-stage feed heating has been adopted for No. 2 set to raise the temperature of the condensate to 340 deg. F. at m.c.r. (compared with two stages for No. 1 to give 190 deg. at m.c.r.). Three Mather and Platt 300,000 lb. per hr. feed pumps have been installed; two of them are driven by 500-HP 3.3-kV direct-on started 3,000-RPM motors and the third by an automatic-started 3,000-RPM steam turbine.

A Metropolitan-Vickers bled-steam evaporator (which can be operated with sea water if necessary), comprising three single effects in parallel (one spare) takes steam from the



No. 1 turbo-alternator; the sea-water evaporator can be seen in the right foreground

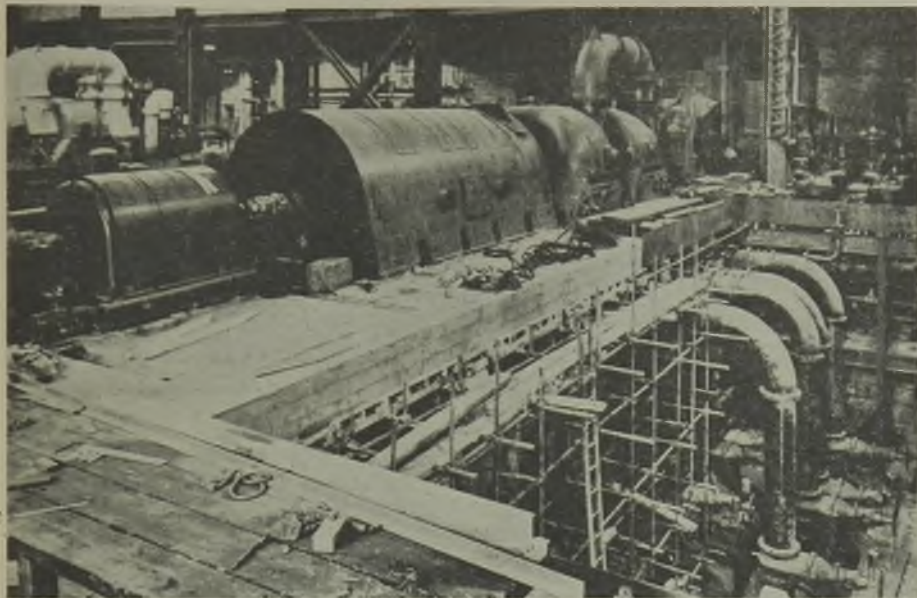
cylinder instead of 19, so that advantage may be taken of the higher steam conditions (600 lb. per sq. in. and 820 deg. F.), the number in the l.p. cylinder remaining at six for each way of steam flow to the double exhaust. Its most economical rating is at m.c.r. instead of at 24,000 kW. The alternator is similarly wound for 33 kV but it is rated

No. 3 heater tapping and returns the vapour to an evaporator condenser between Nos. 1 and 2 heaters, whence the distillate is pumped to two 15,000-gal. tanks. A variable stroke pump (Candy Filter Co.) injects caustic soda and sodium sulphite in solution into the feed-pump delivery mains.

For feeding the earlier boilers there are two

360,000 lb. per hr. pumps (one Mather & Platt electric and one automatic Weir steam) and one 150,000 lb. per hr. (Mather & Platt) electric pump. Pending the finding

The 400-V switchboard of the same make is in two normally separated halves, one fed from the station transformers and the other from the house alternator. A 250-kW Diesel



High-pressure turbo-alternator ; part of No. 1 set can be seen to the left

of fresh water, a triple-effect salt water Mirreles Watson 20,000 lb. per hr. evaporator was installed.

The control room and also the main 33-kV switchgear are located apart from the power station. The switchgear is laid out on the mesh principle so that each busbar section is within the zone of protection for each alternator or transformer. It is of the Reyrolle pneumatically-operated small-oil-content type with a rupturing capacity of 750 MVA. Merz-Price protection is used for the alternators with negative-phase-sequence equipment as back-up. The alternators are earthed through separate 25-ohm resistances and a Metrosil surge divertor is provided for each. Protection for the main and house-service transformers is given by over-current and earth fault devices.

Station auxiliaries are supplied from the main busbars through two Met-Vick 3-MVA 33/3·3-kV transformers or the 1,500-kW house set coupled to No. 2 turbo-alternator. The B.T.H. 3·3-kV switchgear, accommodated in an annexe to the turbine room, is of the air-break draw-out type for 75 MVA.

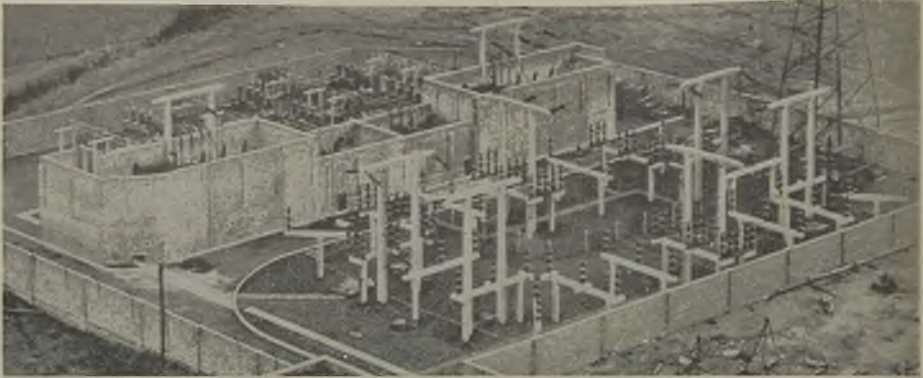
alternator by W. H. Allen & Co. has been installed to start up one set in emergency.

Power is transmitted over a 110-kV double-circuit steel-tower line to Belfast, where connection is made at two substations to the systems of the Corporation and the Electricity Board. The conductors are 0·15 sq. in. copper equivalent, one circuit being of cadmium copper and the other of steel-cored copper with a bitumenised tape over the core. A central switching station, now under construction at Finaghy on the outskirts of Belfast, is being equipped with 110-kV Reyrolle air-blast switchgear arranged in the form of two meshes interconnected by switchgear and operated by two duplicate full-duty air compressors. Protection of the longer lines is of the distance-measuring type and of the shorter lines of the balanced voltage type.

Messrs. Kennedy & Donkin were responsible for the design and construction of the power station and the associated transmission system. They were assisted by Messrs. C. S. Allott & Son, consulting civil engineers, and by Mr. A. Bryett, architect. The principal

contractors, other than those previously mentioned, included the following:—Motor controls, Brookhirst Switchgear, Ltd., and

Automatic Telephone & Electric Co., Ltd.; laboratories, Griffin & Tatlock, Ltd., Baird & Tatlock, Ltd., and A. Gallenkamp & Co.;



The layout of the 110- and 33-kV switchgear is seen in relation to the transformers which are protected by blast walls

Contactors, Switchgear, Ltd.; cables, W. T. Henley's Telegraph Works Co., Ltd.; air-conditioning, Sturtevant Engineering Co., Ltd.; auxiliary transformers, British Electric Transformer Co., Ltd., and Bonar Long & Co., Ltd.; cranes, lifts and hoists, Herbert Morris, Ltd., Marryat & Scott, Ltd., Whar-ton's Crane & Hoist Co., Ltd., and Ransomes & Rapier, Ltd.; lighting and wiring, Troughton & Young, Ltd.; 33/110-kV trans-formers, Hackbridge Electric Construction Co., Ltd., and Ferranti, Ltd.; 110-kV transmission line, J. L. Eve Construction Co., Ltd.; isolating switches, 110-kV,

civil engineering work, McLaughlin & Harvey, Ltd.; structural steelwork, Harland & Wolff, Ltd.

## I.E.E. London Students

### President's Address

**I**N his recent address to the London Students' Section of the Institution of Electrical Engineers, SIR HARRY RAILING spoke of the social implications of engineering, pointing out that increasing material knowledge necessitated the acceptance of fresh responsibilities by the individual, the community and the State.

Sir Harry enjoined his audience not to specialise too early, but when it became necessary each should endeavour to be master of his own trade while retaining a broad understanding of the work of others in as wide a field as possible. Of the relative values of the methods most useful in engineering work, mathematics and physics were of paramount importance. To some a more physical approach was natural, while others achieved much by a mathematical approach.

A broader understanding of sociological problems was necessary, and if the engineer neglected the spiritual aspect his work was liable to be a dismal failure.

For the well-being of the community the scientific approach should be applied to social problems and politics, but its limitation should be borne in mind. Man was finite, and from that fact should spring humility and tolerance of others.



Part of the main 33-kV switchgear which is of the pneumatically-operated low-oil-content outdoor type

Switchgear & Equipment, Ltd.; 33-kV, Allen West & Co., Ltd.; air compressor, Alley & McLellan, Ltd.; batteries, Edison Swan Electric Co., Ltd.; internal telephones,



# Industrial Heating

## Applicability of Electrical Methods

**I**N opening the discussion on the paper presented before the Installations Section of the Institution of Electrical Engineers on radiant, dielectric and eddy current heating by Messrs. L. J. C. Connell, O. W. Humphreys and J. L. Rycroft (see *Electrical Review*, April 6th, p. 507), Mr. S. G. KING (Electrical Furnace Co.) said that if one took into account all the costs of labour and power, it was possible to pick out exactly the right type of heating for any purpose. Heating problems should be considered from the thermal point of view and then it should be decided what was the best method of bringing about the required temperature. In some localities gas or oil might be best and electrical engineers should fearlessly say so. One of the great outlets for eddy current heating was surface hardening, the first plant for which was installed here nine years ago. But the greatest use for induction or eddy current heating might turn out to be in conditioning certain shaped parts prior to working on them by stamping or forging or some other process. There was also great scope for the combination of different methods. Induction heating was already being used for copper brazing and with silver alloys, and although at first sight it seemed expensive the savings were very great.

### Absorption Coefficient

Dr. L. HARTSHORN (N.P.L.) remarked that it had been said that radiant heating was a class in which an external source of heat was employed but from the scientific point of view the lamp used for radiant heating was no more a source of heat than was the oscillator used for high-frequency heating, or the radio transmitter. They were all generators of magnetic waves and the efficiency in all cases was very much the same. All that was effected was the absorption of electromagnetic energy, which was measured by the absorption coefficient, or power factor, which were different measures of the same quantity. The assumption that efficiency was controlled by power factor, or absorption coefficient, was not theoretically correct.

A practical example of dielectric heating was the drying of dehydrated vegetables. For transport, they were compressed into blocks about one inch thick and to give cohesion to the blocks it was necessary to apply the pressure while the material was a little damp. Then it was necessary to get rid of that water which was usually done in tunnel dryers at a temperature of 60 deg. C. This took from 6 to 8 hours and therefore it was a case for dielectric heating as it was not possible to get

the heat into the block and get the water out with conventional methods. Dielectric heating put heat in and the internal pressure developed then forced the water out. Scorching could be prevented by having a gap between the electrode and the material.

Mr. J. C. LOWSON (B.T.H. Co.), said that the haphazard enclosure of radiant-heat tunnels might lead to overheating of the equipment and controlled ventilation was of considerable importance. By comparatively simple means it was possible to avoid overheating the equipment and avoiding cooling the work unnecessarily. He showed a slide indicating the basic principle of a ventilation control system in which the incoming air was warmed by contact with the lamp bulbs and the low velocity air over the entire lamp bank formed a cushion which prevented the fumes from reaching the reflectors, thus helping to keep them clean. A light screen, open at top and bottom, placed around the tunnel, prevented direct draughts from blowing through the equipment and obviated glare from the lamps. He challenged the authors' implication that for general applications the trough was more efficient than the individual circular reflector and thought it was misleading to take as a criterion of efficiency the number of watts that could be put into a given size of plant. The important thing was the ratio of input watts to useful work done, and a more fundamental criterion of efficiency was the watts expended per article produced. The only fair way of comparing two such heating systems was to compare the watts input of two plants giving the same production of the same article. Where it had been possible to make such a comparison, the individual circular reflector system showed a saving of 25 per cent. or more as compared with the trough system.

### Past Experimental Stage

Mr. F. E. ROWLAND (G.E.C.) wished to dispel any idea that lamp heating was still largely in the experimental stage. Equipments were operating having a capacity of from less than 1 kW up to 500 kW. This form of heating could be applied in small units, which made it very flexible, and also to conveyor production lines. A manufacturer who had experience for two years with a plant loaded to 270 kW installed another loaded to 233 kW and in the near future this installation would total 675 kW. Lamp heating had achieved outstanding results during the war and drying times had been enormously reduced.

Dr. J. H. NEILSON (Joseph Lucas Ltd.)

referring to the latest American practice, said a reflector incorporated in the bulb permitted closer spacing of the lamps, which were mounted in a double-wall enclosure so that very good heat insulation was obtained and the contacts were kept cool. One of the difficulties in this country was that lamps would not withstand high temperature and it was necessary to lose the benefit of some of the enclosure in order to keep the contacts cool. However, by keeping the contacts out of the oven, the problem was solved. The application of lamps for small installations made possible the use of lamps of the dull emitter type which were available in 700 W size instead of 250 W.

Dr. H. P. ZAIDE (AEC Manufacturing Co.) mentioned some problems which were solved only by the judicious use of two heating methods. For drying the coating on arc welding electrodes, for example, it was necessary to adopt a combination of forced convection and radiant heating, the latter being applied for a short period after the former had dealt with the large amount of moisture in the coating. The original attempt

to do the work solely by radiant heating did not bring about the desired result.

Mr. HUMPHREYS, who replied to some of the points raised in the discussion, said that some of the matters referred to had had to be left out of the paper owing to lack of space and the endeavour had been to treat the subject in general terms. This particularly applied to the absence of any discussion of gas and oil and the use of more than one heating process for the same operation. He would not advocate trough reflectors in all cases; for large plants there was no doubt that lamps with internal reflectors were wanted, but he had not yet seen one. There was such a reduction in maintenance and such an increase in intensity that they must be the most suitable so long as the plant was sufficiently large for any lack of concentration in reflection to be unimportant. With a single reflector irradiating a small object, it was essential to control the radiation very closely, but in the case of a plant heating thousands of objects, if the radiation missed one it would strike another, and that was all that was required.

## Power Line Tension

### Division Between Conductor and Core

**A**N experimental investigation undertaken to determine how temperature and tension may affect the sharing of mechanical load between the steel core and outer aluminium sheath of overhead power lines has been the subject of an interim report (F/T 139) issued by the E.R.A. A paper based on that work has been prepared by MR. E. W. W. DOUBLE (Rotax, Ltd., formerly with E.R.A.) for the Transmission Section of the Institution of Electrical Engineers.

Tension was measured by a magnetic method and the test circuit is described and illustrated in the paper. The author's conclusions are that strong adhesion between the aluminium and steel suggests that the initial load ratio just before stringing is largely determined by the temperature of manufacture, and that local damage of the outer wires has little effect on load ratio in other sections of the conductor. Load ratio decreases with fall in temperature, the aluminium wires then taking up a greater share of the total load, though over a moderate range of temperature no permanent alteration occurs.

The steel seems to carry more than its proper share of the total load, but neither its safety nor that of the conductor as a whole is thereby threatened. The final distribution of load and its effect on conductor sag is eventually determined by the rate of creep in the aluminium wires, and is therefore independent of the stringing temperature. A large fall in

temperature, however, is liable to hasten the commencement of creep.

More data concerning creep are required; but the rate of creep seems negligibly small, provided the stress in the aluminium wires remains less than about 6.25–6.5 tons per sq. in. These stresses may occur at conductor tensions about 25 per cent. below the maximum design load, and so, irrespective of stringing temperature, some creep must be expected in service. Since the maintenance of high conductor tensions for periods long enough to cause serious creep is uncommon, its effects on load ratio and conductor sag will therefore be small; hence no change is recommended in B.S. 215.

Inelastic stretch can cause large and permanent increases in conductor sag, far outweighing those due to creep and, moreover, the latter increases may occur shortly after stringing, and in any case earlier than those due to creep. Pre-stressing at the maximum load envisaged removes most of the inelastic stretch and it is therefore recommended that conductors be tensioned to the maximum design load for about 10–20 minutes before final stringing. The effective modulus of elasticity of a conductor falls slowly with increase of temperature, the theoretical values agreeing closely with those obtained during test. Over a wide temperature range no permanent variation of the modulus occurs, provided the conductor is first pre-stressed and stabilised.

## CORRESPONDENCE

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

### Supply Authorities as Electrical Contractors

I AM sorry to see that Mr. Moss, in his letter to you in the April 6th issue, is endeavouring to re-start the feud generally known as "municipal trading" by his statement of supply authorities "poking their noses into the installation and retail sides of the electrical industry" and that "it is high time this lop-sided method of trading was stopped." In point of fact the reverse is the case, namely, that the supply authorities had their noses poked into this matter, and I thought that the whole question had been relegated to history by the passing of the 1926 Act. I would remind Mr. Moss of Section 48 of that Act.

As vice-president of the I.M.E.A. at that time I was responsible, in conjunction with the then president, Mr. R. W. L. Phillips, for thrashing out with the representatives of the Electrical Contractors' Association the precise wording of that clause, and after it had been agreed a pamphlet was prepared and circulated to all Members of Parliament explaining the reasons for the clause, and the signatories to this pamphlet included the then president of the Electrical Contractors' Association, Mr. H. J. Miles. The pamphlet, after setting out the reasons for the clause being submitted to Parliament for inclusion in the Bill, concludes with this statement:—

"The Incorporated Municipal Electrical Association have satisfied the Electrical Contractors' Association (England, Wales, and Ireland) that they have no desire to interfere with the legitimate business of electrical contracting, but rather to assist it in every possible way. The contractors, on their part, are satisfied that the establishment of the proposed joint committee would prevent any abuse of the powers which it is now agreed should be granted to those municipalities who possess hiring but not selling powers. Without this protective clause, however, the full development of electricity supply would continue to be retarded, as in the past, by lack of co-operation. It is urged, therefore, that every member of Parliament, who desires that the objects of the Bill shall be secured, will support the annexed clause, and resist any amendments to it."

I would ask your readers to compare this statement, endorsed by the president of the E.C.A., urging every Member of Parliament to support the granting of these powers to every municipal supply undertaking (company undertakings, of course, being free to do as they please), with Mr. Moss's statement that

it is high time this lop-sided method of trading was stopped. This would be putting back the clock of progress with a vengeance, and it is to be regretted that Mr. Moss should have ventured to resurrect the matter without first fully acquainting himself with the past history and all that has led up to the present position.

London, W.C.2.

F. W. PURSE.

### Universal Domestic Tariff

MR. FERNS, in his letter published in your issue of March 30th dodges the question I put to him, but he seems to think that four questions ought to be answered by me. Here are my answers:—

(a) I am not competent to say how many kWh will be used by consumers with five types of heavy loads; nor is Mr. Ferns. There are very wide variations.

(b) My statement means that there is a fundamental difference between existing industrial tariffs and Mr. Ferns' proposals. I would add that no undertaking could afford to adopt the formula suggested by Mr. Ferns for an industrial tariff.

(c) I am not surprised at new tariffs, there are thousands of them.

(d) Five types of heavy loads are installed in many domestic premises already. These loads are encouraged by progressive undertakings. It is wrong for Mr. Ferns to assume that his proposals would operate without financial loss to an undertaking. A consumer with two types of heavy load would get about 700 kWh per quarter for £2 10s. He would then be able to obtain a free gift of a further 340 kWh per quarter by just installing three more types of apparatus. This gift to the consumer will cost the undertaking something.

Mr. Ferns may point out that a consumer who increased his loading as shown above would increase his consumption by more than 340 kWh per quarter. This may be so, but the addition of a refrigerator and a vacuum cleaner would qualify as two additional loads. After this free gift the price would be  $\frac{1}{2}$  of a penny per kWh. Compare this price with the running charge, plus the fuel surcharge, of bulk supply tariffs. No undertaking can survive by charging less than cost of bulk supply to domestic consumers. Under the proposed universal domestic tariff the first 1,000 kWh per quarter would be sold at 0.6d. per kWh and the remainder at  $\frac{1}{2}$  of a penny per kWh. The average working costs of all authorised undertakers (excluding capital charges) is more than 0.6d. per kWh.

Mr. Ferns regards my views as narrow and

parochial. I would like to broaden my view. Will Mr. Ferns explain how his tariff can be applied nationally without financial loss to undertakings?

Welwyn Garden City.

B. CROWSLEY,  
A.M.I.E.E.

### Training Apprentices

**I** COULD not agree more with the views expressed by Mr. James Scott in your issue of March 30, but does the industry ever consider the viewpoint of the unfortunate trainee?

My parents by dint of sacrifice, ensured my passage through school and university to the crowning glory of a B.Sc. degree in electrical engineering, whereas my own wish was to be apprenticed to a firm which conducted suitable technical classes, in addition to the routine work-bench training, the importance of which is so rightly stressed by your correspondent. After twelve years (five spent in the Army), I am more than ever convinced that my view was correct. I have consistently found that possession of a university degree is a bar to progress in the electrical industry, despite my proven ability to handle tools in company with tradesmen.

When I had begun work with a certain firm at £3 per week, I was offered 15s. per week by a well-known firm in whose type of work I am most interested. Do such big firms consider that a man of 20 or 22 should continue to be dependent on his parents? I imagine that such men should be suitably paid and regarded as investments, though I agree that too many graduates are afraid to dirty their hands, and would be bad investments. It is perhaps significant that my temporary employers have found me worthy of up-grading from the lowest rank, in an employment for which I was most definitely not trained.

Somewhere in England.

MAJOR  
(ex-Burma).

### Steel-Cored Copper Conductor

**Y**OU published in your issue of March 30th a letter from Mr. N. F. Marsh in which he stated that he did not think that putting bitumenised tape round the steel core would help much, except possibly in the larger sized conductors with two layers of copper wires.

May we assure Mr. Marsh and anyone else interested that a well bitumenised or other similar tape properly applied helps a great deal and, in fact, affords excellent protection over long periods, even when covered with only one layer of copper wires. Most stringent tests of over ten years duration have shown this to be the case. Some details of the tests will be found in the *I.E.E. Journal*, Vol. 91, Part 2, No. 23, October, 1944, pp. 456-459.

We agree that the application of a tape

wrapping to single-wire cores of small size presents some difficulty since the increase in diameter caused thereby necessitates a modified stranding. The efficacy of the tape wrapping as an additional protection does not, however, depend on there being more than one layer of copper wires covering it.

Rugby. COPPER DEVELOPMENT ASSOCIATION.  
G. W. Preston,  
General Manager.

### Guarantees

**I**N the article in your issue of March 23rd, entitled "Guarantees" Mr. F. W. Purse suggested that new consumers needing special mains should be required to guarantee a revenue equal to about 40 per cent. of the capital outlay on mains. The author's application of the statistical evidence is erroneous in mixing up old with new business, in assuming a particular kW relationship between capital outlay on mains and the revenue to be earned, and in forgetting that the load on a section of mains does not stay at the original value but grows continually.

The conception of a percentage guarantee is fundamentally unsound, since if a consumer uses electricity up to the value of his guarantee he is not contributing anything special towards his exceptional mains outlay. The only meticulous solution is to make the consumer pay the special capital charges involved by the mains extension and let his consumption (the tariff charges will take care of all the undertaking's normal working and capital costs involved in the supply of electricity) take its natural course, which is quite contrary to the view expressed by Mr. Purse.

Now it is quite obviously not practicable, in general, for a consumer to pay for a mains extension (we are not concerned here with the simple problem of a long service on the consumer's own property) and therefore some other method of ensuring an adequate return had to be evolved, *viz.*, the guarantee method. The 20 per cent. on the capital outlay on special mains was simply a figure which experience had shown to be reasonable *on the average*. Before the war the revenue was rising at the rate of £6 million per annum whilst distribution capital was rising at the rate of £30 million, which gives a ratio of 20 per cent. But this is not all. Almost half the capital expenditure of local authorities had been paid off and consequently a high proportion of the £6 million arose from plant of zero book value. Consequently a lower figure than 20 per cent. could reasonably be used for guarantees, especially where further development is likely.

Just as every individual consumer cannot be expected to show a profit on a particular tariff so every individual mains extension cannot be expected to provide an immediate increase in revenue. Many undertakings

have laid down many miles of mains without any revenue guarantees, but the policy paid in the end. Thus if new extensions can maintain an average ratio of revenue increase to mains-outlay increase which experience has shown to be satisfactory there is no need to be unduly perturbed by the alarming

figures given by Mr. Purse. Again, money is cheaper to-day than it was pre-war, and the increased cost of mains extensions automatically compensates for the increases in other operating costs brought about by the war.

Wolverhampton.

J. L. FERNS.

## PERSONAL and SOCIAL

### News of Men and Women of the Industry

**T**HE British Electrical Development Association is advertising for a development engineer for the investigation of new applications of heat and power. The salary is £700-£800.

Morley Corporation requires a borough electrical engineer and public lighting superintendent, the salary offered being £650 per annum rising to £750, plus war bonus. Applications are invited by the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board for the position of deputy electrical engineer (commencing salary £850 per annum plus a car allowance of £96). The West Midlands Joint Electricity Authority is advertising for a constructional assistant (£600 per annum).

Mr. F. C. Gill, A.M.I.E.E., A.I.Mech.E., who as already announced has just been appointed assistant manager and mains superintendent to the Chesterfield Corporation Electricity Department, has been at Chesterfield since 1943, serving first as technical assistant (distribution) and then as senior technical assistant. Before that, from 1928 to 1943, he was junior mains assistant and later mains assistant to the Electricity Department at his native town of Bradford. Mr. Gill received his technical



Mr. F. C. Gill

education and training in the Department of Electrical Engineering, Bradford Technical College, and with the Bradford Electricity Department. He is thirty-nine.

Mr. Stewart F. Philpott, M.I.E.E., has joined R. B. Pullin & Co., Ltd., Brentford, as fractional-HP motor development engineer. For the past nine years he has been with the General Electric Co., Ltd., Witton, Birmingham, and has contributed a number of articles on fractional-HP motor subjects to the *Electrical Review*.

At a social evening arranged by Ardeer (Ayrshire) Electrical Association Mr. R. M. Freer, who is retiring from the post of chief electrical engineer to I.C.I. (Explosives), Ltd., and Mr. J. McGill, power station attendant, who retired recently from Ardeer Factory Electrical Department, received presentations.

Messrs. Charles and Richard Hinde have just retired after serving for fifty-seven years with the Automatic Telephone & Electric Co., Ltd. They are twins and started at fourteen years of age; in 1938 they completed 50 years unbroken

service, and each was presented with a gold medallion in the design of an automatic telephone dial inset in the ten finger-holes with rubies for each five years of service. They were then working on the development of the distant reading gyro-magnetic compass described in the *Electrical Review* of March 16th. During the last war they worked on the design of a special anti-submarine device. As a parting gift their fellow-workers presented each with a clock, set in a representation of an automatic telephone dial in a handsome wooden case.

Mr. F. J. Cole, M.I.E.E., A.M.I.Mech.E., borough electrical engineer and manager of the West Bromwich electricity undertaking, has been appointed electrical engineer to Blackpool Corporation, in succession to Mr. H. F. Shanahan, who is retiring. Mr. Cole, who is forty, will receive a salary of £1,490, rising in two years to £1,750, plus cost of living bonus. He has served with several municipal authorities, including Darwen and Shipley, and was chosen out of fifty-two applicants.

Mr. H. H. Ballin, Ph.D., B.Sc. (Econ.), Associate I.E.E., F.I.E.S., for many years lighting engineer with the General Electric Co., Ltd., has been appointed commercial manager of the illuminating engineering department of Thorn Electrical Industries, Ltd. Dr. Ballin, apart from his activities in the field of illuminating engineering, has devoted considerable time to the study of the history of electricity supply.



Dr. H. H. Ballin

At the annual general meeting of the Manchester and Salford branch of Electrical Association for Women the Mayor of Salford presented the Elizabeth Sloan Chesser Cup, awarded annually in the Association's electrical housecraft diploma test, to Miss J. Thorp, who is Salford Corporation Electricity Department's senior demonstrator.

Mr. D. W. Kent, B.A., A.C.A., secretary of the Igranic Electric Co., Ltd., has joined the board.

Mr. C. G. Renold was elected president of the Engineers' Club, Manchester, at the thirty-second annual general meeting at the Club on March 27th. He is chairman of the Post-War Industrial Reconstruction (Manchester) Group, a founder member of the Manchester Engineering Council and is closely associated with

the Manchester University and the Chamber of Commerce. The hon. treasurer, Mr. E. Royle, and hon. secretary, Mr. A. G. Livesay, were re-elected. The report of the Committee for the past year, presented by the retiring president (Mr. E. A. Mercer) showed that the membership had increased and more and more engineering and allied institutions had made use of the facilities of the Club for lectures, etc., many distinguished visitors having addressed these meetings.

Mr. F. Garside, A.M.I.E.E., A.M.I.I.A., deputy borough electrical engineer of Reigate, who, as previously reported, took up new duties on April 3rd as borough electrical engineer and manager at Kendal, received his technical education at the Royal Aircraft Establishment Technical School and the Manchester College of Technology. After completing his apprenticeship at the Royal Aircraft Establishment Mr. Garside served with the Metropolitan-Vickers Electrical Co., the Burmah Oil Company and the Basingstoke Corporation.

A. Reyrolle & Co.'s concert party has raised £500 for a children's cot in the Royal Infirmary, Newcastle. The cot has been dedicated by Mrs. Merz, wife of Mr. Norbert Merz, chairman of the company.

Mr. S. J. Harley, B.Sc., formerly Controller of Jigs, Tools and Gauges, Machine Tool Control, Ministry of Supply, has been appointed Technical Controller of the Machine Tool Control.

Mr. Charles Edison, son of Thomas Alva Edison, is in charge of preliminary arrangements for the celebration of the centenary of his father's birth on February 11th, 1947.

Mr. J. Wyatt Williams has resigned from the secretaryship of the West London and Provincial Electric & General Trust, Ltd., consequent upon his appointment as a director. He is succeeded as secretary by Mr. H. Welsford. The company's registered office is now 68, King William Street, E.C.4.

Mr. E. J. Jarvis, borough electrical engineer of Kingston-on-Thames, has recently been appointed a member of the Central Electricity Board's National Consultative Committee.

Mr. Hugh Purslove Barker, M.I.E.E., previously engineering director of Parkinson & Cowan, Ltd., has been appointed deputy managing director.

Mr. A. J. Crocker, works manager with C. A. Parsons & Co., Ltd., Heaton, Newcastle-on-Tyne for thirty-two years has retired and has received a presentation from the officials and staff of the company. Mr. Crocker joined Parsons in 1896 at the age of fifteen.

Mr. Geoffrey Bowyer, secretary of W. B. Dick & Co., Ltd., has been appointed a director.

Mr. J. H. Moss, has become a partner in the firm of Raworth, Moss & Cook, chartered patent agents. He has had over twenty years' experience with patents in the mechanical, electrical and chemical fields of invention.

Mr. A. E. Rayment has been appointed manager of the London office (Royal London House, 16, Finsbury Square, E.C.2) of Chas. Begg & Co., Ltd., of Dunedin, New Zealand. Mr. Rayment, who was born in London, has been with Begg & Co. in New Zealand for the

past seventeen years and he is taking charge of the buying of electrical appliances and equipment for the company.

Mr. Alfred Clark, chairman of Electric & Musical Industries, Ltd., has been elected by its newly established Radio Industry Council as its first president.

Mr. C. Eric Stewart, A.M.I.E.E., has arrived in Bombay to take up his duties at the Bombay branch of Johnson & Phillips, Ltd. Mr. Stewart, who is the son of the late Mr. Charles Stewart, for many years a director of Johnson & Phillips, joined the company in 1928 upon leaving King's College, London.

The committee of the I.E.E. North-Eastern Students' Section has nominated the following for the 1945-46 session: Chairman, Mr. H. Hilton (North-Eastern Electric Supply Co.); vice-chairman, Lt. L. B. Knowles (R.N.V.R.); and hon. secretary, Mr. T. J. Morgan (G.P.O. Engineering Department).

Mr. A. C. Holmes, hon. secretary of the I.E.E. North Midland Students' Section, has been nominated as chairman for 1945-46. Mr. R. Oliver has been nominated as vice-chairman and Mr. J. C. W. Wilkinson as hon. secretary.

Darwen Town Council on Thursday paid tribute to the services rendered by Mr. F. M. Fletcher, borough electrical engineer for the last twenty-six years, who has retired.

The annual general meeting of the South Wales Branch of the Association of Mining Electrical Engineers has been provisionally fixed for May 26th. Officers nominated for next session are: Messrs. T. R. Thomas, B.Sc., M.I.E.E. (president); T. G. Dash, A.M.I.E.E., and R. H. Morgan, Associate I.E.E. (first and second vice-presidents, respectively); A. C. MacWhirter, M.I.E.E. (hon. treasurer); H. C. Charlton, A.M.I.E.E. (hon. secretary); and W. Todd, Associate I.E.E. (hon. assistant secretary).

## Obituary

Commander J. A. Binnie.—The death is announced of Commander J. A. Binnie, R.N., who from 1931 to 1939 was works manager of the transformer department of Ferranti, Ltd., at Hollinwood. He was educated at Charterhouse and the R.N. College at Dartmouth, passing out in time to serve as a midshipman in the Battle of Jutland. After the last war he studied science at Cambridge, and thereafter devoted his attention to research and development, particularly connected with anti-submarine defence. He returned to the Navy in 1939 and it was while he was with a convoy to Russia that he lost his life.



The late Commander J. A. Binnie

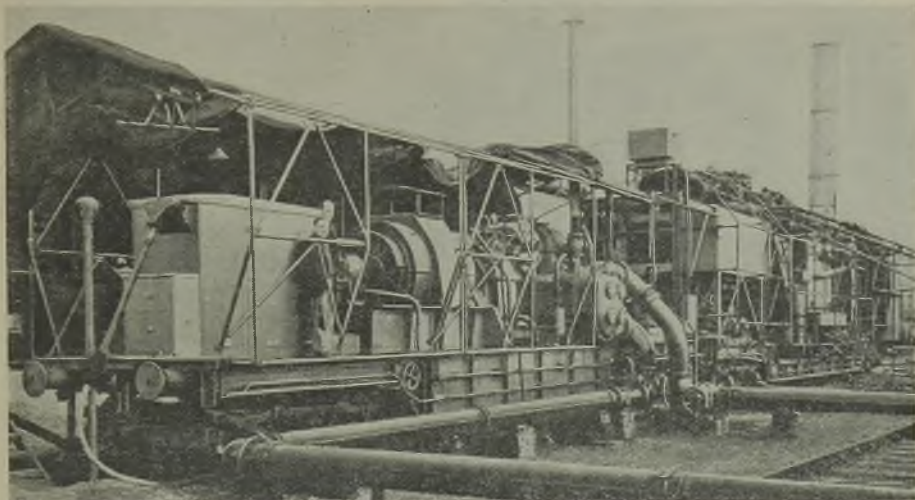
Mr. A. C. Marshall.—The death occurred in February of Mr. Arthur C. Marshall formerly president of the Detroit Edison Co., and since his retirement consultant to the company. He was seventy-two.

# Power Stations for Russia

## Mobile Plant in Devastated Areas

**E**XPERIENCE gained in the design of transportable generating units for emergency use in this country during the war, although, as Sir John Chancellor said at last week's A.E.I. meeting, these were fortunately

two Kennicott slug feeders equipped with live-steam heaters between them to raise the temperature of the feed to that of the economiser inlet. With fuel of 7,840 BThU per lb., the maximum continuous rating is 16,750 lb.



A 2,500-kW coal fired mobile power station showing water connections and coal conveyor

not required, has proved useful in aiding reconstruction in the U.S.S.R., where many sets built by the Metropolitan-Vickers Electrical Co., Ltd., to the order of the Ministry of Supply are now in operation. These units are mounted on railway rolling stock and are of four types, coal- and oil-fired 1,000 kW, coal-fired, 2,500 kW and oil-fired 5,000 kW.

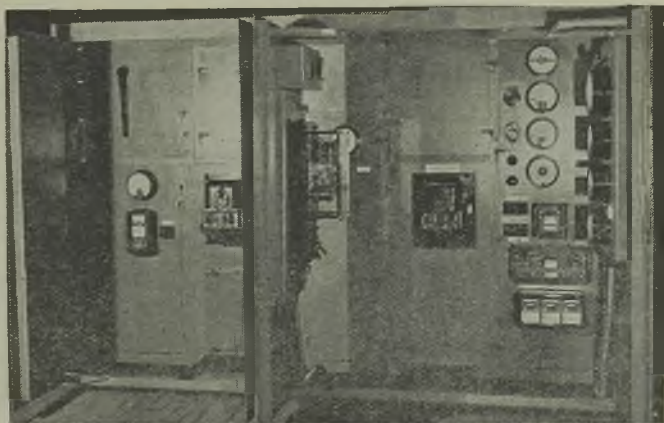
Steam for the 1,000 kW coal-fired unit is raised in a John Thompson boiler with

per hr. Steam conditions are 382 lb. per sq. in. (gauge) and 690 deg. F.

For the oil-fired 1,000-kW set the boiler is of the La Mont type (Ivor Power Co., Ltd.) built in two sections, one consisting of combustion-chamber cooling tubes and the second

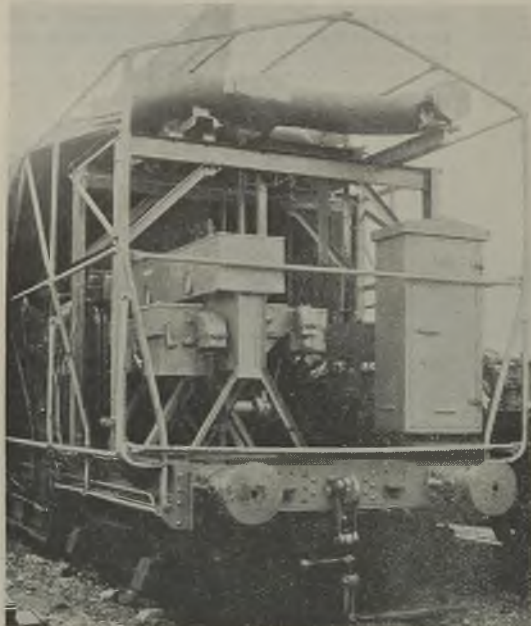
### High-voltage switch group

an electrically driven chain-grate stoker, forced- and induced-draught fans and centrifugal feed pump, a steam-driven reciprocating pump being provided as stand-by. Make-up water is treated chemically in



of the convection elements and superheaters. A steam-driven turbine pump discharges water taken from the underside of the steam and water drum to distribution heads. Two

exhaust forms part of the shell of the condensers which have effective cooling areas of 806, 1,470 and 2,540 sq. ft. The m.c.r. is based on 27.6 Hg, with 800, 2,300 and 4,020 gal. per min. of circulating water at 60 deg. F. A centrifugal condensate extraction pump driven from the turbine shaft and a two-stage steam-operated ejector with inter- and after-coolers for the main feed are included. The c.w. pump is separately mounted for placing near the water source and a small petrol-driven pump is provided for priming.



End view of auxiliary truck showing medium-voltage auxiliary switchboard and transformer

Turbine speeds are reduced to the 1,500 RPM of the alternator by means of Metrovick double-helical, single-reduction gears. Generation is at 6.3 kV, three-phase, 50-cycles, 0.8 p.f. Closed air-circuit ventilation is employed, the air cooler being fitted with wire-wound Clayton-Still tubes, and a fan is mounted at each end of the alternator rotor. The exciter is direct-coupled to the alternator. Auxiliaries are supplied at 380 V through an oil-immersed naturally cooled outdoor transformer, usually rated at from 75 to 150 kVA, which is connected permanently to the alternator terminals.

The 6.3-kV oil-switchgear is self-contained in a weather-proof kiosk. Protective devices include over-current and restricted earth-fault relays and a "Metrosil" surge diverter. A medium-voltage control board includes two oil circuit-breakers for auxiliaries and others for local distribution.

oil burners are fed from an electric rotary pump and a vertical steam pump, and forced draught is produced by an electric fan. A live-steam-heated single-effect evaporator supplies make-up feed for which a vapour condenser is provided by a tubular feed-water heater taking the exhaust of the boiler auxiliaries. The m.c.r. of the boiler is 17,500 lb. per hr. with steam conditions of 390 lb. per sq. in. and 690 deg. F. when fired with oil fuel of 17,650 BThU per lb.

The boiler for the 5,000-kW equipment is of the Foster-Wheeler design (Ivor Power Co.) comprising essentially steam and water drums and a water-wall header together with a two-pass superheater. The f.d. fan is driven by a single-stage impulse steam turbine, the exhaust from which is taken to a single-effect evaporator for the make up. Five oil burners are fed by an electric centrifugal pump and a steam reciprocating pump. A tubular feed-water heater, heated by steam from the evaporator or by reduced-pressure live steam is connected between the boiler inlet and its feed pumps. The m.c.r. rating is 65,000 lb. per hr. at 392 lb. per sq. in. and 700 deg. F. with fuel of 17,500 BThU per lb.

Except as to the number of stages, the three sizes of turbine are generally similar in design and run at 7,500, 6,000 or 5,000 RPM. The

### Telling the Americans

▶ GREAT credit is due to Mr. Davis M. De Bard, the well-known American engineer, for his endeavours to present to the American public a true idea of conditions in wartime England. For five years Mr. De Bard has had letters from twenty-six correspondents connected with utility services here and at his own expense has made them available to people in the American electrical industry and others. It is estimated that 40,000 people have thus secured first-hand information from Great Britain and, as the *Electrical World* says, although this "isn't a lot when comparison is made with a population figure in excess of 130 million, if these letters from England have helped to bind that 40,000 closer to our allies they have been very much worth while."



# English Electric Bombers

## Aircraft Production to Continue After the War

**S**PEAKING at the company's annual meeting on March 1st, Sir George Nelson, chairman and managing director of the English Electric Co., Ltd., referred to the large production of aircraft, tanks and other equipment for the Forces for which the company had been responsible. Sir George gave more details of this work last Friday. He said that over 3,000 Hampden and Halifax bombers had been produced at the English Electric Company's Preston works and the company was to continue aircraft production after the war.

Realising the imminence of war, the company, as far back as 1936, had greatly extended its school and training facilities to meet anticipated demands on

its resources of management, engineering knowledge and productive skill and capacity. Its high standard of technical accomplishment had thereby enabled it to train and use unskilled labour to an extent that would otherwise have been impossible. In 1938 the first contract was received for the Hampden bomber and without outside help other than a Handley Page liaison officer the first machine was produced in fifteen months from the time of starting. Similarly the four-engined Halifax was in production within eighteen months. Jigs and tools numbering 83,000 and costing £1¼ million had had to be made for the Hampden, and 43,000 costing £1,900,000 for the Halifax. Only 5 per cent. of skilled labour was used in the factory and the change-over from one type of machine to the other was made without the loss of a single plane. Sir George paid special tribute to the work of Mr. A. Sheffield, the manager of the works.

Referring to the company's post-war plans, Sir George said that, having demonstrated in the war that the experiences and resources of the company could make a valuable contribution to the design and manufacturing technique of aircraft, the board felt that it was its duty to continue in aircraft production and in this connection had secured the services of Mr. Edward Petter as chief engineer and designer. Fortunately for the company a substantial part of its other wartime activities had been its normal peacetime work and he foresaw a long period of

full employment at all its factories. He anticipated a resumption and expansion of activities in the export market.

### Extension of Preston Works

To meet the wartime production the Preston works have been greatly increased, resulting in a total area including the final assembly and flight sheds of nearly 2,000,000 sq. ft. and the number of employees at Preston has increased from 1,500 to 13,500 (40 per cent. women, chiefly from the cotton industry), the total number of employees at all factories being 28,000, against 7,500 before the war. No fewer than 30,000 parts are required for the Halifax and over a thousand major



Forming of "Perspex" nose, canopies, etc., for the Halifax bomber at the Preston works

changes in design have had to be coped with; the planning, drawing office and rate-fixing departments alone employ 400 people.

At the main works the various components are made and assembled into five major units—fuselage, intermediate and outer wings, tail unit and undercarriage, etc., the final assembly being completed at the aerodrome. It speaks well for the high standard of workmanship that an average of only 1.6 test flights per machine are required before acceptance. Of special interest in the production methods are the use of a new 8,000-ton press for shaping aluminium parts, the heat-treatment section, spot welding by machines designed and built by the company, and the moulding and production of plastics. A new method of making "Perspex" noses, canopies, etc., involves the electrical jointing of  $\frac{1}{8}$ -in. sheets and the use of a suction process to mould the "Perspex," which has previously been raised to a temperature of 170 deg. C. by means of an electrically-heated table to make it pliable.

Apart from aircraft, the English Electric Co. has made at its Stafford works thousands of tanks of the "Covenantor," "Centaur,"

"Cromwell" and other types; tens of thousands of precision aircraft instruments; hundreds of thousands of Service radio transformers; cathode-ray ignition testers for i.c. engines; electrical equipment for magnetic mine sweepers; dynamometers for aero-engine testing; electrical propulsion and auxiliary equipments for submarines; millions of fuses for the Admiralty; and millions of die-cast components for all kinds of purposes. It can be said that Stafford has played a very important part in winning the battle of the Atlantic.

The Rugby works has supplied hundreds of Diesel generating sets for ships of all kinds, aerodromes, and locomotives serving with our armies overseas. Complete transportable Diesel-electric power stations mounted on railway trucks for general war service have also been made, besides steam turbines for operating ships' auxiliaries and turbo-alternator sets for various power stations.

The Bradford works has produced electric generators for ships' auxiliaries and degaussing apparatus, high-frequency alternators used in destroying acoustic mines, naval rangefinders, fire direction and control equipment, including gear for the gun mountings, and various equipments for stabilising naval depth charge mortars, searchlights, sound locators and predictors, Diesel-electric locomotive equipment for Army service, tens of thousands of rotary transformers for radio purposes in aircraft, dynamometers for aero-engine testing and electric mining locomotives for Russia.

Some indication of the immense productive capacity necessitated by these and other war activities is given by the facts that the value of the products has represented £60,000,000 above the normal turnover of the company's established business and the combined floor area of the four main factories has been increased from about 1,700,000 sq. ft. to 3,360,000.

## Indian Appliance Market

### Limited But Growing Scope

**T**HE Canadian Trade Commissioner in Bombay, Mr. Paul Sykes, has reported to his Government on the Indian market for electric household appliances. So far, he says, the demand has been small, but it is growing. The United Kingdom has enjoyed more than half the trade with one notable exception—domestic refrigerators. Mr. Sykes attributes the predominant position of the United Kingdom to the tariff preference of from 24 to 36 per cent. He mentions that Japan, as a result of strenuous price competition, was strengthening her position in the market before the war.

There was then practically no competition from local sources, although the manufacture of ceiling fans, small electric motors and water pumps had been started. It is pointed out that these enterprises have since been extended, and accompanied by a limited production of electric kettles, irons and a number of the more simply made appliances of this type. The Trade Commissioner, however, considers it improbable that such competition will exert much influence on post-war imports of appliances of good quality for an appreciable time. But he adds that the entry of two important British firms, in addition to a number of purely local manufacturing companies, into this industry must be given due consideration.

#### Factors Influencing Demand

The report carefully weighs future prospects. On the one hand it is recalled that there is only a very small European population, while the Indian element is unaccustomed to the use of modern household electrical equipment. Moreover domestic servants are numerous. On the other hand there is evidence of a widening appreciation of the utility of electrical goods. New apartment houses in the larger cities have been equipped with refrigerators. The provision of sockets for irons, razors, and other

small appliances has extended to many hotels, clubs, and other institutions.

The Trade Commissioner finds of considerably more significance the general tendency, in the larger cities at least, towards modernisation in standards of living, including the use of aids to comfort, convenience and health. This trend is, of course, likely to be stimulated by the supply companies which will be anxious to extend their sales of electricity. In post-war reconstruction, power development projects figure largely. Mr. Sykes then proceeds to deal with the different types of appliances in detail. Some of the points which he makes are summarised in the following notes:—

**Refrigerators.**—Demand is substantial, generally for a well-made machine with a sound cabinet and ample refrigerating capacity of 4 to 8 cu. ft.

**Air conditioners.**—The market is growing for portable machines designed for domestic operation, and capable of maintaining the temperature of a room of average size at 70 to 80 deg. when outside temperatures range from 80 to 120 deg.

**Cooking appliances.**—There is a fair market for the smaller types and for single and double hotplates, but a relatively small demand for ovens.

**Washing machines, hair-dryers, razors, etc.**—The market is limited.

**Irons, toasters, etc.**—This general range of goods can be sold in fairly substantial volume, mainly in ordinary domestic sizes.

**Water-heaters.**—There is a limited market for instantaneous and storage types.

**Lighting equipment.**—There is a good market for ceiling and wall fixtures and a growing demand for standard and table lamps.

**Fans.**—There will always be a good market for table types of 8, 12 and 16 in. and for ceiling types, preferably of 56 in. span.

# Cable Insulation

## Future for Synthetic Materials

LAST month's informal discussion at the Institution of Electrical Engineers was opened by Mr. T. R. SCOTT (Standard Telephones & Cables, Ltd.) who spoke of the future of cables insulated with synthetic and thermoplastic substances; he did not deal with sheathing. Mr. Scott emphasised that before anybody attempted to condemn thermoplastic materials as insulants for wires and cables they should study the record of polyethylene in this war as a submarine and high-frequency cable insulant. Unfortunately, owing to restricted supply, economics and specialised usage (as well as secrecy) the general public was not sufficiently familiar with its properties. Much more would be heard of this material and its derivatives. If its price became comparable with that of natural rubber, which he thought was quite possible, the post-war wire and cable position would be profoundly affected.

### Plasticisers for P.V.C.

P.v.c., the future of which was somewhat nebulous, suffered from the fact that it was not usable in cable practice without the addition of a plasticiser and during the war the choice of plasticisers had been strictly limited, while the amount used had been largely determined by the claims of the Services. Therefore wartime p.v.c. was not really representative of post-war material which could, and would, be marketed for general wire and cable purposes. For example, a new non-migrating plasticiser had been developed which would make a considerable change in many characteristics. As an insulant p.v.c. suffered from the fact that it was polar and therefore must be inferior in many electrical properties to non-polar materials such as polyethylene. On the other hand it offered inertness to oxidation, resistance to attack by oil and fireproofness. His feeling was that if temperature standards remained as at present p.v.c. had a distinct future, but if, as he later suggested, they were to be increased, then it would be replaced by a chlorinated or other halogenated insulant, which was vulcanisable.

Turning to "synthetics," by which he meant polymeric thermoplastic materials which were cross-linked, vulcanised or cured, experience in this country was very meagre. Although satisfactory cables had been produced from Buna S, this material had no outstanding qualities except as a substitute while supplies of natural rubber were short. If the price were such as substantially to undercut rubber the position might be different, but that did not seem probable. Neo-

prene, electrically, was not too "pure" although it could be rectified to some extent at a price. Butyl was the "dark horse" of the bunch; there was little or no experience of it for cables, but its flexibility, ageing and temperature range were all attractive.

Disregarding economic considerations which would be indeterminate for some time, he felt that the chlorinated version of Buna was the most likely rival to rubber, although it was possible that research in natural rubber would lead to some "synthetic modification" of it, which would eliminate some weak points, no doubt with some commensurate increase in cost.

Mr. Scott referred to the temperature limits of the orthodox rubber-insulated cable for which the maximum operating temperature had been fixed at 120-135 deg. F. The tendency was for higher ambient temperatures which could be met by h.r. grades of rubber cable, but if an alternative to rubber were introduced giving a safe operating temperature of, say, 190 deg. F., with no serious drawbacks and with normal rubber cable expectation of life and without appreciable increase in cost, it might sweep the market to the exclusion of natural rubber.

### New Specifications Needed

Before synthetics were generally used, much work would be necessary to change cable specifications, codes of practice, etc., from those founded on rubber to specifications founded on other materials. This would take time, and the introduction of synthetics on a large scale might be delayed thereby.

The general discussion revealed that whereas p.v.c. had been satisfactory for several years when used on fine wires, in the case of larger cables subject to appreciable temperature rise, there was a tendency for the conductor to cut through the insulant owing to its softening. New specifications should not be just a modification of specifications for rubber cables.

One speaker put forward the view that the chemical and electrical side of synthetic insulation should not be subordinated to the mechanical; the tendency for the cable to cut through the insulant under temperature rise could be limited by mechanical protection. The possibility of synthetic insulation competing with impregnated paper was also put to Mr. Scott, as was the point that with l.v. cables synthetic insulation could be used direct in the ground without lead sheathing, it being impervious to moisture.

From the household wiring point of view it was felt by one speaker that the average wire-

man would always prefer natural rubber; in this field for synthetic insulation much prejudice had to be overcome. The importance of economic considerations was borne out in the discussion. Objection was taken to the use of the word "substitute" in relation to synthetics and special uses were mentioned in which rubber might not be suitable. The possibility of countering ice loading on cables by synthetic insulation was also mentioned.

Mr. Scott in his reply said that one very simple answer to all criticisms was for

users to state definitely to the manufacturers what they required. There should be a specification for each type of cable. Synthetic chemists, he added, might well have already solved the problem of icing on cables, since certain types of material had been developed which inhibited moisture deposition. As to the temperature problem, 4-kV and 20-kV cables with synthetic insulation were being used at present in America. Whether synthetic insulation would be better and cheaper than paper insulation remained to be seen.

## Power Companies

### Past and Future Development

**T**HE Incorporated Association of Electric Power Companies has published a 24-page booklet with the title—"Electricity Supply: The Voice of Authority." Repeating the statement that the power companies' area of supply covers two-thirds of Great Britain, the booklet refers to those who demand the nationalisation of an industry which is virile, ordered and progressive. These people approach the subject from opposite directions: one party says that nationalisation is the only hope of salvation for the industry; the other thinks that free enterprise has made such a good job of it that it is time the State took it over.

#### Rural Territories

The history of the power companies is reviewed and it is shown that their origin lay in the inability or unwillingness of existing local authority and company undertakings to supply electricity outside their own circumscribed areas. More than half of the power companies' territory is rural and nearly all the rest is semi-rural; there are about 115 people to the square mile as against 4,810 in local authority areas. By 1910 eight companies had spent £13 million in getting electricity supply to these areas under way. There were then nearly 3,000 miles of transmission lines (there are 48,000 miles to-day) and domestic consumers numbered about 62,000 (over 2,000,000 to-day). They built large and efficient power stations and interconnected systems which made electricity available over large areas; they employed the "grid" idea regionally before it was adopted nationally.

Thus for the first time rural industries were given electricity supply and the connection of these made it easier to serve the domestic consumers at economic rates. Uniformity of tariffs was achieved in wide areas and the substitution of the large single unit for many independent unco-ordinated units made possible an increasing standardisation of voltages and systems.

Between 1910 and 1929, progress was extraordinary and in the next ten years phenomenal. In rural electrification, almost

solely due to the power companies, low-voltage mains were added to at the rate of 2,000 miles a year and by the end of 1938 there were over 20,000 miles—an increase of 440 per cent. over 1929. Electricity was made available to 67 per cent. of the premises in rural areas and practically all of these accepted the supply, 90 per cent. being actually connected. This proves the falsity of the allegation that electricity is too dear for most country dwellers.

#### Cheap Power

The power companies claim to be the cheapest providers of power but admit that in certain areas prices charged to domestic consumers are slightly higher due to the greater cost of supplying sparsely-populated areas. In 1937-38 the companies' average selling price to both power and domestic consumers was 15 per cent. less than that charged by local authorities. Wartime increases have enlarged the disparity, to the advantage of the power companies' consumers.

It is asserted that but for the war 90 per cent. of the rural areas still unserved would have had a supply by now. Plans are in hand for the expenditure of at least £100 million upon generation and distribution. Those relating to distribution, on which £50 million will be spent, have actually been completed and lodged with the Electricity Commissioners. Over 200,000 dwellings are involved in the scheme and soon there will not be a single community of over 50 people without an available supply. At the same time attention is being given to improving the load diversity, greater standardisation of voltages and uniformity of tariffs.

The Association believes that if the public could voice its wishes it would say that it would be folly to scrap the experience and practice which has made the industry so successful for a political experiment.

At the end of the booklet the Association's proposals regarding reorganisation are summarised and quotations are made from the McGowan and Cooper Reports in which the retention of existing large undertakings is considered advisable.

# Demand-Related Cost

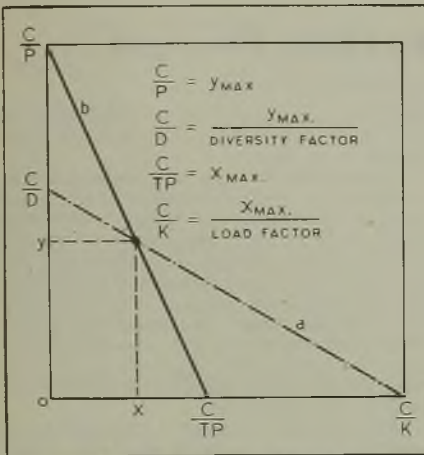
## The E.R.A. Method of Allocation

**A**N improved method of allocating the demand-related portion of the standing cost of electricity supply which has been evolved by the E.R.A. was described in the *Electrical Review* of April 6th. Its main features are the concept of "potential-peak periods" (during which the annual maximum demand on a supply system or part of it may occur) and the allocation of demand-related cost based jointly on consumption and highest demand within the potential peak periods but not outside them.

Based on principles suggested by the United States engineer, W. J. Greene, the E.R.A. method can be illustrated by using the following symbols and definitions, in

requires two equations. The first states that the cost to be allocated must equal the sum of the allocations to the individual component loads, *i.e.*,  $C = \Sigma(kx) + \Sigma(dy) = Kx + Dy$ . The second is derived from the consideration that if the magnitude of a component load is constant throughout the potential-peak periods, such component adds its full demand to the absolute system peak, at whatever time within the potential peak periods the latter may occur. Consequently, a load of this character monopolises an amount of system capacity equivalent to its demand. The second equation is, therefore,  $C/P = Tx + y$ .

The highest demands, *d*, and the consumptions, *k*, during the assumed potential-peak periods have to be ascertained for each of the component loads. In the first place, the allocation is based on the classes of consumers supplied from the system. The annual consumption of each class is known, and by using an estimated load factor, the corresponding *m.d.* can be calculated. In exceptional cases the annual *m.d.* of a component load may not be expected within the assumed potential-peak period and the corresponding *d* must be estimated from load curves. If, for instance, the potential peak-periods are assumed to be from 7 a.m. to 11 p.m. on all days of the two winter quarters, the *k*'s can be found by deducting from the total consumption an estimated proportion in respect of off-potential-peak (night) hours. Sub-division within a class can be effected similarly, *e.g.*, as between domestic consumers on the "all-in" and other tariffs.



Greene's consumption and demand method

### Graphical Solution of Equations

In the diagram the chain-dotted line, *a*, represents the first, and the solid line, *b*, the second equation, the solution, *x* and *y*, being given by the intersection of the two lines. The possible range of *x* and *y* is determined by the line, *b*, since for a given system the demand-related cost *C* and the capacity (identified with *P*) are given. The position of the line, *a*, depends on *D* and *K*; the lower *C/D* is in relation to *C/K*, the lower, relatively, will be *y*, and the higher *x*.

As *D* denotes the sum of the component *m.d.*'s it is directly proportional to the diversity factor *D/P* (as confined to potential-peak periods). On the other hand *K* depends on the system load factor (as referred to the aggregate of potential-peak periods), represented by *K/TP* and the higher this "period" load-factor, the nearer will the *x*-intercept of line *a* be to  $x_{max}$ , thus making for a relatively higher *x*.

which "system" denotes both a comprehensive system or a part:—*C*, total annual demand-related cost in respect of a system; *d*, highest demand (half-hour) of a component load during the potential-peak periods; *D*, sum of the *d*'s involved ( $D = \Sigma d$ ); *k*, annual consumption of a component load during the potential-peak periods; *K*, sum of the *k*'s involved ( $K = \Sigma k$ ); *P*, annual collective *m.d.* on the system; *T*, aggregate annual duration of the potential peak periods; *x*, a share of demand-related cost (per 1,000 kWh) allocated during the potential-peak periods; *y*, a share of demand-related cost, allocated per kVA or kW of highest demand during the potential-peak period. The allocation to a component load is given by the formula  $kx - dy$ .

Determination of the factors *x* and *y*

Hence, with relatively high system diversity, a component load having low period load factor, *i.e.*, comparatively high  $d$  and low  $k$ , will receive a relatively lower allocation ( $kx+dy$ ) than if the diversity were low. With increasing system load factor the allocation to a component load will become relatively higher for a high period load factor than for a low period load factor.

If it is certain that a particular component load (*e.g.*, radiant heaters where the system m.d. occurs during cold snaps) will make its full demand at the time of the annual system peak, then such load is treated according to the conventional peak-responsibility theory, and the E.R.A. method is applied to the rest only.

#### Cost Classification

A Technical Report (K/T112) entitled "A Method of Classifying Electricity Supply Cost," by W. A. Carne, has been issued by the Association (10s. 6d. net). In this

principles of a scientific system of classification are suggested as the basis for a standard system of costing and accounting, founded on the chronological order of functions and the natural sequence of processes. This is held to be the only one that lends itself readily to the production without duplication both of details for operational control and of bulk figures for accountancy purposes. The system can be easily adapted to changing and expanding requirements.

A series of model cost statements, drawn up in accordance with a cost-classification scheme given in an appendix, briefly describes the method and illustrates its utilisation for local administration, accountancy control and inter-undertaking comparison. Other appendices give a general exposition of the various requirements of a cost-classification system and a comprehensive coding scheme, which enables the elements of costing to be produced under appropriate heads and covers for the varied aspects of cost segregation.

## Lighting Installation Design

### Questions the Engineer Must Ask Himself

**A**LTHOUGH there is a wealth of information available to specialists practising in interior illuminating engineering, it may easily be misused if a correct appreciation of its background is lacking. In a paper prepared for submission to the Installations Section of the Institution of Electrical Engineers yesterday (Thursday) Mr. R. O. ACKERLEY (G.E.C.) set himself the task of summarising in as logical a sequence as possible the data that are available, trying to put each part in correct perspective to every other part and to the problem as a whole. With that end in view the author discusses possible answers to a series of questions the illuminating engineer must ask himself when designing an installation. A chart is included to indicate sequence and interrelation of progressive steps in lighting design to which reference is made periodically as the author develops his argument.

The paper stresses the importance of careful task analysis in the first instance to determine exactly what is the visual problem for which suitable lighting has to be provided; it then goes on to discuss methods of lighting factors affecting illumination requirements, the selection of appropriate fittings and lamps as well as the calculations necessary to determine their positions and wattages.

Account has been taken of some of the psychological aspects of the subject as well as the physical and physiological, but aesthetic considerations have been deliberately excluded. Therefore the author tends to illustrate his points with utilitarian examples, but much of what he says about factories will apply equally well to shops, offices, school

interiors and even the home, although in the last mentioned case particularly aesthetics cannot be ignored.

The paper also deals with probable post-war trends, excluding wiring, in which respect the lighting engineer will be very much in the hands of his clients. He cannot be expert in every field, but he must first understand what the task is before he can attempt to resolve it into its usual components. With such closer task analysis must be associated greater comprehension of the relative weights to be given to factors affecting seeing and more appreciation of the requirements for psychological satisfaction.

More attention is likely to be paid to the possibility of making work more easy to see; for instance, the substitution of grey enamelled wire for black to facilitate coil winding. All experience points to a steady demand for higher illumination values so the art must be mastered of furnishing them without sacrificing comfort, but tolerable fittings brightness cannot be increased proportionately. One solution is likely to be the employment of large-area sources of low brightness. Multiple-lamp units or continuous lines of light will be more satisfying than the same number of lamps spaced individually as entirely separate units. Even with fluorescent lamps some cut-off of bare lamp light at angles just below the horizontal is desirable. One effective way of achieving this result is to install the lamps in slightly recessed troughs. The simplest method of controlling field brightness is by the use of reflectors with louvres to concentrate within the desired angle so that the spread of light can be adjusted.

# COMMERCE and INDUSTRY

Production of Prototypes. American Substitute Materials.

## Preparing for Post-War Trade

OF more than 1,300 applications received by the Board of Trade from manufacturers for facilities to enable them to carry out experimental work, including the manufacture of prototypes, in preparation for the change-over to peacetime production, only thirteen have been rejected. Applications relating to electrical machinery and equipment represent 4 per cent. of the total and there is a similar percentage for machine tools and for food machinery. Refrigeration machinery and equipment accounts for 2 per cent. and radio for 1 per cent. Except for a few materials, the whole supplies of which are required for essential wartime purposes, it is possible to make available the necessary materials for all approved experimental and development work, but no extra labour is allowed.

## Export Licensing Changes

The Board of Trade has issued the Export of Goods (Control) (No. 3) Order, 1945 (S.R. & O. 1945 No. 357, Stationery Office, 1d.) which operates as from April 9th and effects a number of relaxations. The schedule to the principal Order (No. 10 of 1943) is amended in several respects. In Group 12 (2) the item "Electric filament lamps and parts thereof" has been deleted and the following substituted:— "Electric filament lamps and parts, the following: Carbon filament lamps, tubular filament lamps, other electric filament lamps of a rating not exceeding 50 V and parts of electric filament lamps." Watt-hour meters have been excluded from the item "Instruments for indicating, measuring, recording or testing electrical properties or quantities."

## Machinery, Plant and Appliances Control

The Machinery Licences Division of the Board of Trade has now been merged with the Industries and Manufactures (Engineering) Department. In future all applications for licences to supply controlled goods under the Machinery, Plant and Appliances Orders, and all related correspondence, should be addressed to the Assistant Secretary, Industries and Manufactures (Engineering) Department, Board of Trade, Millbank, London, S.W.1.

## Substitute Materials Exhibition

For over three years a display of American substitute materials in great variety has been available in London for study, by special pass only, by Service experts and industrialists. The exhibits have been lent by the United States in order to help the British production effort and some of the substitutes have already been evolved in like forms in this country.

The exhibition is maintained by the United Kingdom Commercial Corporation, which sent one of its directors to create a mission in New York for the collection of a representative range of samples for the guidance of the various

Ministries concerned in London. The U.K.C.C. Mission in New York has obtained the samples by personal contact only with 450 donor firms.

An average of 45 exhibits per month has been added to the collection, expanding the range of products represented until at present there are some 1,300 exhibits, ranging from paper packing materials and fibrous products, leather and textiles to metals, pharmaceutical substances, glass and a very wide range of plastic materials. Among the last named are insulating sleeveings, rubber substitutes, "Fiberglass" (Owens-Corning) and plastic ducts for wiring systems ("Pierceway") in low-cost electrified homes.

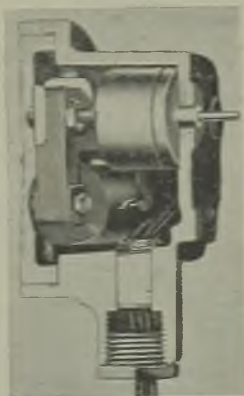
## South American Trade Guides

Further additions have been made to the series of reviews of commercial conditions in various countries produced by the Department of Overseas Trade. These cover Brazil, Chile, Peru and Bolivia and are obtainable at 6d. each from the Stationery Office or through booksellers.

## Explosion-proof Motor

An electric motor totally enclosed in a bronze casting for use in explosive atmospheres has been developed by the Warren Telechron Co., Ashland, Mass., U.S.A. The bronze enclosure has a removable screw-down cover.

The enclosed motor which the company supplies for a variety of speeds, voltages



Gas-tight miniature motor

and frequencies, was developed by the company primarily for use with automatic controls applied to industrial processes in atmospheres containing such explosive or inflammable impurities as ethyl ether vapour, gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapours and natural gas. These bronze encased motors are now in use in a number of large American war plants producing chemicals, synthetic rubber, high-octane gas and ammunition.

## Fused-plug Demonstration

Some of the capabilities of the domestic 3-kW 230-V socket outlet with fused plug made by Dorman & Smith, Ltd., which was described in the *Electrical Review* of October 29th, 1943, p. 569, were demonstrated in London last week.

Both discrimination and direct short-circuit tests were carried out successfully, silently and without "flash." The mechanical and physical properties of "Alorite," a special ceramic material used for making the fuse body were demonstrated. This is strong dielectrically and non-hygroscopic, remaining quite cool in service, even after short-circuit clearance. The material is machine-drawn into tube form and then fired, which makes it so hard that it will easily cut glass and grindstones make no impression on it whatever. A short "Alorite" tube used as a cutting tool in a lathe without lubricant turned hard silver steel easily, the ceramic remaining cool to the touch. Finally, a ceramic tube of  $\frac{1}{8}$  in. bore and  $\frac{1}{4}$  in. external diameter, unsupported in any way, was forced in a hand press through a mild steel plate  $\frac{1}{8}$  in. thick without damaging the tube.

### Revised War Allowance for Women

As from April 16th the total adult war allowance for women staff workers in engineering establishments is to be 19s. per week as compared with 23s. 6d. for men. Agreement to this effect has been reached between the Engineering and Allied Employers' National Federation, the Association of Engineering and Shipbuilding Draughtsmen, the Association of Scientific Workers, and the Clerical and Administrative Workers' Union.

### Science in Peace

The Association of Scientific Workers, Hanover House, 73, High Holborn, W.C.1, has published in booklet form (price 3d.) an account of a conference on "Science in Peace" held in February.

### Warning Consumers of Electricity Cuts

It was reported to a meeting of the Huddersfield Chamber of Commerce last week that the Electricity Commissioners are considering the provision of warnings to consumers whose supplies of electricity may be cut off at peak periods next winter. Sir H. Gordon Kaye, a member of the Chamber, expressed the opinion that warnings issued in the B.B.C. news were insufficient owing to the danger in which people employed on unprotected machines might be exposed when they found themselves in darkness. In a letter he had received from Mr. W. Mabane, M.P., it was stated that it was out of the question to estimate the oncoming load on the electricity system so closely that instructions could be given in advance of the peak for load to be shed. If control rooms were compelled to stand by decisions arrived at some hours before the peak load arose they would inevitably have to play for safety and sometimes shed load unnecessarily.

### Placing Contracts

During a discussion by Grimsby Electricity Committee on the invitation of tenders for contracts the borough electrical engineer (Mr. G. W. Parker) said that under Standing Orders an order exceeding £100 in value must be accepted under a formal contract after tenders had been invited by advertisement in the local Press. If the lowest tender was not accepted the Committee concerned had to inform the Town Council of its reason. The Committee needed certain switchgear and transformers but it was useless to

advertise for tenders in the local newspapers.

The chairman (Alderman W. H. Thickett) said that the Committee had standardised its electric cookers and there was no point in asking other firms to tender for spares. The Committee did not always accept the lowest tender because sometimes the quality was not up to its standards.

It was agreed to make representations to the Town Council asking for permission, in special circumstances to invite tenders or to obtain offers as required.

### Australian Production

Statistics of Australian manufacturing production in 1941-42 have now been issued except for a number of items withheld for reasons of security. Those relating to the electrical industry are given in the accompanying table, together with comparative figures, where such are available, for 1939-40. The comparison can only

| Class of Equipment  | 1941-42<br>£A | Inc. or dec.<br>on 1939-40<br>£A |
|---|---------------|----------------------------------|
| Alternators .. .. .   | 83,430        | + 69,480                         |
| Generators .. .. .  | 136,855       | + 124,139                        |
| Motors, AC .. .. .  | 655,146       | + 145,656                        |
| Motors, DC .. .. .  | 96,280        | + 28,930                         |
| Transformers and converters   |               |                                  |
| Above 20 kVA  |               |                                  |
| For use in supplying industrial power and light                                     | 404,734       | + 91,724                         |
| For other industrial use  | 51,934        | *                                |
| Below 20 kVA  |               |                                  |
| For use in neon signs   | 13,032        | - 15,126                         |
| For use in radio and electrical toys  | 68,215        | + 52,621                         |
| For industrial use other than the supply of power and light                         | 43,565        | - 30,525                         |
| Batteries, dry .. .. .  | 636,280       | *                                |
| Accumulators (automobile, radio)  | 671,982       | + 138,662                        |
| Telegraph and telephone apparatus   | 802,680       | + 736,920                        |
| Regulating, starting and controlling apparatus                                      | 1,014,620     | + 419,810                        |
| Household appliances (not exceeding 33 lb.)   | 76,570        | + 22,400                         |
| Household fittings (switches, etc.)   | 387,578       | *                                |
| Electrical appliances and apparatus for motor vehicles, cycles and explosion motors | 113,670       | - 73,190                         |
| Other domestic cooking apparatus  | 141,910       | - 9,240                          |
| Heating apparatus   | 247,040       | - 29,550                         |
| Neon signs, etc.  | 730,115       | *                                |
| Other electrical articles   |               |                                  |

\* Comparative figures not available.

be approximate, by reason of price increases and some changes in classification that seem to have been made. The only decreases shown are in goods which may be regarded as not essential to the war effort. It will be seen that the output of generating plant and motors nearly doubled in value.

### Apprentice Training at Liverpool

The Liverpool Electric Power and Lighting Committee has approved the continuation of a scheme for the training of university students. At the April meeting of the City Council questions were asked as to the position of apprentices who had been called to the Forces and what steps would be taken to ensure that they would receive adequate training on their



return to civilian life. The chairman of the Committee replied that the J.I.C. was considering what measures could be taken to recognise the period of service in the Forces as part of the apprenticeship. Those now serving as electricians in the Forces would have special consideration. Other apprentices would be given training facilities.

### Trade Publications

**Steatite & Porcelain Products, Ltd.**, Stourport-on-Severn, Worcs.—Metallised ceramic bushes for hermetically sealed components are described in leaflet No. 18, with dimensions of various shapes and sizes. A film of silver is fired on to porcelain at red heat, then thickened with copper plating and finally silver plated to prevent tarnishing, so facilitating soldering for making a gas-tight joint between ceramic and metal parts. Terminals in the metal cases of paper condensers were first made in this way, since when a variety of "Frequentite" tubes, cases, boxes, bases and supports have been likewise hermetically sealed to withstand tropical conditions.

**Prat-Daniel, Ltd.**, Dalston Gardens, Stanmore, Middx.—Combined induced draught fans and dust "Turbocollectors" for steam boilers are described in leaflet P.13, which illustrates various lay-outs. During the passage of gases round the fan scroll centrifugal force concentrates the entrained dust particles at the outer periphery. Just before the fan discharge that part of the gas volume (10 to 15 per cent.) containing most dust is skinned off by means of an adjustable damper and led through ducting to a high velocity cyclone collector. The tangential inlet to the latter forms a vortex, dropping the dust down the cone, whence it is discharged to a hopper.

Applications for copies of these publications should be made on business letter-headings.

### Changes of Name

The following companies have changed their names: Peto Scott Electrical Instrument (Holdings), Ltd., to Peto Scott Electrical Instruments, Ltd.; B. G. Suthers, Ltd., to B. & S. Electrical Contractors, Ltd.; Northern Auto Electric Services, Ltd., to N.A.E.S., Ltd.; and Isle of Wight Auto & Electrical Services, Ltd., to H. A. Wills, Ltd.

### Canadian Electrical Imports

During 1944 electrical apparatus to the value of \$57,859,000 was imported by Canada. The figure for 1943 was \$48,542,000.

## TRADE MARKS

**A**PPPLICATIONS have been made for the registration of the following trade marks. Objections may be made within one month from April 4th:—

**MONARCH.** No. 632,497, Class 6. Sparking plugs for explosive engines.—Dorman & Smith, Ltd., Ordsal Electrical Works, Middlewood, Salford, 5.

**SUCAL** (design). No. 629,784, Class 24. Metallised textile piece goods and articles (not included in other classes) made therefrom.—Callender-Suchy Developments, Ltd., Hamilton House, Victoria Embankment, London, E.C.4.

## Tummel-Garry Scheme

### Inquiry to be Held

The Secretary of State for Scotland has appointed Mr. John Cameron, D.S.C., K.C., Sir Robert Bryce Walker and Major G. H. M. Brown Lindsay, D.S.O., to hold an inquiry in Edinburgh on April 25th, into objections to the North of Scotland Hydro-Electric Board's Tummel-Garry scheme. The scheme also covers a small project at Gairloch.

Mr. Cameron, who was in charge of the Loch Sloy inquiry, is Sheriff of Inverness, Elgin and Nairn. Sir Robert Bryce Walker is chairman of the Scottish Fire Commission and holds other public offices. Major G. H. M. Brown Lindsay is convener of East Lothian and chairman of the Central and South-East Scotland Planning Committee. The clerk to the inquiry will be Mr. John McKenzie, and all communications should be sent to him at Parliament House, Edinburgh. Pitlochry Amenities Committee states that Mr. L. Hill Watson, K.C., will represent local objectors at the inquiry.

That the proposed damming of the rivers Tummel and Garry at Pitlochry in the hydro-electric scheme should be abandoned is recommended in reports issued last Saturday by the Amenities and Fisheries Committees appointed under the Hydro-Electric Development Act. The Hydro-Electric Board has announced it does not intend to accept the recommendation.

The Amenities Committee states that the project will involve flooding the valley of the Tummel to within 2ft. 6in. of the top of the Falls of Tummel, and of the valley of the Garry for a distance above the Bridge of Garry. Regretting the projected disappearance of the Falls of Bruar and the loss of such exceptionally beautiful Highland scenery as the lower reaches of the Tummel and the Garry, the Committee by a majority decision recommends that the Board should not take powers to proceed with construction of works at Pitlochry.

The Fisheries Committee says the salmon spawning grounds on the upper Garry will be made useless, and recommends that the part of the scheme relating to the impounding of the waters of the upper Garry and the Bruar and other tributaries above the Falls of Struan should be abandoned.

### Oliver Lodge Scholarship

**I**N order to commemorate the silver jubilee of the Radio Section of the Institution of Electrical Engineers, the Council of the Institution has founded a research scholarship which is to be called the "Oliver Lodge Scholarship."

The Scholarship will have a basic annual value of £250 and will be tenable for one year, but may be extended for a second year. The Council wishes to encourage Scholars to travel and, after approval of a candidate's programme, may make an additional grant for this purpose. The Scholar will be required to carry out research in a subject closely allied to radio engineering.

Further particulars and nomination forms may be obtained from the Secretary, Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2. The closing date for receiving nominations is May 15th.

# Views on the News

## Reflections on Current Topics

**W**HAT is the optimum size of a factory? Sir George Nelson, chairman and managing director of the English Electric Co., told me last week that for the manufacture of a single product he does not consider there is any limit to size, but that for a "mixed" factory a unit employing about 4,000 is ideal. "There just aren't men made to handle efficiently factories larger than that," he said. Sir George also thinks that tariffs between members of the British Commonwealth should be abolished in order to encourage a healthy intercourse of trade throughout the Empire after the war. The position should, he says, be the same as between the various states of the U.S.A., which, of course, have no tariff barriers.

\* \* \*

It is reported from Dublin that the Drumm Battery Co. is to go into voluntary liquidation. The company's activities were suspended in 1940 on account of conditions set up by the war which prevented it from proceeding with the commercial exploitation of its patents and from securing the necessary materials. For some years a train operated by Drumm batteries has been running between Dublin and Bray (Co. Wicklow) and it is said that the batteries, which were guaranteed for ten years, have stood up well to continuous operation. I have heard of no other major applications of the battery; indeed an air of secrecy has always surrounded this development in which the Irish Government was closely interested.

\* \* \*

Labour members of the Grimsby Town Council unsuccessfully objected at a meeting of the Council to a proposal that electric cookers and wash-boilers should be installed in a new housing estate. One of them maintained that it was wrong to ignore the local gas company. From such a source the championing of private enterprise against municipal trading comes as a surprise.

\* \* \*

Allegations that the Committee dealing with the Corporation's temporary houses had altered its original decision after an interview with the gas company officials were made at a recent meeting of the Luton Town Council. The Committee had resolved to recommend that all of the houses should be electrically equipped but when the matter came before the Council it was found that a half-and-half arrangement was proposed. I observe from a local newspaper report that some nasty things were said about gas during the debate. One member asserted that where he lived the

women had their gas coppers in the gardens, using long flexible tubes to connect them with the supply. "Otherwise," said the councillor, "there was a great possibility of their being asphyxiated by the fumes in the scullery." He also deprecated the use of gas geysers in bathrooms.

\* \* \*

In view particularly of the recent need of supply undertakings to provide an indication of the consumption of energy in temporary houses, I was interested to learn from Mr. John A. Sumner, city electrical engineer of Norwich, of an experiment that is being carried out in his area. About a year ago 232 special meters were installed in various classes of houses to measure the separate consumption of cookers and large and small water heaters, in houses in different rateable value classifications. Unfortunately, so far figures are available for only nine months, but they should certainly be of assistance to other undertakings. Mr. Sumner offers to send details of the scheme to anyone interested.

\* \* \*

I am sure I cannot be alone among men-folk who have been convinced during the war of the desirability of having a dish-washing machine in the home; housewives, of course, needed no convincing. It comes as somewhat of a surprise therefore to be told by a current Edmundsons advertisement in the national press that I can have a dish-washer at a reasonable price by creating a real demand for it. Surely there can be no disputing the demand. The stumbling-block to the use of this apparatus, except in catering establishments and the like, has always been the high price. But is there any reason why the price should be so high? Is a dish-washer any more complicated or costly to make and sell than a washing machine or a refrigerator, both of which we look forward to seeing in widespread use after the war? The matter now seems to be one for the manufacturers.

\* \* \*

Judging by the number of cases I have seen reported, wanton damage to street lamps must be a serious problem. One reason for it may be that children who have grown up in the "black-out" find the street lights strange. The most serious trouble, as might be expected, is breakage of lanterns, and at Birkenhead the Watch Committee is experimenting with the use of reinforced glass. At Sheffield over 2,400 panes were smashed during January and February alone, apart from which 300 small electric lamps were stolen.—REFLECTOR.

# Liverpool: 1941 and After

## Effect of Concentrated Bombing on Electrical Output

**DURING** the enemy air attacks of May, 1941, many districts in the Liverpool Corporation Electric Supply Department's area were completely devastated by high explosives and fire. The result in one part of the city centre is only too vividly illustrated in the accompanying photograph taken from a window of a nearby building. This view, with the River Mersey in the background, will give readers some idea of the immensity of the task with which the Department was faced in restoring the supply of electricity to adjacent areas by means of the cables lying under the streets of the damaged portion which forms part of a district where the load distributed is of the order of 114,000 kW per square mile.

In addition to damaged 33-kV feeders, low-voltage cables, both AC and DC, and tramway feeders, there were cables in duplicate supplying the printing plant of the local

newspapers and after each interruption the supply was quickly restored, which brought a tribute from the Press, who were able to say their editions were never late.

In the right foreground of the photograph can be seen an example of good fortune. The static substation, which can be recognised by its three roof ventilators, remains unscathed amidst a scene of desolation. Many of the largest buildings appearing prominently in the background contained substations which were affected by fire and water or became inaccessible due to damage in the buildings, but it was found possible to dry out the plant and restore supplies to the undamaged portions of buildings in the vicinity from which, in some instances, National and Civil Defence services were being directed.

The general effect upon the undertaking's output caused by the destruction over the

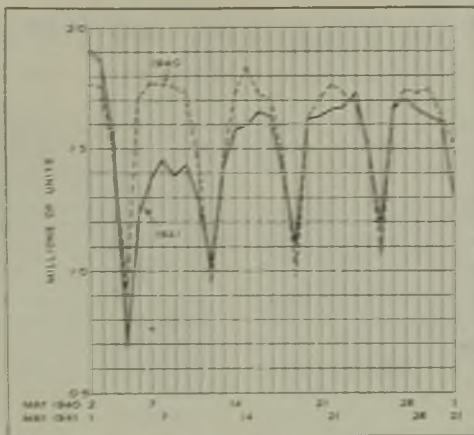


Chart of daily output in May, 1940 (dotted line) and 1941 (solid line)



One of the most devastated areas. Note the undamaged static substation in the right foreground

whole area of supply is indicated in the chart in which the daily output of units to the undertaking for the month of May, 1941, has been plotted, together with the daily output for the corresponding month of 1940. The effect of the heavy raids at the beginning of May, 1941, are reflected in the fall in output, particularly after the most severe raid on the night of Saturday-Sunday, May 3rd and 4th. The gradual recovery in the industrial

activity of the city and port is equally shown as the output by the end of the third week exceeded that of the previous year. Whilst the output on Sunday, May 4th, was well down, it will be observed that on successive Sundays it exceeded the figures for 1940, the increase being brought about by the determined effort to make good the damage sustained and to utilise to the fullest extent the resources of the area.

## ELECTRICITY SUPPLY

### Location of Belfast Plant.

**Aldershot.**—**POST-WAR DEVELOPMENT.**—In the first twelve months after the war the Electricity Committee expects to spend £7,603 on extensions in the Aldershot Park, Kingsway and North Lane areas.

**LOANS.**—Application is to be made for sanction to raise the following loans: Substation buildings, £539; substation equipment £4,029; mains, £3,035; services, £2,070; meters £3,400.

**Belfast.**—**POWER PLANT DISCUSSION.**—A deputation of Belfast Corporation Electricity Committee waited on the Minister of Commerce, Northern Ireland, recently regarding the allocation of plant for the future development of electricity in Northern Ireland. The Committee has made application for sanction to a loan of £1,000,000 for plant, and while the Ministry's consultants think that the plant should go to the Government's Ballylumford station (described in this issue), the Committee holds the view that it should go to the Corporation's Harbour power station.

**Bingley.**—**HIGHER CHARGES.**—The Electricity Committee has received sanction from the Electricity Commissioners and the Minister of Fuel and Power to increase electricity charges in the whole district by 10 per cent. No change will be made in cases where there is a special agreement incorporating a coal clause.

**Birkenhead.**—**RATE CONTRIBUTIONS.**—Alderman G. S. Prentice, chairman of the Finance Committee, presenting the Council's budget, said that it was proposed to allocate to rate aid £7,560 from the electricity undertaking's disposable balance of £32,800. The profits of the undertaking were estimated at £21,000, which was £4,000 higher than last year. Income from the gas undertaking was expected to be £27,000 more than last year, but this was more than offset by increased coal and manufacturing costs, and from the disposable balance a contribution to the rates of £3,780 was proposed. Transport profits were expected to reach £34,000 which, with a balance brought forward, made the available balance £45,000, of which £15,120 was to be allocated to the rates.

**Blackpool.**—**REBATE.**—The Town Council on April 5th decided to discontinue for one quarter the 10 per cent. war increase in the electricity tariff, as recommended by the Electricity Committee. The proposal had been rejected by the Finance Committee because of accountancy difficulties.

**Cheltenham.**—**METER RENT CONCESSION.**—The Electricity Committee has abolished the

### More All-Electric Houses.

meter rental of 1s. per quarter under the domestic two-part tariff.

**Chesterfield.**—**KITCHEN PLANNING EXHIBITION.**—There were 18,460 visitors to a kitchen planning exhibition held recently by the electricity undertaking. Parties of school children were conducted round the exhibition each morning, and the older children were asked to write an essay on what they had seen, electric irons being given as prizes to every school in the borough.

**Darlington.**—**SUPPLY TO BRICKWORKS.**—The Town Council has applied to the Electricity Commissioners for sanction to borrow £3,465 for the supply of electricity to Neashams Brickworks.

**Eastbourne.**—**ELECTRICITY FOR TEMPORARY HOUSES.**—The Town Council has approved a recommendation of the Housing Committee that electricity should be used for cooking, refrigeration, water boilers, etc., in temporary houses. In the figures given by the Committee it was estimated that the cost of gas mains which would fall on the Committee would be £2,545 if gas were used. With electricity the capital charge would fall on the Electricity Committee as the services would have to be laid for the lighting. It was also estimated that the cost to the tenants for electricity would be slightly less than for gas.

**Edinburgh.**—**UNDERTAKING'S JUBILEE.**—The Corporation Electricity Department reached its jubilee on April 11th. The first generating station was at Dewar Place and it cost £115,000.

**Grimby.**—**TURBO-ALTERNATOR IMPROVEMENTS.**—The borough electrical engineer (Mr. G. W. Parker) reported to the Electricity Committee last week that the makers of the 15,000-kW turbo-alternator at the electricity works had recommended certain alterations and improvements. In its six years' life the set had generated 260 million kWh and was giving excellent service. In view of experience with other sets the makers strongly recommended that sixteen turbine rings should be replaced by rings of newer metals and improved methods of construction. They also recommended that a new set of labyrinth of molybdenum steel should be fitted. Though there was no legal obligation upon them the makers were prepared to bear a substantial portion of the cost. The alterations could be carried out during the regular annual overhaul of the set. The Committee accepted the offer.

**SUPPLY TO FARM.**—The Committee approved a proposal to supply electricity to a farm at

Cawkwell, in the area of the Mid-Lincolnshire Electricity Supply Co., Ltd. It was stated that the company raised no objection, the Grimsby mains being much nearer. The cost was estimated at £1,520.

**Guilford.**—**MAINS EXTENSIONS.**—The Electricity Committee is to provide a supply to the Stoke Hill and Westborough estates at a cost of £12,942.

**Horwich.**—**ELECTRICAL INSTALLATION.**—A consulting engineer is to be engaged by the Lancashire Education Committee to prepare plans for re-wiring the Mechanics' Institute Technical College. The estimated cost is £530.

**Huddersfield.**—**ORDER CANCELLED.**—The Highways Committee recently instructed the Electricity and Gas Department to suspend street lighting for the duration of double summer time, but at the meeting of the Council last week the deletion of the minute was ordered, the instruction to the Department having been given without the permission of the Council.

**Ilford.**—**KITCHEN EXHIBITION POPULAR.**—The Electricity Committee reports that over a thousand persons visited the post-war kitchen unit at the central showrooms.

**Johnstone (Renfrewshire).**—**TRIAL ALL-ELECTRIC HOUSES.**—The Housing Committee is to consider a suggestion made by representatives of the Strathclyde Electricity Supply Co., Ltd., that in new housing areas after the war a proportion of the dwellings should be all-electric as a trial. The question of street lighting by electricity in new areas will also be considered.

**Littleborough.**—**ELECTRICITY PREFERRED.**—The Electricity Committee has recommended the U.D.C. to make application to the Electricity Commissioners for sanction to borrow £3,900 for extending the electricity supply to a proposed new housing site at Hollingworth. The Ministry of Health is to be informed by the clerk that the Council prefers electric cookers, refrigerators and wash boilers in the temporary bungalows.

**London.**—**IMPROVEMENT AT STEPNEY.**—Presenting the Council's estimates, Councillor J. C. Lawder said that there had been a substantial reduction in the deficit on the electricity undertaking, which continued to show signs of a healthy recovery.

**TELPHER REPLACEMENT.**—Battersea Electricity Committee is to replace telpher plant at a cost of £4,000.

**LOAN.**—Application is being made by Hackney Electricity Committee for sanction to borrow £3,500 for meters and substitution plant.

**Long Eaton.**—**NEW SWITCHGEAR.**—The Urban District Council has approved a recommendation to install switchgear and to erect a new building to house it at an estimated cost of between £5,000 and £6,000.

**Morecambe.**—**NEW FEEDER.**—The Electricity Committee is to lay an interconnecting feeder cable between Lancaster Road and Broadway substations at a cost of £1,397.

**Preston.**—**CONVERSION OF LIGHTING.**—The Corporation has accepted the Electricity Committee's offer to convert street lamps from gas to electricity at £10 per lamp.

**Reigate.**—**ALL-ELECTRIC HOUSES.**—The Borough Council has decided that the first

hundred temporary houses shall be all-electric. The Electricity Committee is to install the mains and services free of cost.

**Salford.**—**SUBSTATIONS.**—The Light, Heat and Power Committee is seeking sanction to borrow £16,500 for substations.

**South Shields.**—**POST-WAR DEVELOPMENT.**—The borough electrical engineer has submitted to the Electricity Commissioners an estimate amounting to £14,919 for post-war electrical development.

**Warrington.**—**RATE RELIEF.**—The Electricity Committee has agreed to contribute £10,000 in relief of rates in respect to the current year and a minimum of £10,000 in respect of year 1945-46 the exact sum to be settled later in that year.

**LIGHTING OF GAS SHOWROOMS.**—The Gas Committee has decided that the lighting of the gas showrooms shall be by electricity.

## Overseas

**Australia.**—**MELBOURNE IMPROVEMENTS.**—A grit-arresting system, including an electrostatic flue dust collector, is being installed at the Spencer Street power station of the Melbourne City Council. Works being carried out by the electricity undertaking during the year ending September 30th next call for an estimated expenditure of £100,000.

## TRANSPORT

**Australia.**—**TRAMWAY EXTENSIONS.**—As soon as the necessary materials are available after the war the Melbourne and Metropolitan Tramways Board plans to construct electric tramways along routes where buses are at present operated. Together with new depots and workshop extensions the work is estimated to cost £944,000.

**Darlington.**—**LOAN FOR TROLLEY-BUSES.**—Sanction has been received by the Town Council to borrow £20,000 for the purchase of eight trolley-buses.

**Leeds.**—**TRANSPORT PLANS.**—The City Council has approved plans by the manager and chief engineer (Mr. W. Vane Morland) for the post-war development of the City Council's tramway and bus undertaking. The report stresses the desirability of constructing right-of-way enclosed tram tracks to large housing estates and expresses approval of the Ministry of Transport's proposal for segregating heavy passenger traffic. Certain tram routes, it is urged, should be scrapped, and replaced by buses. The question of improving bus station facilities is to be considered.

**Newcastle-on-Tyne.**—**NO RATE RELIEF.**—When the question of levying a general rate was discussed by the City Council it was stated that the Transport and Electricity Department would not be able to give a grant towards the rate fund this year owing to special wartime taxation and higher costs generally.

**South Shields.**—**LAST TRAM ROUTE TO CLOSE.**—It is expected that the last tram route at South Shields will be abolished within twelve months. Only one tram route was still running at the outbreak of the war but the change-over had to be deferred. Trams were started at South Shields thirty-nine years ago and in 1935 the first trolley-bus made its appearance.

# FINANCIAL SECTION

## Company News. Stock Exchange Activities.

### Reports and Dividends

**Associated Electrical Industries, Ltd.**—Lt.-Col. Sir John Chancellor presided at the annual meeting on March 5th in the absence through illness of the chairman, Sir Felix Pole. After referring to the deaths of Messrs. P. S. Turner and N. B. Dickson and the appointment to the board of Mr. A. J. Boyd, Capt. H. Vivian and Mr. V. J. Radbone, Sir John Chancellor reviewed the accounts (see our last issue, p. 512) and mentioned the acquisition of the British Thomson-Houston Co.'s 7 per cent. preference shares.

The output from the factories of the group was greater than ever before and orders in hand also constituted a record; practically the whole of their manufacturing facilities had been employed on Government work. The A.E.I. group now employed 65,000 people of whom 42 per cent. were women.

Their combined research departments had contributed in no small degree to recent scientific discoveries and to the improvement of engineering design and technique brought about by those discoveries. In this connection Sir John referred to the knighthood recently conferred on Dr. A. P. M. Fleming.

The Metropolitan-Vickers Co. had begun to assist the Government in the development and manufacture of various forms of equipment for the fighting services in 1936 and during the war the scope and volume of the work had steadily grown. The most notable of the company's contributions had been in connection with the development and manufacture of radar equipment, automatic pilots, gun mountings and controls, and aircraft. Mobile power stations had been designed for emergency use in this country; occasions for their use did not arise but the designs were modified and adjusted to suit Russian conditions and many had been sent to our Ally. [These sets are dealt with elsewhere in this issue.—*Editors.*]

Sir John briefly referred to the work of Ferguson, Pailin, Ltd., the Edison Swan Electric Co., Ltd., Ediswan Cables, Ltd., and Harcourts, Ltd., and then spoke of the steps being taken by the companies to maintain and increase their export business. It would be necessary to ensure that the industrial efficiency and productive capacity of their factories were maintained at the highest level. In this connection large capital expenditure would have to be incurred on the thorough re-equipment of the factories and he welcomed the Government's intention to provide tax relief in this matter.

At the conclusion of the final business the meeting was addressed by Mr. Clark H. Minor, one of the American directors and president of the International General Electric Co., of America, who dealt with the British War Relief Society of America.

**Lancashire Dynamo & Crypto, Ltd.**—Speaking at the annual meeting on April 4th, Mr. H. W. Bosworth (chairman) said that there would be many post-war problems and the board therefore recommended that £100,000 should be used to

form a post-war contingencies reserve. The main works at Trafford Park and Willesden had been fully occupied. Foster Transformers & Switchgear, Ltd., had had a satisfactory year. Crypton Equipment, Ltd., was moved to Bridgewater early in the war and the company had purchased the freehold of its temporary premises and was modernising them. The food machinery section had operated successfully and a new factory was being acquired. The dispersal factories in London and the Midlands had produced large quantities of important war materials. Mr. Bosworth said it was obvious that there was a need for greatly increased export trade and restrictions on that trade should be removed. During the year the company had exported a very appreciable percentage of its output.

**British Insulated Cables, Ltd.**, reports that with the balance brought forward (£390,484) the profit for the past year was £1,231,901 as compared with £1,286,521 for the preceding year. After providing for income tax and preference and interim ordinary dividends, £100,000 (same) is transferred to reserve for war and post-war contingencies; a final dividend of 10 per cent. is paid on the ordinary capital, again making 15 per cent. for the year, plus a cash bonus of 5 per cent. (same). The balance carried forward is £409,867.

In the statement which the chairman, Sir Alexander Roger, is to present at the annual meeting on April 19th, reference is made to the company's wartime activities which have consisted mainly of providing cables for a wide variety of military purposes. In addition to its ordinary construction department the company has maintained an organisation for the repair of essential underground cables and overhead lines damaged by enemy action. This and similar organisations have been largely responsible for the rapid restoration of electricity supply after severe enemy raids. The company supplied at short notice cable installations for the "Mulberry" ports.

In the past five years about 18,000,000 miles of insulating wire have been supplied to the Services; the finer gauges of wire mainly manufactured on the Continent before the war have been produced in this country with equipment and skill comparing favourably with the long established Continental practice. Substitute materials have been successfully applied in many instances. The company has also achieved an equally impressive output of condensers and other components for radio, telephone and telegraph equipment, aircraft navigating instruments, anti-submarine devices and mines; moulded plastic products for Service use; and electric welding machines and magnetic moulding machines for munition factories. It has also produced large quantities of shell and bomb parts. The company and its subsidiaries now give employment to nearly 18,000 people, about 8,000 of whom are women.

Among the subsidiary companies special reference is made to British Copper Refiners, Ltd., which during the war has dealt with large

tonnages of blister copper from Northern Rhodesia.

Sir Alexander refers to the company's educational scheme and says that provision has been made, through the Prescott Grammar School Scholarship Foundation Fund, for scholarships for pupils of the school a number of whom find employment in the company's Prescott works. About 2,200 employees are on national service and the company looks forward to their early return. A questionnaire has been sent to each of them to enable the company to ascertain what positions they will be suitable for upon their return. As to the future every step possible under existing conditions is being taken to ensure that the company will be well equipped to play its full part, but final plans cannot be made until the question of controls is settled. Sir Alexander looks forward with complete confidence to this country achieving the volume of export business so essential to its future and to full employment.

**Switchgear & Cowans, Ltd.**—After providing for taxation, the net profit for 1944 was £22,632 as compared with £22,653 in the previous year. As already announced, the dividend is maintained at 20 per cent. A sum of £2,324 (£9,000) goes to general reserve and £20,392 (£12,084) is carried forward. Stock and work in progress stand at £156,454 (£97,928) and total floating assets at £346,941 (£337,978). Liabilities include creditors, taxation, etc., £178,695 (£218,660), debt to subsidiaries £9,134 (£3,200) and debt to banks £29,578 (nil).

**Central London Electricity, Ltd.**, reports a total revenue of £3,450,345 for 1944 against £2,956,887 for 1943. The net revenue balance rose by £471,170 to £1,184,348, and with the crediting of interest there is available £1,228,475 (against £748,126). After meeting debenture interest, income tax, etc., the net income is £552,967 (£445,158) to which is added £5,000 from No. 2 reserve and £219,370 brought in, making £770,337. Sinking fund contributions take £560,237 and dividends £215,311, leaving £1,790 to be carried forward. As already reported, London Associated Electricity Undertakings, Ltd., which holds most of the capital is paying a 4 per cent. dividend on its ordinary shares.

**Scottish Power Co., Ltd.**—In his speech at the company's annual meeting Mr. William Shearer (chairman) referred to recent remarks by Lord Airlie who was reported to have stated that in the areas of the Grampian Company new consumers were "being turned away daily owing to shortage of power." Mr. Shearer said that he knew of no case of an application for a supply of electricity being refused where it was possible for them to obtain the necessary priority for material. As they were now prohibited from establishing any new generating works themselves, it was clear that the Grampian Company would be entirely dependent on the resources of the North of Scotland Hydro-Electric Board for any additional supplies that might in future be needed. The essence of their Afric scheme had been the provision of an additional source of supply for their northern network. The Board's Tummel-Garry scheme did not appear to meet this point.

In refutation of allegations that they were exploiting the Highlands, he showed that,

excluding special supplies to authorised undertakings and the C.E.B., the average price obtained during 1944 from their general business was 1.3d. per kWh; including special supplies it was slightly under 1d. Further reductions in the rates of supply to power users in industrial areas served by their selected stations were put into effect during the year, and their tariffs for public lighting were also reduced. Consumers in the Grampian areas, where the demand was met from water power, had no increased fuel costs to meet and therefore enjoyed a special stability of tariffs.

Dealing with rural development, he said that steady, if slow, progress was made with farm connections. The results were not altogether encouraging. The average revenue was disappointingly low and the schemes investigated had not received the wholehearted support of the farmers concerned.

With regard to the heavy local rating liability, it appeared that while the Hydro-Electric Board would, from its commencement, benefit from the Bill now before Parliament, the negligible relief to the Grampian Company could not materialise for several years. He drew attention to the fact that provision for local rates and taxation in respect of the year 1944 totalled £637,567, representing 60 per cent. of their trading surplus and being four times greater than the dividend which the ordinary stockholders would receive.

**The Woking Electric Supply Co., Ltd.**, reports a net revenue for 1944 amounting to £104,942, plus £3,139 interest. Income tax takes £27,277, debenture interest £9,433, preference dividends £11,500, depreciation and renewals £22,191, reserve £20,000, and war damage contribution reserve £5,000. After paying a final dividend of 4½ per cent., making 7½ per cent., £6,158 (£4,565) is carried forward.

**The Mid-Cheshire Electricity Supply Co., Ltd.**, records net revenue amounting to £102,918 (£104,099). Income tax accounts for £42,364 (£40,737), depreciation and renewals £17,831 (£16,279), pensions £5,000 (same) and employees' bonus £2,500 (same). The ordinary dividend is maintained at 8 per cent. and £25,253 (£19,563) is carried forward.

**The Mersey Power Co., Ltd.**, shows a net revenue for 1944 of £387,549 (£357,386). To this is added £104,128 from over-estimated costs in previous years. Taxation takes £115,000 (£136,878), and depreciation and renewals £299,207 (£119,921). An ordinary dividend of 8 per cent. is to be paid and £85,596 (£76,465) is carried forward.

**A. Reyrolle & Co., Ltd.**, announce a final dividend on the ordinary shares of 7½ per cent. making 12½ per cent. for 1944, the same as for the previous year. The net profit was £114,771 (against £117,532).

**The Enfield Cable Works, Ltd.**, is to pay a final dividend of 6½ per cent. (same), again making 12½ per cent. The net profit for 1944 was £115,897, against £117,206 for the previous year.

**Fescol, Ltd.**—From a net profit of £6,829, against £6,738, the company is paying an ordinary dividend of 9d. per share (same).

**Worthington-Simpson, Ltd.**, announce a trading profit for the past year of £194,933, against £134,529, and a net profit of £23,092 (£21,106).

The dividend on the ordinary shares is increased from 7 to 8 per cent., and £39,965, against £30,064, is carried forward.

The Rheostatic Co., Ltd., is maintaining the dividend on the ordinary shares at 12 per cent. by a final payment of 8 per cent. The net profit for the year to September 30th last was £9,730 (against £8,784).

Pye (Ireland), Ltd., records a net profit for 1944 amounting to £6,004 (£6,153). A dividend of 7½ per cent. (same) is to be paid and £6,383 (£5,282) is carried forward.

The Windermere & District Electric Supply Co., Ltd., reports a profit for 1944 of £5,715. An ordinary dividend of 10 per cent. is to be paid and £6,062 (£5,517) is carried forward.

The Urban Electric Supply Co., Ltd., is paying a final dividend of 4 per cent. (same), again making 8 per cent. for the year.

## New Companies

**Radio Trade Service (Reading), Ltd.**—In the details of this company supplied to us and published in our issue of February 16th, the address of the registered office should have read: 78a, King's Road, Reading. The address of the first directors, C. G. Witt and Mrs. Dorothy Witt, is 283, Norcot Road, Tilehurst, Reading.

**Electro-Technical Industries, Ltd.**—Private company. Registered March 29th. Capital, £5,000. Objects: To carry on the business of electrical appliance manufacturers, etc. Directors: L. A. Manser, 24, Brockdale, N.11; and L. Pack, 34, Evelyn Road, Cockfosters, Herts. Registered office: Sardinia House, 52, Lincoln's Inn Fields, W.C.2.

**Electrical Instruments Co. (Hillingdon) Ltd.**—Private company. Registered in Edinburgh March 26th. Capital, £2,000. Objects: To carry on the business of electrical and general equipment specialists, etc. First directors: F. Neumann, 116, Kirkpatrick Gardens, Clarkston, Renfrew, and H. Stangel, 63, Marsewood Road, Glasgow. Registered office: 124, St. Vincent Street, Glasgow.

**E. A. Furze & Company, Ltd.**—Private company. Registered March 27th. Capital, £500. Objects: To acquire the business of the Kingsway Electric Co., 1, Braemore Road, Hove. Directors: B. Oberman, Wharfe House, Kingsway, Hove; and E. A. Furze, 37, Derek Avenue, Hove. Registered office: 146, Bishops-gate, E.C.2.

## Companies' Returns Mortgages and Charges

**North Metropolitan Power Station Co., Ltd.**—Particulars have been filed of £1,500,000 3¼ per cent. second mortgage debenture stock 1970, authorised February 22nd, and covered by trust deed dated March 13th. The stock is charged on freehold lands and buildings, with fixed plant and machinery at Brimsdown, Enfield and Willesden, Middlesex; Waltham Holy Cross, Sewardstone, Essex; and Hoddesdon, Herts, and the company's interest in respective agreements with and leases to Northmet Power Co., and rental and other moneys payable thereunder, and the company's undertaking and other property, present and future, including

uncalled capital. The charge ranks subject to charges created by trust deeds of February 25th, 1927, and August 19th, 1930, *pari passu* with trust deeds dated February 16th, 1937, November 11th, 1938, and June 26th, 1939. The whole amount is now issued. Trustees: Baring Bros. & Co., Ltd.

Supplemental trust deed dated March 13th providing additional security under (1) trust deed dated August 19th, 1930, securing £850,000 5 per cent. second mortgage debenture stock 1963; (2) trust deed dated February 16th, 1937, securing £1,000,000 3¼ per cent. second mortgage debenture stock 1963; and (3) trust deeds dated November 11th, 1938, and June 26th, 1939, securing £2,700,000 3¼ per cent. second mortgage debenture stock, series "B," 1965. Property charged: Freehold lands and buildings at Enfield, Sewardstone and Hoddesdon, and all rental or other moneys payable to the company under a lease made between the company and the Northmet Power Co. These charges are subject to the charge created by trust deed dated February 25th, 1927, securing £850,000 5 per cent. guaranteed stock 1957. Holders: Baring Bros. & Co., Ltd.

**Partridge Transformers, Ltd.**—Particulars filed of series of £4,000 debentures, authorised January 23rd, charged on the company's undertakings and property, present and future, including uncalled capital, the whole amount being now issued.

**Provincial Electrics & Refrigerators, Ltd.**—Particulars filed of series of £10,000 debentures, authorised March 14th, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

## Receiver Appointed

**Electroflow Battery & Engineering Co., Ltd.**—E. W. Rufus, of 63, Coleman Street, E.C., has been appointed receiver under powers contained in debenture dated October 19th, 1944.

## Liquidations

**Chipping Norton Electric Supply Co., Ltd.**—Winding up voluntarily. Liquidator, Mr. L. A. Pearl, 109, Jermyn Street, London, S.W.1.

## Bankruptcies

**E. S. Cheatle**, trading as Apex & Radio Electrical Service, 580, Coventry Road, Small Heath, Birmingham, radio and electrical dealer.—Order made February 13th refusing debtor's discharge.

**G. S. Whiston**, 112, West Street, Crewe, electrical engineer.—Last day for receiving proofs for dividend April 17th. Trustee, Mr. P. M. Milward, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver.

**A. J. Harding**, 50-51, Broad Street, Hereford, electrical engineer.—Last day for receiving proofs for dividend April 18th. Trustee, Mr. O. B. Wallace, 133, St. Owen Street, Hereford, Official Receiver.

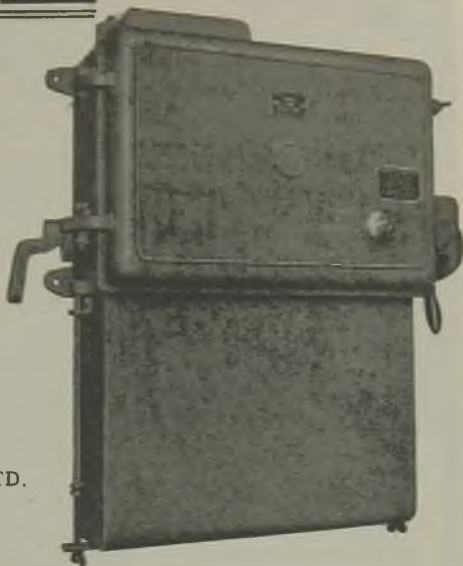
**T. Hughes-Davies**, wireless engineer, Radio House, High Street, Llangefni, Anglesey.—Proofs for dividends by April 20th to the trustee, Mr. A. H. Ward, Official Receiver, Friends Meeting House, Hunter Street, Liverpool,



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# STOCKS AND SHARES

TUESDAY EVENING.

**W**ITH the Budget looming in the near distance, Stock Exchange markets might have been expected to present a languid appearance and prices to take on a disposition to decline. This year, however, the approach of the Budget is making no difference either to the volume of Stock Exchange trade—which is fairly considerable—or to the firmness of prices, which is still very noticeable. The prices of investment stocks and shares not only hold their ground, but, where changes are made from day to day, they are generally in the upward direction.

## Price Fluctuations

De la Rue shares are amongst the principal features of the industrial market. The price has been up to 11½, the highest reached up to the present. Each successive rise brought in a few profit-takers, but the buying proved better than the selling and ready support was forthcoming at 11½ or anything under. In another department, Vactric shares rose to 24s., further improving upon their recent substantial gain, but eased off to 23s. 6d. Veritys are a shade better at 9s. Atlas Electrics gained a few pence at 7s. 6d.

Electricity supply ordinary shares remain steady. West Gloucestershire are 1s. up at 27s. Electrical Distribution of Yorkshire are harder at 47s., and Yorkshire Power at 46s. In the foreign group, Tokyo Electric "sixes" rose two points, to 25½, on hopes of an early termination to the war in the Far East. Brazilian Traction fell away to 27½ upon disappointment with the declaration of a dollar per share dividend, but the price recovered to 27½.

Mild indifference still characterises the public attitude towards Home Railway stocks. Transport "C" at 65½ is easier. The strength of British Government and other gilt-edged securities is reflected in a rise of 30s. in Southern Railway 5 per cent. preference to 119½. The preferred is equally better at 78½. Tilling shares eased off to 60s. 9d.

The radio section is moderately active. Prices are mostly better. Electric & Musical shares have been extensively bought, and the price responded with 1s. rise to 35s. E. K. Cole kept about 41s. 3d. and Cossor 33s. Radio Rentals are 30s. 6d., Scophony 5s. 3d.

## British Insulated

The British Insulated Cables annual general meeting will be held in Liverpool on April 19th, and in an advance statement Sir Alexander Roger, the chairman, is able to lift partially the veil of secrecy imposed during the war upon the company's activities.

The trading profit is £43,000 down, but the net profit comes out at £56,000 higher than that of the previous year. The company

is in an extremely strong financial position, thoroughly equipped to take advantage of post-war opportunities.

## Equipment Companies

Dealings have now started in the £1,022,330 8 per cent. cumulative preference stock in £1 units, issued by Associated Electrical Industries in exchange for 7 per cent. cumulative preference in British Thomson-Houston. As already stated, the offer to exchange ten of the latter for eleven of the former was accepted by over 90 per cent. of British Thomson-Houston holders. The offer remains open until the 18th of this month. The company's ordinary shares are on offer at 56s. 9d. ex the recent dividend, and at this price the yield comes to 3½ per cent. on the money. The 8 per cent. preference are quoted at 41s. to 42s.

Crabtree Electrical Industries 10s. ordinary shares stand at 44s. The dividend for the last few years has been 17½ per cent. per annum, at which the yield on the money is a shade under 4 per cent. General Electric ordinary at 97s. 6d. pay £3 11s. 9d. and Brush 5s. ordinary shares, of which 25,000 are on offer at 11s. 1½d. give a return of £4 0s. 9d. at that price, assuming maintenance of the dividend of 9 per cent. paid in respect of 1943.

## Communication Stocks

The anomaly persists of dullness in the price of Cable & Wireless 5½ per cent. preference at 113 and firmness in the ordinary stock of the combine. After a rise to 91½, the ordinary reacted to 90. Globe Telegraph & Trust ordinary are 1s. 6d. higher at two guineas ex dividend. Anglo-Portuguese Telephones at 28s. have gained 6d. Telephone "Props." at 20s. 6d. are equally better. International Telephone & Telegraph hold their rise at 31. The Navy Department of the United States Government proposes to create a monopoly to acquire all American international communication facilities, but the Senate naturally opposes it.

## Central London Electricity

Central London Electricity reports an increase of about half a million pounds in its revenue total for 1944, compared with 1943. The bulk of the issued capital stock is owned by London Associated Electricity Undertakings, which company published its accounts on March 21st, these showing a profit of £238,000, about £6,000 less than that for 1943. London Associated is paying a dividend of 4 per cent., and at the present price of the shares, 26s. 6d., the yield on the money comes to a modest 3 per cent. From this it is tolerably clear that anticipation looks for an increase in the dividend. In the first four years of the company's existence, 1935-1938, the ordinary shares received 7 per cent. annually.

## Forthcoming Events

**Saturday, April 14th.**—Leeds.—Electricity Department Offices, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. "Operating Efficiency of Steam Electric Power Stations," by G. B. Downham.

**Cardiff.**—At South Wales Institute of Engineers, 5.45 p.m. Association of Mining Electrical and Mechanical Engineers (South Wales Branch). "Turbine Maintenance," by E. Hartmann.

**Monday, April 16th.**—London.—Royal Empire Society, 2.30 p.m. Farmers' Club. "Present and Future Aspects of Electricity in Agriculture," by H. W. Grimmitt.

**London.**—Institution of Electrical Engineers, 7 p.m. London Students' Section. "The Lumen Method of Illumination Calculation," by G. S. H. Mogford.

**Tuesday, April 17th.**—London.—Institution of Electrical Engineers, 5.30 p.m. Radio Section. Discussion on "Design of Broadcast and Television Receivers for the Post-war Market," to be opened by L. H. Bedford, O.B.E.

**London.**—Lighting Service Bureau, Savoy Hill, 6.15 p.m. Association of Supervising Electrical Engineers. "Electrical Installations for Post-war Buildings," by E. J. Sutton, A.M.I.E.E.

**London.**—Institution of Electrical Engineers, 2.30 p.m. British Society for International Bibliography. Annual general meeting and presidential address.

**Manchester.**—Engineers' Club, 6 p.m. I.E.E. North-Western and Mersey and North Wales Centres. Visit of President (Sir Harry Railing) and Discussion on the second report on "Education and Training for Engineers," to be presented by Sir Arthur Fleming.

**Luton.**—Town Hall, 7.30 p.m. Luton Electrical Society. Annual general meeting and display of films of electrical interest.

**Wednesday, April 18th.**—London.—Royal Society of Arts, John Adam Street, Adelphi, 1.45 p.m. "The Work of the Department of Scientific and Industrial Research," by Sir Edward Appleton.

**London.**—Savoy Hotel, 1 p.m. British Plastics Federation. Annual luncheon.

**London.**—Lighting Service Bureau, Savoy Hill, 5.30 p.m. Illuminating Engineering Society. "Circuits for Discharge Lamps," by R. Maxted and J. M. Hull.

**Sheffield.**—I.E.E. Sheffield Sub-Centre. Address by the President, Sir Harry Railing.

**Newcastle-on-Tyne.**—Neville Hall, 6 p.m. British Institution of Radio Engineers (N.E. Section). "Dielectric Heating by the Radio-frequency Method," by L. Grinstead, M.I.E.E.

**Thursday, April 19th.**—London.—At Institution of Electrical Engineers. Annual conference of Electrical Association for Women.

**Taunton.**—Corporation Electricity Show-rooms, The Parade, 3 p.m. I.E.E. Devon and Cornwall Sub-Centre. "Electrical Aspect of Farm Mechanisation," by C. A. Cameron Brown. (Tea at Castle Hotel, 4.45 p.m.).

**Swansea.**—At 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. Informal discussion.

**Friday, April 20th.**—London.—Institution of Electrical Engineers, 5.30 p.m. Measurements Section. "An Electrical Moisture Meter," by Dr. L. Hartshorn and W. Wilson.

**London.**—At Royal Society of Arts, Adelphi, 5.30 p.m. Institution of Electronics. "Dynamics of Electron Beams," by Dr. D. Gabor (B.T.H. Co.).

**Manchester.**—Engineers' Club, 6 p.m. I.E.E. North-Western Centre Radio Group. "Frequency Modulation," by Dr. K. R. Sturley.

**Bath.**—At 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. Burkitt.

**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.

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

**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.

**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, K.C.B.

## Cooling Towers

### I.M.E.A. Proposals

It is reported by the *I.M.E.A. Journal* that at a recent meeting of the North-East and East England Centre of the Association problems relating to precipitation from cooling towers were discussed. It was suggested that an investigation might be undertaken into the loading and design of parabolic concrete cooling towers.

The Generation Committee of the Council has considered the matter and agrees with the view that part of the difficulties was due to overloading of the towers. Many undertakers are now erecting cooling towers for the first time and investigations are being carried out to ensure that the trouble experienced by certain undertakers will not recur.

The Generation Committee is to consider the preparation of a draft specification and form of guarantee for the erection of cooling towers and a communication has been addressed to the Electrical Research Association pointing out the difficulties and asking if E.R.A. will carry out an investigation with a view to ascertaining what improvement might be made in efficiency of operation and particularly what factors in construction and design have a bearing upon the efficiency of cooling towers during their useful life.

# Coal Mining

## Recommendations of the Reid Committee

**I**N last week's *Electrical Review* brief reference was made to the Ministry of Fuel and Power's committee of seven, under the chairmanship of Mr. C. C. Reid, appointed to report upon the changes necessary to raise the British coal producing industry to a state of full efficiency.

The second paragraph of the Committee's report states clearly in bold type that members undertook the task in their capacity of mining engineers and that all their conclusions and recommendations have been formulated from their professional viewpoint. They have not hesitated to condemn systems of mining and methods of working which, in their opinion, fall short of the best practice known to them. They themselves have not allowed the fact that they have been parties to those practices to prejudice their findings.

The first part of the report is historical, its six chapters including a comparison between the coal industry of Britain and those of the United States, Germany (Ruhr), Poland and Holland; it is a statistical analysis with some commentary upon the progress of the mechanisation of British mines. Tabulated data reveal a number of striking contrasts. For instance a comparatively large degree of mechanisation in some districts has been accompanied by low output per manshift (OMS), whereas the converse is true of other districts. Thus a good deal remained to be done (in 1939) in the application of coalcutters and conveyors in certain areas. The very important exporting districts, in spite of further mechanisation at the face, were unable to improve appreciably on the OMS achieved twelve years before.

The introduction of power-loading machinery has shown that some underground transport systems are inadequate to handle efficiently the larger output obtained at the coalface with loading machinery. The absolute necessity for improvement of transport underground is emphasised. One haulage worker is employed for every 50 tons of coal produced in the United States, for 23 tons in Holland, but only for 5 tons in Britain.

### Underground Electrification

The use of electricity below ground grew by 40 per cent. in twelve years to 1,224,000 HP in 1939. The most striking development during the same period was the increase of over 400 per cent. in the HP of conveyors and loaders to 75,000 HP, while coalcutters accounted for an increase in connected load of 78 per cent. and the HP per man employed underground nearly doubled to 2.02 HP.

Electric winders were installed at 350 mines, an increase of 98; the HP installed for this purpose increased by 24 per cent. The connected electrical load on the surface increased by 34 per cent. to 1,078,622 HP. In the case of screening and washing equipment the increase was 66 per cent. and the HP per man employed at the surface rose materially to 6.58.

Lack of broad vision has not encouraged mining engineers to formulate bold schemes. The Committee believes that far too few mining engineers see the technical problems of the industry in a true light, or realise the extent to which traditional practices need to be altered. The reasons are, in part at least, insularity of outlook, financial stringency and the fact that mining engineering as a profession, having become less attractive, has not secured an adequate inflow of young men of engineering ability.

### Technical Considerations

In contrast to earlier freedom from technicalities most of the nineteen chapters of the second part of the report are essentially technical in character. Reduced importance of the traditional "longwall advancing" system of mining is envisaged: a new machine is briefly described which not only undercuts the coal, but tears it down from the face (thus avoiding drilling and shoring) and also automatically loads the coal on to a conveyor. It represents a revolutionary development in mining technique which the Committee believes to be of very great importance, particularly to the future of "longwall" mining. The development and trial of such appliances have been materially assisted by the Ministry of Fuel. Three types of British design are referred to; the "cutter-loader" has been successfully applied in a number of mines, showing great promise, while prototypes of "slabbing" and "stripping" machines are nearing completion.

Chapters XI and XII are concerned to show the absolute necessity of fundamentally changing underground transport practices and undoubtedly contain some of the most important technical conclusions of the Committee, which recommends that in new and remodelled mines, and whenever possible in others, locomotive haulage should be introduced in preference to endless rope or main-and-tail systems unless conveyor transport or direct rope haulage is more suitable for the conditions and gradients.

It seems to the Committee that a clear case exists for the removal of the present embargo upon the electric trolley (overhead collector

wire) locomotive, which is the most efficient form of underground traction available. Diesel engines are likely to be widely used in future and electric battery locomotives should be permitted in both intake and return airways, subject to certain conditions. It is suggested that a model code of special regulations should be issued at an early date to avoid uncertainty in planning. Locomotive haulage will require changes in signalling systems, which will need to be essentially visual in conjunction with telephony.

Big improvements in lighting underground are advocated, the flame safety lamp being regarded as obsolete. Too little illumination reacts adversely on production, safety and health. A standard of the order of 0.4 ft.-candle is called for in general working areas. Adequate light at the face is unlikely to be provided by hand or cap lamps alone; a general system of power-fed (mains) lamps is necessary, supplemented if desired, preferably by cap lamps. More light should be provided outbye on roadways.

The importance of electric power to efficiency underground is emphasised. Its replacement of compressed air would bring very considerable advantages in convenience, cost and continuity of power supply. Electricity is undoubtedly superior to compressed air and it is essential to intensive "room and pillar" mining as well as higher powered machines in "longwall" mining. Permission to use electricity should depend primarily upon the general standard of ventilation, the improvement of which is advocated with the aim of making mines safe for electricity rather than devising machines which will work safely in badly ventilated areas.

#### Transmission Voltages

Suitable voltages should be adopted for different purposes; for example transmission over long distances (say, over 1,000 yards) should not usually be attempted at medium voltage. There are circumstances in which the 3,300 V commonly used for transmission underground might with advantage be raised to 6,600 V; the adoption of a standard working voltage would be an advantage. A number of installations still retain the non-standard frequencies of 40 and 30 cycles.

The chief electrical problem to be solved is that of power distribution at the coalface, light-weight switchgear of simplified design being a requirement of urgent necessity. Gate-end switches of present unwieldy and complicated design constitute a serious disadvantage. The group necessary to a double-unit conveyor face may weigh as much as 3 tons and when assembled in one unit, as is common practice, cannot be moved without mechanical aid and then only at the cost of considerable time and labour. The weight and dimensions of such gear have generally been carried beyond reasonable bounds.

The draft Electricity Regulations (for mines) are said to be unreasonably restrictive in relation to recent developments; the Committee advocates their amendment, after careful review, before being established. It is recommended that new mines should be laid out on an all-electric basis and, wherever practicable, the complete electrification of existing mines should be seriously considered. A careful examination is needed of generating stations serving individual mines to determine whether their continued operation is warranted, or whether they should be replaced by a central power station, or purchased energy from public mains.

Improvements in surface plant and lay-out are called for and a plea is made for the better training and education of officials and workmen. There is a chapter on the rights and duties of mine workers and owners; another deals with the necessity for long-term planning of production, recommending a five-day week for underground workers. Following a consecutive statement of conclusions and recommendations, there is a final chapter entitled "The Conditions of Success" setting out the reasons why the Committee believes that its recommendations cannot be carried through by the coal producing industry organised as it is to-day.

#### Drumm Company to Close Down

**T**HE Ministry for Industry and Commerce has accepted a recommendation of the board of directors of the Drumm Battery Co., Ltd., to close down, and the company has arranged to go into voluntary liquidation. The activities of the company were suspended in August, 1940, because it was found impossible owing to the war situation to make further progress towards the commercial exploitation of the patents or to secure supplies of materials.

The company, in a statement to the Press, says that before suspension in 1940 it had established the original claims made for the battery as a practical and economic means of railway traction for frequently stopping, short-distance suburban traffic. With the co-operation of the Great Southern Railways Company a suburban passenger train service worked by four 2-coach Drumm battery train units had been put into operation on the railway line between Harcourt Street and Bray, and this service has continued to operate satisfactorily. The batteries were guaranteed to have a working life of ten years; they have stood up to this guarantee and some of them have exceeded it. The company financed the cost of equipping the four trains and erecting charging stations out of the moneys advanced to it by the Government, and the cost was repaid in full by the railway company.

Owing to world conditions it has not been possible to assess the value of the patents, but the winding-up of the company will not mean that efforts to realise the foreign patents, particularly American, will be abandoned, nor will it preclude the manufacture under licence of further batteries for railway or other traction purposes in Eire.

# 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. — "Single- or polyphase electron-discharge device." 1889/43. January 26th, 1942. (568205.)

Automatic Telephone & Electric Co., Ltd. — "Telephone or like systems." 17863/43. December 21st, 1942. (568229.)

Bennis Combustion, Ltd., and A. W. Bennis. — "Underfeed or retort type stokers." 16420. October 7th, 1943. (568165.)

Bristol Aeroplane Co., Ltd., and T. M. Roberts. — "Spot welding machines." 12299. July 28th, 1943. (568211.)

British Insulated Cables, Ltd., and J. C. Quayle. — "Dielectric material and electric cables." 4128. March 27th, 1942. (568125.)

British Insulated Cables, Ltd., and H. G. Spencer. — "Electric cable heating elements." 16238. October 4th, 1943. (568243.)

British Thomson-Houston Co., Ltd. — "Apparatus for starting electric discharge devices." 7073/43. May 7th, 1942. (568131.)

"Bases for electric lamps and similar devices." 8991/43. June 8th, 1942. (568133.)

British Thomson-Houston Co., Ltd. (General Electric Co.). — "Thrust bearings." 3563. February 25th, 1944. (568254.)

A. P. Castellini and Robey & Co., Ltd. — "Electromagnetic actuating mechanisms for valves and like timed moving parts of internal combustion engines." 13453. August 18th, 1943. (568216.)

English Electric Co., Ltd., and H. S. Carnegie. — "Reversible driving means." 4136. March 13th, 1943. (568149.)

G. H. Fletcher and Metropolitan-Vickers Electrical Co., Ltd. — "Electric motor equipments." 12618. August 4th, 1943. (568155.)

"Electric motor equipments." 13656. August 5th, 1943. (568156.)

General Electric Co., Ltd., and E. H. Croft. — "Electric motor control systems." 1297. January 31st, 1941. (568202.)

Hoover, Ltd. — "Suction cleaners." 15469/43. September 22nd, 1942. (568242.)

D. A. Ivcher and Nalder Bros. & Thompson, Ltd. — "Electrical measuring apparatus." 16721. October 12th, 1943. (568166.)

S. B. Jackson. — "Turbo-generator installations." 9578. June 15th, 1943. (568137.)

Marconi's Wireless Telegraph Co., Ltd. — "Signal transmission systems." 14926/43. September 11th, 1942. (568240.)

Marconi's Wireless Telegraph Co., Ltd., C. S. Cockerell and M. H. Cuffin. — "Radio receivers." 16182. December 15th, 1941. (568123.)

Marconi's Wireless Telegraph Co., Ltd., F. T. Farmer and L. W. Whitaker. — "Radio direction-finding systems." 769. January 12th, 1940. (568119.)

M-O Valve Co., Ltd., and J. H. Partridge. — "Manufacture of electrical insulators for thermionic valves and the like." 18162. December 27th, 1940. (568122.)

M-O Valve Co., Ltd., and L. R. E. Windsor. — "Electric discharge devices having electrodes treated to increase thermal radiation." 9833. June 18th, 1943. (568208.)

A. L. Peach. — "Method and means for electrolytically providing metals with an improved hard wearing surface of chromium." 15031. September 14th, 1943. (568161.)

Philips Lamps, Ltd., and A. Nemet. — "Electrical timing arrangements." 7913. May 18th, 1943. (568185.)

Plessey Co., Ltd. (R. R. Mallory & Co., Inc.). — "Electric power supply systems." 15358. September 18th, 1943. (568200.)

Pressed Steel Co., Ltd., and J. F. Tribe. — "Portable drilling machines." 16932. October 15th, 1943. (568228.)

Radio Corporation of America. — "Acoustic stethoscope." 5293/43. April 1st, 1942. (568128.) "Sound pick-up devices." 7026/43. May 4th, 1942. (568235.)

Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington. — "Electric discharge lamps." 17257. October 20th, 1943. (568167.)

Smart & Brown (Engineers), Ltd., and W. H. Spivey. — "Electrical plug contact pins." 9924. June 19th, 1943. (568190.)

Southern Engineering Supplies (Proprietary), Ltd. — "Electromagnetic switches." 9536/43. February 3rd, 1943. (568136.)

Standard Telephones & Cables, Ltd., and C. W. Earp. — "Radio beacons." 3433. February 23rd, 1940. (Addition to 525182.) (568120.)

L. A. Warner. — "Radio navigators." 7070. May 5th, 1943. (568236.)

Westinghouse Electric International Co. — "Circuit arrangements for gaseous electric discharge lamps." Cognate applications 9177/43 and 9178/43. June 24th, 1942. (568238.)

A. Wilson. — "Electric fittings such as plugs, switches, ceiling roses, adaptors, lampholders and the like." 10626. June 30th, 1943. (568194.)

## Coal Position in France

**A**LTHOUGH the electric power situation in France has improved considerably during the past few weeks, the steam plants in particular have had many serious problems to overcome. Coal supplies to Paris, and particularly in the Normandy and Brittany areas, have improved considerably but the quality is causing the engineers some trouble; it varies considerably from one train-load to another. Some plants have endeavoured to overcome this problem by modifying their boilers. For example, at the Arrighi plant air is pumped through 44 small pipes, into the upper part of the ash-box arranged so that the supply and pressure can be controlled. It has been found that this method has improved efficiency although it greatly increases the speed at which the coal burns and often raises the temperature above what has been considered safe. A recent examination showed that the fall in production, due to bad coal quality, is about 8 per cent. and in some of the Paris plants it has reached 13 per cent.

# 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.

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

**Dundee.**—April 16th. Corporation Housing Department. Various works, including electric lighting installation, at 172 cottages at Dryburgh. Particulars from city quantity surveyor, 21, City Square.

**Glasgow.**—April 30th. Corporation. Supply and erection at Dalmarnock sewage works of three electrically-driven centrifugal pumps, one exhauster for priming and one portable electrically-driven centrifugal pump. Specifications and forms of tender from the manager, Sewage Department, 50, John Street, Glasgow, C.1.

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

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

**Middlesbrough.**—April 20th. Tees-side Railless Traction Board. Two 300-kW mercury-arc rectifiers, etc. (March 9th.)

**Plymouth.**—May 5th. Electricity Supply Department. L.v. underground network disconnecting boxes. (See this issue.)

### Orders Placed

**Ilford.**—Electricity Committee. Accepted. One hundred Gillingham type lamp columns, 10 ft. 6 in. high (£4 ls. per column) and C.N. swan neck brackets, complete with type "K" cast-iron hoods and enamelled reflectors (£1 3s. per bracket).—Lucy & Co. Ten tubular pattern standards, with 5 ft. projection, to give a height of 20 ft. to lamp filament (£12 16s. per standard).—Revo Electric Co.

**Liverpool.**—Electric Power and Lighting Committee. Equipment needed in connection with an extension of the distribution system:—Completion of two 33-kV circuit-breaker panels for Clarence Dock generating station (£9,486).—B.T.H. Co. Extension of 33-kV switchboard at Eagle and Child substation (£16,425).—G.E.C. Extension of 11-kV switchboard at Marsh Lane substation (£1,293).—Switchgear & Cowans. 33-kV and 11-kV cables with telephone and pilot cables and fittings, etc. (£124,619).—B.I. Cables. 11-kV switchgear for Eagle and Child and Speke substations (£21,634).—Ferguson, Pailin. Seven 33-kV isolators for Lister Drive generating station (£2,016).—English Electric Co.

For the proposed supply of electricity for L.M.S. Railway Co. for the Liverpool-Southport line:—Switchgear (£6,612).—G.E.C.

### 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.

**Derbyshire.**—School canteen and dining centre, Tupton Hall, Clay Cross; J. Harrison, county architect, County Offices, St. Mary's Gate, Derby.

**Glasgow.**—Factory extensions, Lochburn Road, for Cooper, McDougall & Robertson (Scotland), Ltd.; manager.

Refuse disposal works, south-eastern district; city architect.

Reconstruction of offices, Balmoral Street; R. Rogerson & Co., Ltd.

**Ilford.**—Offices, Uphall Road; Howards & Sons, Ltd.

**Lancashire.**—Pavilion restaurant, etc., Old Trafford, for Lancashire County Cricket Club (£100,000); Bradshaw, Gass & Hope, architects, 19, Silverwell Street, Bolton.

**Liverpool.**—Extensions to the City Technical College; L. H. Keay, city architect, Municipal Offices, Dale Street.

**Manchester.**—Crematorium, North Manchester; city engineer.

Permanent houses (60), Parkwood Estate; J. Hughes, housing director, Town Hall.

**Meriden.**—Houses, Ennersdale Close, Coleshill and Fillongley Road, for R.D.C.; McKewan, Fillmore & McKewan, architects, 115, Colmore Row, Birmingham, 3.

**Motherwell (Lanarkshire).**—Extensive alterations at Dalzell and Lanarkshire Steel Works, including improved rolling mill; master of works, Colvilles, Ltd., Motherwell.

**Newcastle-on-Tyne.**—Factory at Coxlodge; Scott & Turner, health salt manufacturers, Gallowgate, Newcastle.

**Northumberland.**—Part of Alnwick Castle to be converted into a college; W. W. Tasker, County Hall, Newcastle-on-Tyne.

**Rochdale.**—Nurses' Hostel, Birch Hill Hospital; S. H. Morgan, borough surveyor.

**Rotherham.**—Workshop, Meadow Hall Road; G. Turton Platts & Co., Ltd.

**Smethwick.**—Works additions; Eclipse Spraying Co., Ltd.

Works additions; Guest, Keen & Nettlefolds, Ltd.

**Sunderland.**—Factory for C. Twigg & Co., Ltd.; gas stove, gas fire and electrical equipment manufacturers, Birmingham.

**Warrington.**—Works additions; Rylands Bros., Ltd.

**West Riding.**—Conversion of Bonegate House, Brighouse, into a dental clinic (£5,046); A. Booth, acting county architect, County Hall, Wakefield.

**Widnes.**—Junior and Infants' School; borough surveyor.



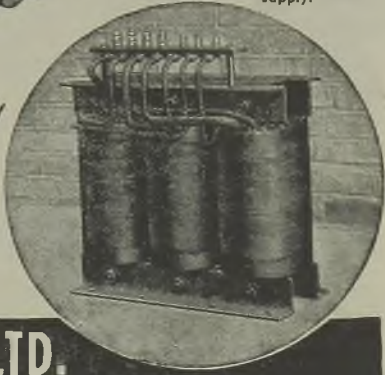
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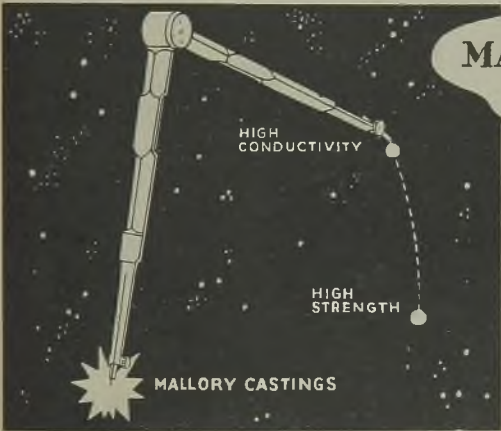
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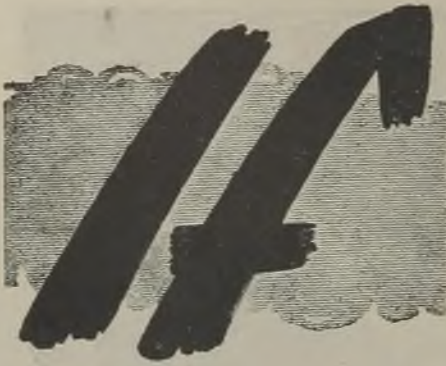
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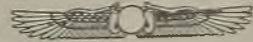
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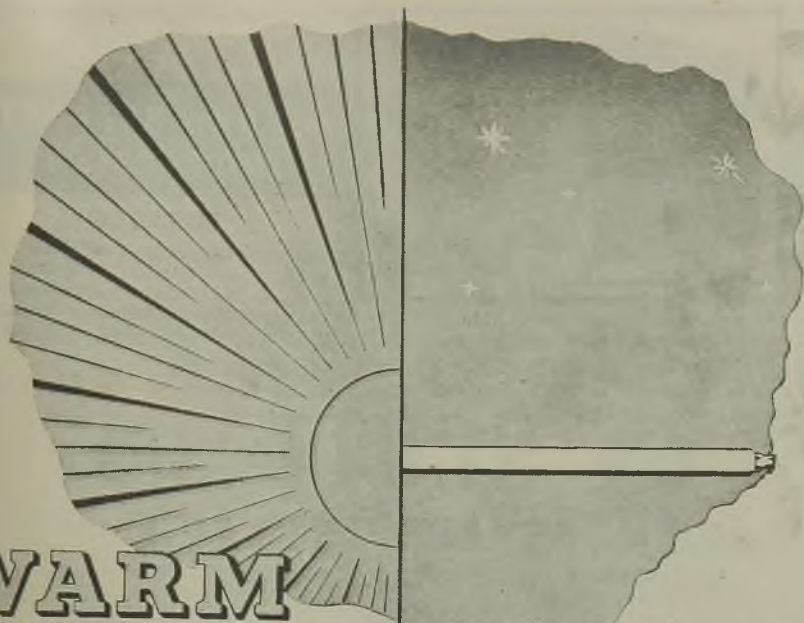
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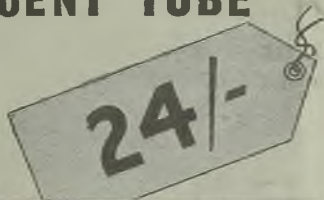
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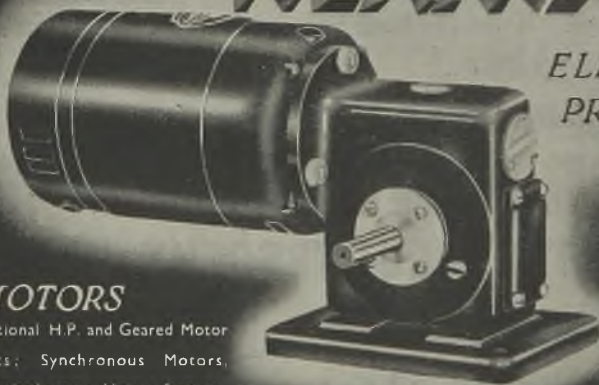
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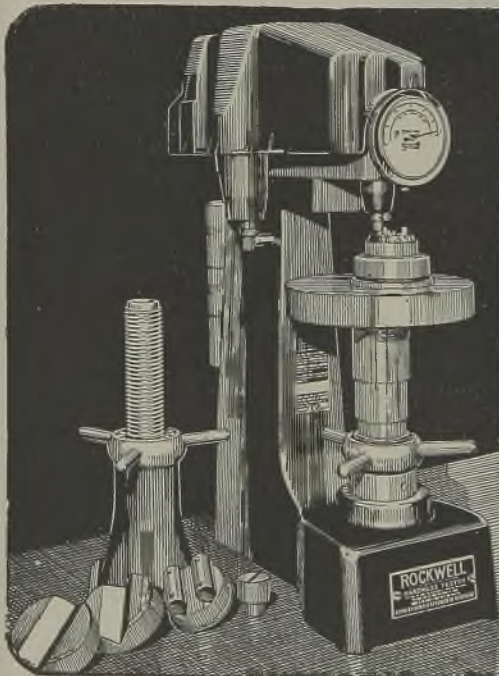
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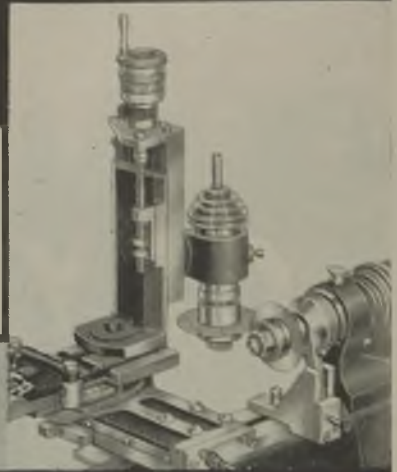
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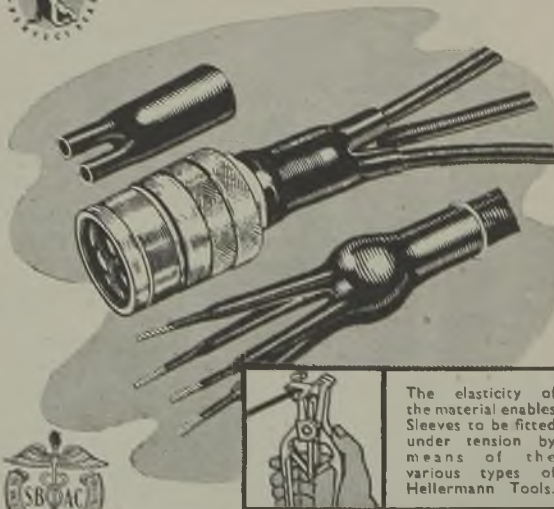
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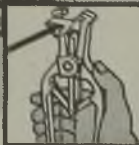
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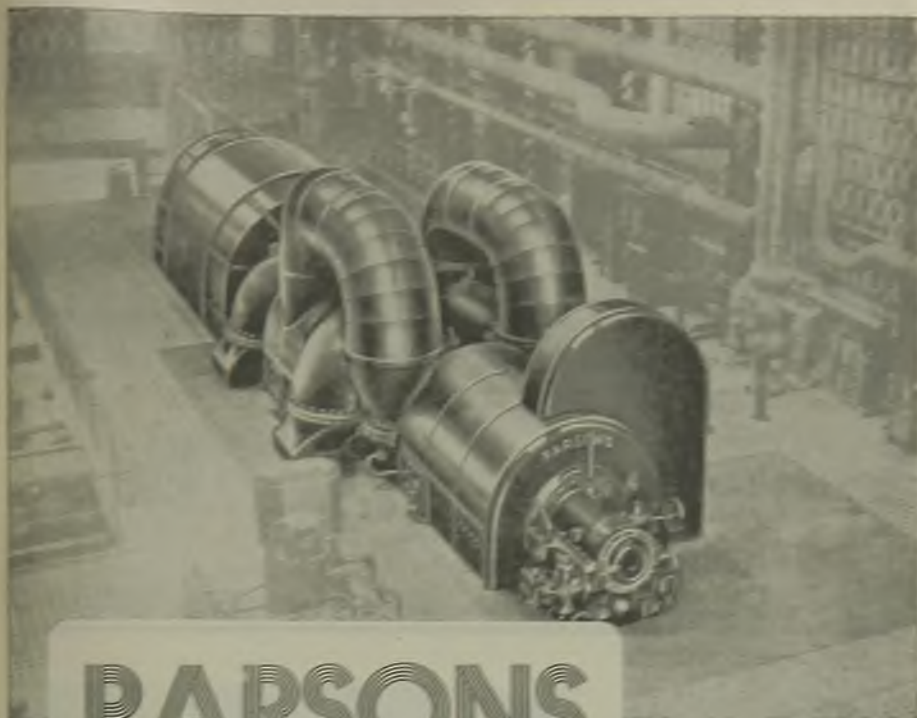
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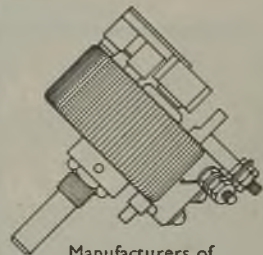
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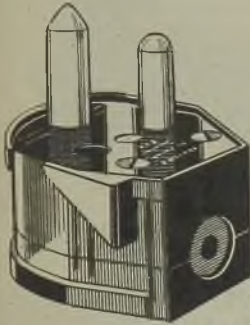
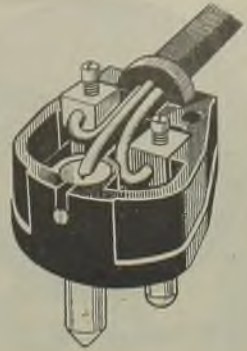
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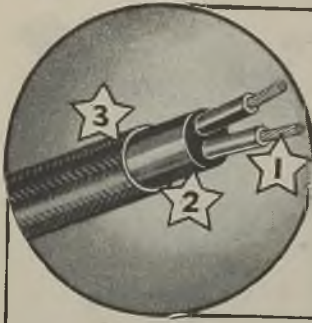
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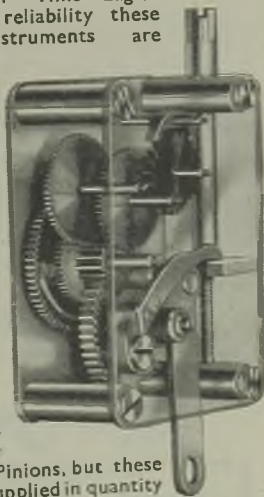
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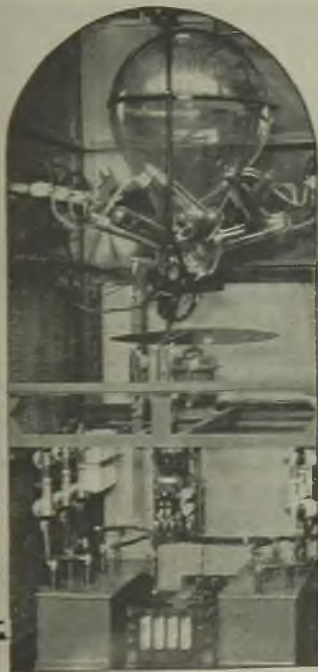
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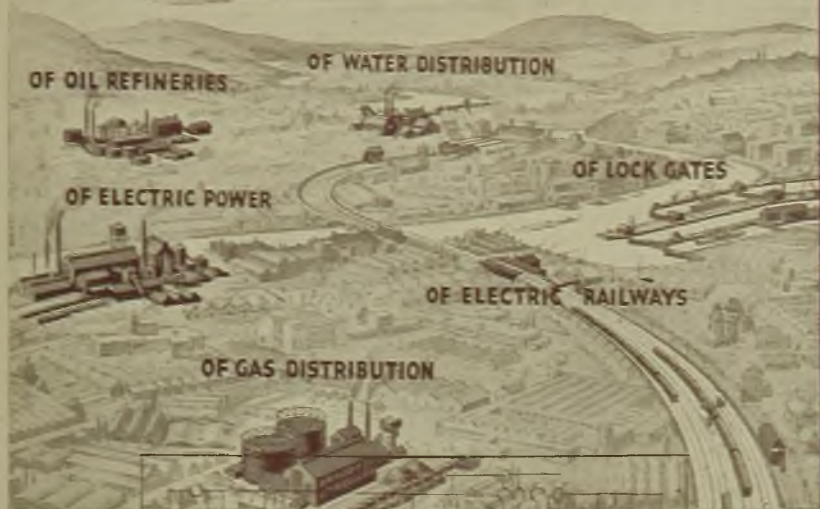
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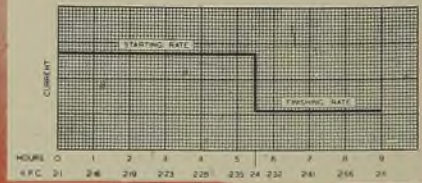
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**ADVERTISEMENTS** for insertion in the following Friday's issue are accepted up to **First Post on Monday**, at Dorset House, Stamford Street, London, S.E.1.

**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.

### CITY OF LIVERPOOL

Electricity Supply Department

Supply of H.T. and L.T. Switchgear for Substations

THE Corporation of Liverpool invite tenders for the supply of HIGH TENSION AND LOW TENSION SWITCHGEAR for Substations for a period of two years. Copies of specifications and forms of tender may be obtained on application to the City Electrical Engineer, 24, Hatton Garden, Liverpool, 3.

Tenders must be enclosed in the sealed envelope provided and addressed to the Town Clerk, Municipal Buildings, Liverpool, 2, and forwarded through the post so as to be received by him not later than the first postal delivery on Friday, April 27th, 1945.

The Corporation do not bind themselves to accept the lowest or any tender, and reserve the right to accept any portion of a tender.

W. H. BAINES,  
Town Clerk. 1768

Municipal Buildings,  
Liverpool, 2.

### CITY OF MANCHESTER

Electricity Department

TENDERS are invited for EXTENSIONS TO 33,000-VOLT SWITCHGEAR at the BARTON GENERATING STATION and BENCHILL SUBSTATION (Specification No. B.145).

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

Tenders, addressed to the Chairman of the Electricity Committee, to be delivered not later than ten o'clock a.m. on Monday, 30th April, 1945.

PHILIP B. DINGLE,  
Town Clerk. 1766

Town Hall, Manchester, 2.  
5th April, 1945.

### CITY OF PLYMOUTH

Electricity Supply Department

THE Plymouth Corporation invite tenders for the supply and delivery of Low Tension Underground Network Disconnecting Boxes. Specifications and forms of tender may be obtained from the City Electrical Engineer, Armada Street, Plymouth. Completed tenders must be returned to the undersigned not later than noon on the 5th May, 1945.

COLIN CAMPBELL,  
Town Clerk. 1780

Plymouth,  
April, 1945.

## APPOINTMENTS FILLED

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

## SITUATIONS VACANT

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

### COUNTY BOROUGH OF HALIFAX

Electricity Department

Assistant Maintenance Engineer

APPLICATIONS are invited by the Halifax Corporation for the position of Assistant Maintenance Engineer at their Foundry Street "Selected" Power Station. The conditions of employment are in accordance with the National Joint Board Agreement and the salary equal to Class G, Grade 7, at present £445 per annum, rising to £472 per annum.

Applicants should have experience in the electrical and mechanical maintenance of a modern power station, and should be capable of supervising such work under the direction of the Maintenance Engineer.

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

Applications endorsed "Assistant Maintenance Engineer," stating age, experience and when at liberty and accompanied by copies of not more than three recent testimonials, should be addressed as under, to be received not later than Monday, 23rd April, 1945. Canvassing, directly or indirectly, will be a disqualification.

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

County Borough of Halifax  
Electricity Department,  
19/23, Northgate, Halifax.

1744

### BOROUGH OF MORLEY

Appointment of Borough Electrical Engineer and Public Lighting Superintendent

APPLICATIONS are invited from duly qualified Electrical Engineers for the appointment of Borough Electrical Engineer.

The successful candidate will be required to undertake the duties of Public Lighting Superintendent.

The salary will be £650 per annum rising by annual increments of £50 to £750 per annum, plus war bonus.

The appointment will be subject to three months' notice on either side, and the post will be a designated one for the purposes of the Local Government (Superannuation) Act, 1937.

The successful candidate will be required to pass a medical examination, and to reside within the district.

Applications, stating age, education, experience and qualifications, accompanied by copies of three recent testimonials, endorsed "Borough Electrical Engineer," should reach the undersigned not later than Monday, the 30th April, 1945.

E. V. FINNIGAN,  
Town Clerk.

Town Hall,  
Morley,  
4th April, 1945.

1767

## COUNTY BOROUGH OF ST. HELENS

## Electricity Department

## Appointment of Junior Engineer

**A** PPLICATIONS are invited for a permanent staff appointment of Junior Engineer for operational duties at the Carlton Street Generating Station.

Candidates must be experienced in the operation of the control board in a modern generating station and must possess theoretical qualifications equivalent to the Higher National Certificate in Electrical Engineering.

The salary will be in accordance with Grade 9a, Class G, of the National Joint Board's Schedule, at present £307 per annum.

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

Applications must be made on a form obtainable from this office. The completed form, together with not more than three copies of testimonials, and endorsed "Junior Engineer," are to be delivered to the undersigned not later than the 27th April, 1945.

P. BREGAZZI, A.M.I.E.E.,  
Electrical Engineer and Manager.

Electricity Works,

Carlton Street, St. Helens.

29th March, 1945.

1749

## CITY OF PETERBOROUGH CORPORATION

## Lady Demonstrator

**A** PPLICATIONS are invited for the position of Lady Demonstrator in the Electricity Undertaking. Candidates must have had a good general education, hold the E.A.W. diploma or certificate, or other approved qualifications, and have a thorough knowledge of domestic electric appliances; they must be competent to conduct lectures, cookery demonstrations and advise on the selection and use of electrical apparatus.

Salary £202 10s. per annum, rising by annual increments of £11 10s. to £236 per annum, plus war bonus at present amounting to £48 per annum.

The successful candidate will be required to contribute to the Corporation's Superannuation Scheme, and to pass a medical examination.

Applications, giving full particulars of training and experience, stating liability for National Service, and accompanied by copies of recent testimonials, to be sent to the City Electrical Engineer and Manager, Albert Meadow, Peterborough, in a sealed envelope endorsed "Demonstrator," not later than the first post on Monday, 23rd April, 1945.

ARTHUR J. REEVES,

Town Hall,

Peterborough.

29th March, 1945.

Town Clerk.

1742

## ROYAL TECHNICAL COLLEGE, SALFORD

Principal: J. E. Richardson, Ph.D., B.Eng.,

M.I.E.E., A.M.I.Mech.E.

**A** PPLICATIONS are invited for the post of full-time Lecturer in Electrical Engineering, to commence duties as soon as possible.

Applicants must have had industrial experience and be capable of teaching Design of Electrical Machinery up to the Higher National and London University Final B.Sc. degree standard, together with at least one other advanced electrical subject.

Salary in accordance with the new Burnham Technical Scales as approved. It is intended that this post shall qualify at least for an additional special responsibility allowance.

Application forms and further particulars may be obtained from the Principal, Royal Technical College, Peel Park, Salford, 5, Lancashire, to whom applications should be returned not later than 21st April, 1945.

H. H. TOMSON, Clerk to the Governors.

1747

**E**NGINEER 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.

## THE MERSEY POWER COMPANY LIMITED

**A** PPLICATIONS are invited for the position of JUNIOR SWITCHBOARD ATTENDANT at a modern power station.

Applicants should be technically qualified and have had experience with power plant switchgear in accordance with N.J.B. Agreement, Class J, Grade 10a (present salary £300 per annum).

Applications, stating present position, age, details of training and experience, together with copies of testimonials, to be addressed as below and received not later than April 21st. Envelopes should be endorsed "Junior Switchboard Attendant."

General Manager and Engineer,  
The Mersey Power Co. Ltd.,  
Roche House,  
Runcorn, Cheshire.

1740

## CITY OF LONDON ELECTRIC LIGHTING CO. LTD.

**A** vacancy occurs for a Shift Charge Engineer at Bank-side Power Station. The successful candidate must be suitably qualified and sufficiently experienced in power station practice to take sole charge of the operation of all plant in the Station.

Salary will be in accordance with the N.J.B. scale, Grade 8, Class H.

Applications, together with details of experience, should be forwarded to the Station Superintendent, 64, Bank-side, S.E.1.

1721

## BATTERSEA POLYTECHNIC, LONDON, S.W.11

**T**HE 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

**A** general engineering works in Colombo, Ceylon, require the services of two unmarried Engineers with good experience of ship repair work and general repairs, age limit 35; applicants must have completed a regular engineering apprenticeship and be capable of directing native mechanics and machinists; they must also be up to the grade of foreman or assistant works manager as regards theoretical training. Copies of references and details of experience in chronological order to be submitted, with amount of salary required, stating age, and when available, to—Box 1765, c/o The Electrical Review.

**A** PPLICATIONS for the position of Draughtsman and Mains Recorder are invited from male candidates who are not less than 25 years of age and experienced in the lay-out of static substations and the preparation of mains plans. Preference will be given to those who have had previous experience in the drawing office of the distribution section of a Public Electricity Supply Authority. The appointment will be in Class H, Grade 9a, of the N.J.B. Schedule (commencing net salary £326 rising to £341 per annum). Write, stating name and address of present employer, age and full particulars of qualifications and experience to: Ministry of Labour, Employment Exchange, Newport, Mon. 1777

**B**UYER. Engineering Head Buyer for manufacturing hydraulic/electrical establishment, with sound knowledge raw material finished and semi-finished auxiliary equipment markets. The successful applicant must be possessed of experience in the above, backed by good technical and commercial training, resource and organising ability, as well as negotiating skill essential to current difficult conditions. Full particulars of age, training and experience requested to Box 1757, c/o The Electrical Review, precedent to interview with likely candidate.

**C**HIEF Engineer required for Switchgear Department of Company in the Midlands, manufacturing all classes of electrical machines and apparatus. Applicants must be Chartered Electrical Engineers with some administrative experience. Age 35/45. Some experience air-break/air-blast gear an advantage. The successful applicants will control design, development, drawing office and experimental work. Salary £800 p.a. or more for special qualifications. Write, quoting D.1087 XA, to the Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for application forms which must be returned completed by 26th April, 1945.

1775

**CONSUMERS' Superintendent** required for electricity undertaking with approximately 8,000 consumers; preference given to applicant who has had special experience in contracting work. A knowledge of the application of electricity to farming may also be a recommendation. Salary £384, including increased cost of living bonuses to date. Applications, giving full details of qualifications, experience, age, stating whether single or married, to be sent to the **Chief Engineer and Manager, Electricity Offices, St. Austell.**

**DEVELOPMENT Engineer** for investigation of new applications of electric heat and power; must have good technical education, initiative and ability to solve utilisation problems. Practical knowledge of equipment design desirable, also fluency in writing reports. Experience with an electricity supply undertaking desirable. Salary £700-£800, dependent on qualifications. State age (superannuation scheme). Applications to be addressed to—**The General Manager and Secretary, British Electrical Development Association, 2, Savoy Hill, London, W.C.2.** 1743

**ELECTRIC Lamp Works Manager** wanted for factory in the North. Good technical experience essential, with executive ability. Apply in confidence, with full particulars of experience and state salary required.—**Box 1759, c/o The Electrical Review.**

**ELECTRICAL Contracting Manager** wanted for well-known business in Scotland. First-class technical and business training; practical experience of power work essential, and preferably good Scottish connection. Only live men of proved ability will be considered. Commencing salary up to £1,000 p.a. according to qualifications. Applications will be treated in strict confidence and should give fullest particulars, including age.—**Box 1745, c/o The Electrical Review.**

**ELECTRICAL wholesalers** require **Trade Counter Assistant** for installation purposes.—**London Electrical Co., 92, Blackfriars Road, S.E.1.** 24

**ESTIMATING Engineer** required by large electrical engineering firm in Essex, for handling enquiries and correspondence regarding wide range of electrical machinery and control gear. Salary £400-£450 per annum, according to age, qualifications and experience. Applications in writing (no interviews), stating date of birth, full details of qualifications and experience (including a list in chronological order of posts held), and quoting Ref. No. 203, should be addressed to the **Ministry of Labour and National Service, Appointments Office, Lloyds Bank Chambers, Hobson Street, Cambridge.** 1761

**GLASS Blower** required for **Television Laboratory.**—**Box 6929, c/o The Electrical Review.**

**NON-Association electric cable makers** require first-class **Representative** for Midlands territory, preferably resident in the Midlands. Must be fully conversant with selling cables and be able to prove results.—**Box 1700, c/o The Electrical Review.**

**OVERSEAS Employment.** Qualified **Engineer** required by firm of sisal producers in Tanganyika for a first tour of 2 years, with good prospects of advancement. Candidates should be of good education and capable of dealing with diesel engines, sisal decorticators, electric dynamos and motors, hydraulic presses, diesel locomotives and other transport. Single men not over 35 preferred. Salary commencing at £25 per month and cost of living bonus £10 to £15 per month, plus annual bonus based on profits. Free first-class passages, furnished quarters and medical attention, and four months' home leave on full pay. Applications in writing (no interviews), stating date of birth, full details of qualifications and experience, including present employment, also identify and quoting **Reference No. O.S.430**, should be addressed to the **Ministry of Labour and National Service, Appointments Dept., A.3(A), Sardinia Street, Kingsway, London, W.C.2.** 1760

**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

**SALES Representative** required for illuminating engineering department of **Thorn Electrical Industries Ltd.** Experience in planning industrial lighting essential. Excellent post-war prospects. Write with details of experience and salary required, to—**Box E.L.2, c/o 105 Judd Street, London, W.C.1.** 1763

**SALES Engineer** with good technical education required by **Control Gear Manufacturers, Central London district.** Write, stating experience, age, salary required and when available.—**Box 1773, c/o The Electrical Review.**

**SALES Representatives** required. One for Central and South London, Surrey, Sussex and Hampshire; one for East and West Ridings of Yorkshire. Permanent progressive posts with salary, expenses and commission. Previous experience of electric lamp and light fittings market, and representatives with connection preferred but not essential. Write, giving age and full particulars of experience, to—**Mr. S. W. Fuller, E. K. Cole Ltd., Southend-on-Sea, Essex.** 1739

**STALYBRIDGE, Hyde, Mossley and Dukinfield Transport and Electricity Board, Deputy Electrical Engineer.** Candidates should preferably possess an Engineering Degree or its equivalent; be a Corporate Member of one of the leading Engineering Institutions; have administrative experience and have held a position of major importance in a large undertaking. Thorough experience is required in generation, distribution and the commercial development of an electricity supply undertaking owning a selected generating station, particularly in regard to the layout and erection of modern power station plant. Salary is in accordance with the N.J.B. Agreement, commencing at £250 p.a., plus a car allowance of £96. The successful candidate will be required to pass a medical examination and contribute to the Board's Superannuation Scheme. Write, quoting D.1170XA, to the **Ministry of Labour and National Service, Central (E. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2.** for application forms which must be returned completed, together with not more than three copies of recent testimonials, by 26th April, 1945. 1776

**STORKEEPER** for progressive Company's London depot (W.C.). Knowledge of electrical accessories and electrical switch and switchfuse-gear. State salary and experience.—**Box 1750, c/o The Electrical Review.**

**TELEVISION Research Assistant** required, experience essential.—**Box 6923, c/o The Electrical Review.**

**TRAVELLERS** required, used to calling on manufacturers, wholesalers, contractors and supply authorities, for the sale of thermoplastic cables in the London and Home Counties area. Please apply, with details of experience, connections and salary required, to—**Box 1769, c/o The Electrical Review.**

**WELL-known electrical engineering company** requires experienced **Publicity Man** to take charge of advertising and technical publications division. Applications, giving full details of training, experience and salary required, to—**Box 1764, c/o The Electrical Review.**

**WEST Midlands Joint Electricity Authority: Constructional Assistant.** Applicants should, preferably, possess a degree in Mechanical or Electrical Engineering and be Corporate Members of either the I.M.E. or the I.E.E. They must have been trained in a manufacturing works and have had a wide experience in the design and construction of electricity generating stations. Salary £600 p.a. Subject to production of medical certificate of fitness, the successful applicant will become a member of the Authority's Superannuation Scheme under the Local Government Superannuation Act, 1937. Write, quoting D.1168XA, to the **Ministry of Labour and National Service, Central (E. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2.** for application forms, which must be returned completed by 25th April, 1945. 1753

**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 lay-out. 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.**

## SITUATIONS WANTED

**AN Electrical Engineer,** experienced in practical mechanical engineering, manufacture, estimating, sales and contracting in cable industry, lay-out, construction and operation of M.V. and E.H.T. underground and overhead distribution systems, etc., testing, fault location, supervision and organisation of labour, mains records, accounts and commercial routine.—**Box 6934, c/o The Electrical Review.**

**CHARTERED Civil and Structural Engineer (30),** experienced in power stations, bridges, tunnels, roads, factories, river works, docks and jetties, seeks position as **Chief of Design and Construction or Technical Representative or Agent.**—**Box 6296, 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.

**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. 6913

**ENGINEER** (29), 1st Class Final C. and G. in Rad. Comm. Part I.I.A. and 10 years' industrial experience, seeks technical representation or similar abroad. 11 years Brazil. Knowledge French, Portuguese and German.—Box 6936, c/o The Electrical Review.

**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 Tyenside.—Box 6920, c/o The Electrical Review.

**FULLY competent Works Engineer** seeks position with post-war prospects. Capable of taking full charge of electrical, steam and mechanical plant, heavy duty equipment, A.C., D.C., H.T. and L.T. plant. Full knowledge of factory regulations, management of staff and efficient, economic running of works plant. Free from Govt. service next few months.—Box 6916, c/o The Electrical Review.

**RAD I.E.E.**, ex R.F.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.

**PLASTIC Moulding (Compression) Foreman** seeks similar position, 18 years' practical experience, ex. refs., go anywhere, free now.—Box 6895, 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.

**RADIO Engineer**, production test and inspection executive, design experience, free August. £600.—Box 6923, 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.

**TECHNICAL Sales Engineer** (31), electric heating, competent in design of schemes and equipment, also factory experience and good trade contacts. Present salary £650.—Box 6915, 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.

## FOR SALE

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

### SLIP-RING A.C. MOTORS. 400 3 50-CYCLES

| H.P. | R.P.M. | DESCRIPTION                                  |
|------|--------|--|
| 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

## CITY OF MANCHESTER

### Electricity Department

#### Plant for Sale

TENDERS are invited for the purchase, dismantling, loading and removal from site of REDUNDANT PLANT, comprising:—

CONVERTING PLANT (100 to 2,500-kW capacity);  
INDUCTION REGULATORS (6,600-volts. 250-kW capacity);

TRANSFORMERS (250 to 1,250-kVA capacity);

MOTORS (1 to 110 h.p.);

D.C. L.V. SWITCHBOARDS (4 to 8 panels, 700 to 4,000-amperes capacity);

A.C. L.V. SWITCHBOARD (draw-out truck type, 7 panels);

all in good condition and ready for further service.

Particulars and form of tender, also official permit to view the plant, may be obtained on application to Mr. R. A. S. Thwaites, Chief Engineer and Manager, Electricity Department, Town Hall, Manchester. 2.

Tenders, addressed to the Chairman of the Electricity Committee, to be delivered not later than 10 o'clock a.m. on Monday, 30th April, 1945.

PHILIP B. DINGLE,

Town Hall,  
Manchester. 2.  
28th March. 1945.

Town Clerk.

1741

## 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.

27

## 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.

26

## TOT. ENCL. D.C. MOTORS

34 h.p., 220 v., 800/1,600 r.p.m., variable.

50 h.p., 220 v., 330/650 r.p.m., variable.

Only used for experiment, latest design by G.E.C., ball-bearing, fully guaranteed.

Many others.

ELECTROPLANT CO., WEMBLEY, MIDDX.

1737



**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

**ECONOMISERS IN STOCK**

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

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

**BURFORD, TAYLOR & CO. LTD.,**

7, Commercial Street, Middlesbrough. Telephone 2622.

65

**A** 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.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.** and **D.C.** Welding Sets, 200 amps., petrol driven, direct coupled, from stock.—The Electroplant Co., Wembley, Middx. 1736

**A.C.** Motors, 1/50th h.p. to 10 h.p. from stock. Also **D.C.**—The Johnson Engineering Co., 86, Great Portland Street, London, W.1. Tel.: Museum 6373. 57

**ALTERNATOR**, 200 kVA, 250 r.p.m., 400/3/50, for A coupling, perfect order.—The Electroplant Co., Wembley, Middx. 1738

**ALTERNATOR**, 500 kVA, 3-p., 50 c., 400/440 v., 750 revs., direct coupled exciter, 2 brgs., on bedplate.—Stewart Thomson & Sons, Fort Road, Seaforth, Liver pool. 21. 52

**DELTA** Grinders or Sanders, 4" wide belt. £5 5s.; 6" wide 1" belt, £10 10s.—John E. R. Steel, Clyde Mills, Bingley, Phone 1066. 52

**EXHAUST** Fans, new 14", 1-phase, 200/250 v., 1.900 c.u. ft./min. £11 15s.—Southern Ignition Co. Ltd., 150, 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

**G.E.C.** Telephone Switchboard, 50 lines, central battery type 6-cord circuits, in good working order, £40. Apply to—The Buyer, Taylor, Taylor & Hobson Ltd., Stoughton Street, Leicester. 1772

**GENERATING** Sets for sale, 18 kVA petrol, 400/3/50; 800-amp. petrol-driven Portable Welding Set; 24-kW, 250-v. D.C. Crude Oil set.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 1778

**HEAVY** duty Arc Welding Plants, 200 amps. Price £31 10s. complete. Also Spot Welders, £36 15s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 50

**IMPROVED** Supplies: 3" Backplate Nipples, Brass Reducers, Shade Carriers, Jack Chains, etc. to wholesale and retail, from—Phillip Henry Whol. Elec. Co., 82, Nisbet, Birmingham, 5. 6917

**INSULATED** 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

**KOHLER** Automatic Lighting Sets, rebuilt, 14, 2, 5-kW, 220 volts, 800 watts, 110 volts; Diesel Set, 5 h.p., A.C., 200/220 v., on bed; other sets.—E. Binns, 156a, Falsgrave Road, Scarborough. 6932

**LESLIE** Dixon & Co. for Dynamos, Motors, Switchgear, Chargers and Telephones.—214, Queenstown Road, Battersea, S.W.8. Telephone, MA 0aulay 2159. Nearest Rly. Sta.: Queen's Road, Battersea (S.R.). 18

**MAY** we send our Engineers' Stethoscope on approval (without obligation)? Particulars on request.—Capac Ltd., 2, Ullswater Road, London, S.W.13. 78

**MONOMARK**, Permanent London address. Letters re-directed, 5s. p.a. Write—BM/MON053, W.C.1. 68

**MOTOR** Generator Sets and Convertors, all sizes and voltages from 3 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. 23

**MOTORISED** 4" Bench Drilling Machine, 13 speeds, £12 2s. 6d.—John E. R. Steel, Clyde Mills, Bingley, Phone 1066. 51

**NAME** Plates for Electrical Engineers. Neatly engraved. Send wording for full size sketch and list (enclose 3d. stamps).—Maile & Son Ltd., Engravers, 367, Euston Road, London, N.W.1. 24

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

**ONE** secondhand G.E.C. Electric Cooker, 230 volt, 26 kW loading, double oven and grill with hot plates. Inspection by appointment. Reply to—Box 1731, c/o The Electrical Review.

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**PHONE** 98 Staines. 35-kW Crude Oil Set, 220 v.; 35-kW Brownell Steam Set, 220 v.; 50-kW Hindley Steam Set, 440/220 v.; 75-h.p. National Twin Diesel; Three-throw Ramp Pump, 3 1/2" x 6", 700 lbs. w.p.—Harry H. Gardam & Co. Ltd., Staines. 60

**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

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

**SELF-Priming** Electric Pumps, 300 g.p.h., £12.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 53

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**71-kW** Steam-driven Generating Set, Ashworth Parker  
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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

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**250** -kVA Alternator, 400 volts, 3-phase, 50 cycles, 750  
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Lane, West Bromwich. 36

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verters, etc., etc., at low prices.—S. C. Bilsby,  
A.M.I.C.E., A.S.I.E.E., Crosswells Road, Langley, near  
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St. George's Avenue, Weybridge. 62

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**COMPANY MEETINGS**

**ASSOCIATED ELECTRICAL INDUSTRIES**

**Record Orders**

**T**HE Forty-fifth Annual General Meeting of Associated Electrical Industries Limited was held on Thursday, 5th April, in London.

Lt.-Col. Sir John R. Chancellor, G.C.M.G., G.C.V.O., D.S.O., presided, and in the course of his speech said:—

The proprietors will have noted with satisfaction the strength of the balance sheet, and particularly of the consolidated balance sheet.

The profit for the year was £703,400, that is after making full provision at current rates for all taxation payable in respect of the profits earned up to the 31st December, 1944. This compares with £695,268 for the previous year, an increase of £8,134. After charging £235,857 against £235,295 for depreciation of plant, etc., the net profit was £467,543, an increase of £7,572.

Your directors recommend a dividend on the Ordinary Stock of 10 per cent per annum, less tax.

The output from the various factories of the Group was greater than in any previous year, while the orders now in hand also constitute a record.

Practically the whole of our manufacturing facilities have been employed on Government work, either for various forms of war equipment by direct contracts or for electrical apparatus ordered under priorities sanctioned by the Government.

There are now over 65,000 persons employed by the A.E.I. group of companies, of whom approximately 42 per cent are women.

We anticipate that for some time to come there will be no lack of orders and that we shall be fully employed on our normal products after the war comes to an end.

**Value of Research**

For many years before the war the combined Research Departments of the group occupied a premier position in the electrical industry, and they have contributed in no small degree to recent scientific discoveries and to the improvement of engineering design and technique which these discoveries have brought about. Many of the scientists employed in these departments are foremost in the country in their particular fields of research; and, on the outbreak of war, their skill and experience proved to be of inestimable value to the Research and Development Departments of the various Ministries. Many of the company's officers have been lent to the Government to assist various Ministries in carrying out their design and production programmes.

So far back as 1936 the Metropolitan-Vickers Company began to assist the Government in the development and manufacture of various forms of equipment for the fighting Services. Since then the scope and volume of that work has steadily grown. Full accounts of our contributions to the defence and war programme, and of the achievements in this direction cannot yet be given, but it is now permissible to indicate the wide range that this work has covered.

**Radar Equipment &c.**

The most notable of that company's contributions have been in connection with the development of Radar equipment, automatic pilots, gun mountings and controls and aircraft. Some idea of the magnitude of this work can be gauged by the fact that during the period indicated it has been found necessary to increase our manufacturing floor space by more than 50 per cent.

At this stage of the war it is natural that the thoughts of directors and officials should be turned to the problems of the post-war period; and in our deliberations the measures to be taken to maintain and increase our export business have occupied a prominent place.

We have been told that in order to pay for the imports necessary to enable us to maintain our present standard of living, the value of our exports must be increased by 50 per cent. To attain that object, will be a formidable undertaking; but with Germany and Japan out of action for some years to come it should not be beyond our power.

It will be necessary for us to insure that the industrial efficiency and the productive capacity of our factories are maintained at the highest level by providing them with the most modern machinery and by seeing that the most economic processes of manufacture are used.

The report was unanimously adopted.

**COMPANY MEETINGS—Continued****BRITISH INSULATED CABLES****A Great War Effort**

**T**HE Annual General Meeting of British Insulated Cables Limited will be held on April 19 in Liverpool. The following is an extract from the statement of the chairman, Sir Alexander Roger, K.C.I.E., circulated with the report:—

The total profit for the year is down, on balance, by £23,895. The final distribution on the Ordinary capital is at the same rates as for some years.

Modern warfare involves the use of electricity to an ever-increasing degree and vast quantities of such main products of your company as cables, insulated conductors, wires and various electrical components are required. Our production of cables and insulated conductors has been enormous, and for such widely diversified uses as in tele-communications, ships, aircraft, tanks and all other mechanical vehicles; in the equipment of munition plants and air-fields, and in the maintenance and extension of essential electricity supply services. In addition to our ordinary construction department, we have maintained in this country a service organisation for the repair of cables and transmission lines damaged by enemy action.

Our production of insulated wires has been astronomical: in five years approximately 12,000,000 miles have been supplied to the Services for use in electrical apparatus, instruments, mines, and even dam-busters. The company has achieved an equally impressive output of condensers and other components for radio, telephone and telegraph equipment, aircraft navigating instruments, anti-submarine devices and mines; of moulded plastic products for service equipment; and of electric welding machines and magnetic moulding machines for munition factories. We have also produced large quantities of shell and bomb cases, and a variety of shell bands, fuses and primers.

We shall continue to devote our maximum energies to work essential to the successful prosecution of the war, but with the prospect of an early victory, particularly in Europe, we are giving an increasing amount of thought to the post-war era. Plans cannot be finalised until uncertainty is removed, in particular as to the degree of controls in the future.

1758

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## Index to Advertisers

|   | PAGE        |
|---|-------------|
| Airscrew Co. Ltd.                                 | 65          |
| Automatic Coil Winder & Elecl. Equipment Co. Ltd. | 66          |
| Automatic Telephone & Electric Co. Ltd.           | 67          |
| Babcock & Wilcox Ltd.                             | Cover ii    |
| Barns, W., & Son.                                 | 78          |
| Belling & Co. Ltd.                                | 12          |
| Berry's Electric Ltd.                             | 40          |
| Blakeborough, J., & Sons Ltd.                     | 22          |
| Braithwaite & Co. Engineers Ltd.                  | 66          |
| Brandon Electrical Eng. Co. (Leeds) Ltd.          | 80          |
| British Electric Resistance Co. Ltd.              | 81          |
| British Mica Co. Ltd.                             | 62          |
| British Power Transformer Co. Ltd.                | 24          |
| British Thomson-Houston Co. Ltd.                  | 5 & 38      |
| British Vacuum Cleaner & Engineering Co. Ltd.     | 64          |
| Brook Motors Ltd.                                 | 9           |
| Burgess Products Co. Ltd.                         | 48          |
| Burt, Boulton & Haywood Ltd.                      | 46          |
| Cable Makers' Association                         | 45          |
| Canning, W., & Co. Ltd.                           | 8           |
| Carter Electrical Co. Ltd.                        | 52          |
| Carter, H. W., & James Ltd.                       | 82          |
| Chamberlain & Hookham Ltd.                        | 27          |
| Chloride Electrical Storage Co. Ltd.              | 58          |
| Churchouse, C. M., Ltd.                           | 26          |
| City Electrical Co.                               | 82          |
| Compound Electro Metals Ltd.                      | 69          |
| Connolly's (Blackley) Ltd.                        | 39          |
| Constructors Ltd.                                 | 32          |
| Cork Manufacturing Co. Ltd.                       | Cover iv    |
| Corrugated Packing & Sheet Metal Co. Ltd.         | 60          |
| Cox-Walkers Ltd.                                  | 60          |
| Critchley Bros. Ltd.                              | 44          |
| Crompton Parkinson Ltd.                           | 19, 28 & 49 |
| Crosland, R. & A. G.                              | 69          |
| Crypton Equipment Ltd.                            | 53          |
| Cryselco Ltd.                                     | 30          |
| Dalyte Electrical Co. Ltd.                        | 84          |
| Davidson & Co. Ltd.                               | 44          |

|   | PAGE      |
|---|-----------|
| Davis & Timmins Ltd.                              | 84        |
| Desoutter Bros. Ltd.                              | 21        |
| Donovan Electrical Co. Ltd.                       | 84        |
| Dorman & Smith Ltd.                               | 61        |
| Drayton Regulator & Instrument Co. Ltd.           | 60        |
| Dryden, Thomas, & Sons Ltd.                       | 84        |
| Duratube & Wire Ltd.                              | 66        |
| Edison Swan Electric Co. Ltd.                     | Cover 1   |
| Electric Construction Co. Ltd.                    | 16        |
| Electrical & General Accessories (Leicester) Ltd. | 69        |
| Engineering Services.                             | 32        |
| Erg Resistors Ltd.                                | 56        |
| Ferranti Ltd.                                     | 11 & 25   |
| Firth, Thos., & John Brown Ltd.                   | 60        |
| Geipel, William, Ltd.                             | 59        |
| General Electric Co. Ltd.                         | 70        |
| Gent & Co. Ltd.                                   | 31        |
| Glover, W. T., & Co. Ltd.                         | 51        |
| Grelco Ltd.                                       | 64        |
| Heatrac Ltd.                                      | 1         |
| Heayberd, F. C., & Co. Ltd.                       | 43        |
| Hellermann Electric Ltd.                          | 54        |
| Henley's, W. T., Telegraph Works Co. Ltd.         | 13        |
| Higgs Motors Ltd.                                 | 3         |
| Hopkinsons Ltd.                                   | 81        |
| Howells (Electric Motors) Ltd.                    | Cover iii |
| Hunt, A. H., Ltd.                                 | 79        |
| Igranic Electric Co. Ltd.                         | 20        |
| Imperial Chemical Industries Ltd.                 | 63        |
| Insuloid Manufacturing Co. Ltd.                   | 46        |
| Ioco Ltd.   | 61        |
| Johnson, Richard, & Nephew Ltd.                   | 56        |
| Jones, Samuel, & Co. Ltd.                         | 62        |
| Kidde, Walter, Co. Ltd.                           | 26        |
| King, George W., Ltd.                             | 66        |
| Klaxon Ltd.                                       | 50        |
| Legg (Industries) Ltd.                            | 64        |
| Litholite Insulators & St. Albans Mouldings Ltd.  | 79        |
| Liverpool Electric Cable Co. Ltd.                 | 2         |
| London Electric Firm.                             | 62        |

(Continued on page 82)

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# Index to Advertisers

(Continued from page 80)

|  | PAGE    |
|--|---------|
| Mallory Metallurgical Products Ltd.....      | 43      |
| Manganese Bronze & Brass Co. Ltd.....        | 14      |
| Martindale Electric Co. Ltd.....             | 41      |
| Mathews & Yates Ltd.....                     | 82      |
| McGregor, Robert, & Co.....                  | 77      |
| M.C.L. & Repetition Ltd.....                 | 1       |
| Metropolitan-Vickers Electrical Co. Ltd..... | 35 & 47 |
| Melway Electrical Industries Ltd.....        | 32      |
| Midland Electric Mfg. Co. Ltd.....           | 33      |
| Ministry of Fuel & Power.....                | 55      |
| M.K. Electric Ltd.....                       | 29      |
| Morgan Crucible Co. Ltd.....                 | 17      |
| Nalder Bros. & Thompson Ltd.....             | 23      |
| Newman Motors.....                           | 18      |
| Non-Ferrous Die Casting Co. Ltd.....         | 58      |
| Parmer, Hope & Sugden Ltd.....               | 83      |
| Parsons, C. A., & Co. Ltd.....               | 57      |
| Partridge Wilson, E., & Co. Ltd.....         | 68      |
| P. & B. Engineering Co. Ltd.....             | 46      |
| Premier Electric Heaters Ltd.....            | 4       |
| Pultra Ltd.....                              | 54      |
| Quasi-Arc Co. Ltd.....                       | 29      |
| Radcliffe, Henry, & Co. Ltd.....             | 78      |
| Radcliffe, F. S., (Rochdale) Ltd.....        | 46      |
| Record Electrical Co. Ltd.....               | 59      |
| Resistances Ltd.....                         | 58      |
| Reynolds, A., & Co. Ltd.....                 | 10      |
| Riley, Robert, Ltd.....                      | 78      |
| Ross Courtney & Co. Ltd.....                 | 1       |
| Rotherham & Sons Ltd.....                    | 63      |
| Sanders, Wm., & Co. (Wednesbury) Ltd.....    | 36      |
| Sangamo Weston Ltd.....                      | 40      |
| Scholes, George H., & Co. Ltd.....           | 52      |
| Scott, Hugh J., & Co. (Belfast) Ltd.....     | 50      |
| Siemens Brothers & Co. Ltd.....              | 15      |
| Sims, F. D., Ltd.....                        | 26      |
| Standard Telephones & Cables Ltd.....        | 6       |
| Stanton Ironworks Co. Ltd.....               | 69      |
| Sterling Cable Co. Ltd.....                  | 62      |
| Sturtevant Engineering Co. Ltd.....          | 7       |
| Thew, Edward H., Ltd.....                    | 84      |
| Tormo Ltd.....                               | 66      |
| Tube Products Ltd.....                       | 37      |
| Tucker, Geo., Eyelet Co. Ltd.....            | 79      |
| Union Cable Co. Ltd.....                     | 65      |
| Van Dorn Electric Tools.....                 | 34      |
| Varley Magnet Co.....                        | 79      |
| Veritys Ltd.....                             | 41      |
| Ward & Goldstone Ltd.....                    | 42      |
| Wardle Engineering Co. Ltd.....              | iii     |
| Webber, J. M., & Co. Ltd.....                | Cover   |
| Welwyn Electrical Laboratories Ltd.....      | 26      |
| Westminster Engineering Co. Ltd.....         | 80      |
| Westool Ltd.....                             | 1       |
| Whitecross Co. Ltd.....                      | 82      |
| Wilcox, Edward, & Co. Ltd.....               | 48      |
| Wilmot-Bredden Ltd.....                      | 64      |
| Worthington-Simpson Ltd.....                 | 56      |
| Young Accumulator Co. Ltd.....               | 44      |
| Zenith Electric Co. Ltd.....                 | 32      |
|  | 83      |

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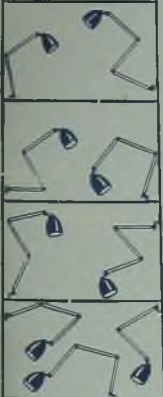
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