

ELECTRICAL REVIEW

FOUNDED
1872

Vol. CXXXIV. No. 3470

MAY 26, 1944

9d. WEEKLY



All look alike for a perfect start but Quality wins!

When buying paper insulated cables make
sure of Quality by specifying

Aberdare Cables Ltd

NINETEEN • WOBURN PLACE • LONDON • W.C.1

DAYLIGHT'S CLOSEST RIVAL



To improve the health and the efficiency of work people on essential war production, to increase output, they need natural daylight to work in. Where that's impossible, the next best thing is daylight's closest rival—"SIERAY" Fluorescent Tubular Lighting. This proved system of industrial lighting cuts out interfering shadows, throwing a perfect, even working light over the whole of factory and workshop. And there's a big saving too—in current. Siemens "Sieray"

Tubular Lamps are approximately three times as efficient as ordinary gas filled lamps of comparable wattage.



FREE ADVICE.—A Siemens industrial lighting specialist will, without obligation, advise on lighting systems already in use. He may be able to suggest improvements in lighting which possibly will save current charges and the nation's fuel.

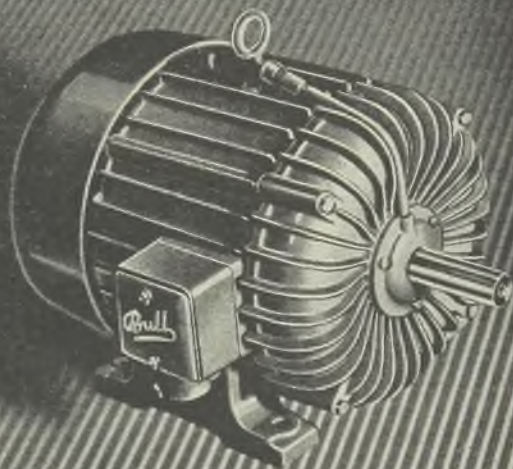


FLUORESCENT TUBE

"The Yardstick of Good Lighting"

SIEMENS ELECTRIC LAMPS & SUPPLIES LTD.,
38/39, Upper Thames Street, London, E.C.4

FAN COOLED



BULL MOTORS (E.R.&F.TURNER LTD)
IPSWICH

ALSO LONDON, MANCHESTER, BIRMINGHAM, SHEFFIELD, NEWCASTLE AND GLASGOW

ANCIENT COMPASSES

This highly ornamental, ancient Pocket Compass is undoubtedly a work of art . . . but modern requirements insist on meticulous scientific precision as embodied in Darwin's Permanent Magnets



DARWINS PERMANENT MAGNETS

DARWINS LIMITED · FITZWILLIAM WORKS · SHEFFIELD

EXPORT DIVISION · DARWINS TOLEDO OVERSEAS LTD · SHEFFIELD

M.11

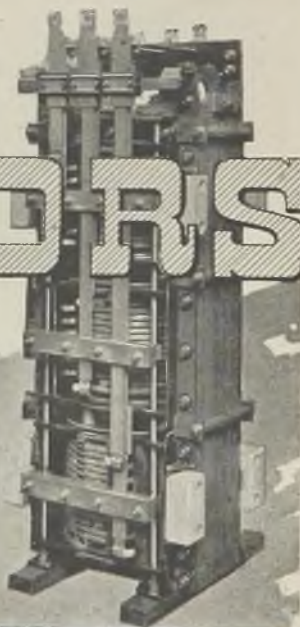


Oil-Immersed Iron-Shielded

REACTORS

**FOR SHORT-CIRCUIT
PROTECTION**

Designed to withstand repeatedly the tremendous stresses to which they may be subjected under external short circuit conditions.



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



ELECTRICAL CONTROL GEAR for all types of installations

"BILL" REWIRABLE
ARC DAMPING TYPE
FUSES OR
"ENGLISH ELECTRIC"
H.R.C. CARTRIDGES.



LONDON: A. W. ZELLEY
73, GREAT PETER ST.
WESTMINSTER, S.W.1

BIRCHFIELDS 5011 (4 LINES)

BILL SWITCHGEAR LTD
BIRMINGHAM 20

MANCHESTER GLASGOW
BELFAST BURTON-ON-TRENT
EXETER SOUTHAMPTON

BILSWITCH BIRMINGHAM

PLUGS AND SOCKETS

5-amp, 250-volt, 3-pole couplings

N633 A.
Two-way
Angle Plug.



N632 A.
Angle Plug.



N651 A.—Cast
Iron Through
Socket screwed
1/2" conduit.



N663 A.
Terminal
Socket and
Cover screwed
1/2" conduit.

SIMMONDS & STOKES LTD.

Victoria House, Southampton Row, London, W.C.1. Holborn 8637 & 2163

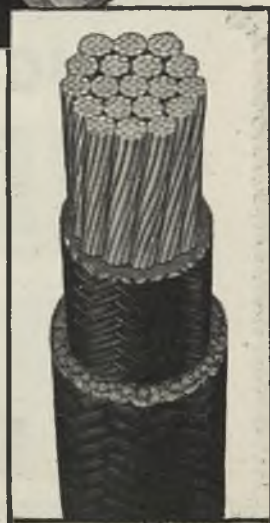


WAR WELDING

War emergency cables for welding need not mean sacrifice of safety and durability. This Crompton Welding Cable will stand up to years of the most rigorous service and give complete satisfaction. Its single flexible conductor is vulcanised rubber insulated and this in turn is protected by tough whipcord braid embedded in the rubber and compounded. It is a cable that fully maintains the Crompton reputation.

CROMPTON WELDING CABLES

Monthly stock lists of Crompton P.I. Cable will gladly be sent you regularly if you will post your request to the address below.



TRADITIONAL RELIABILITY



TURBO-ALTERNATORS
TURBO-GENERATORS
(up to the largest sizes)
TURBINE OR MOTOR-DRIVEN
COMPRESSORS AND BLOWERS
WATER-POWER OR ENGINE-DRIVEN
ALTERNATORS AND GENERATORS
CONVERTING MACHINERY
SWITCHGEAR, TRANSFORMERS, RECTIFIERS,
AUTOMATIC SUBSTATIONS
POWER FACTOR IMPROVEMENT PLANT
ELECTRIC WINDERS, ROLLING MILLS,
AND
ALL KINDS OF HEAVY ELECTRIC PLANT
MOTORS AND CONTROL GEAR
FOR ANY INDUSTRIAL APPLICATION
(large or small)
REGENERATIVE DYNAMOMETER EQUIPMENTS
FOR ENGINE TESTING
ELECTRIC SHIP PROPULSION
ELECTRIC TRACTION
(Road or Rail)
INDUSTRIAL HEATING EQUIPMENT
CINEMA PROJECTOR EQUIPMENT
MAZDA LAMPS, AND
MAZDALUX LIGHTING EQUIPMENT
ELECTRONIC VALVES
OF EVERY DESCRIPTION

• • •

SPECIFY BTH
ELECTRICAL EQUIPMENT

BTH

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

A3441



FOR LONG AND DEPENDABLE SERVICE

Use

TELCON CABLES



**PAPER INSULATED CABLES
OF ALL TYPES FOR**

POWER

TRACTION

LIGHTING

SIGNALLING

MINES

VERTICAL INSTALLATIONS

TELCOVIN^{REGD.} P.V.C CABLES

FOR HOUSE WIRING AND GENERAL DISTRIBUTION

All types — domestic and Service — are available to standard specifications. Materials conform to G.D.E.S.18.

Full details on application



THE TELEGRAPH CONSTRUCTION & MAINTENANCE CO. LTD.

Head Office : 22, OLD BROAD STREET, LONDON, E.C.2
Works : GREENWICH, S.E.10.

Tel. : LONDON Wall 3141
Tel. GREENWICH 1040

"One machine in use is worth 50 under repair...."

Since it was installed this **Wedge Drill** has been dismantled frequently enabling the bearings to be thoroughly washed in paraffin and repacked: the dust to be removed from stator housing and switch case; switch terminals, plugs, sockets and cables to be examined; and nuts, screws and bolts made tight.

As a result it has now drilled nearly a million holes *without once needing Repair Shop attention* and thus fulfilled the present demand for all-out service. Could you say the same of the machines under your care?

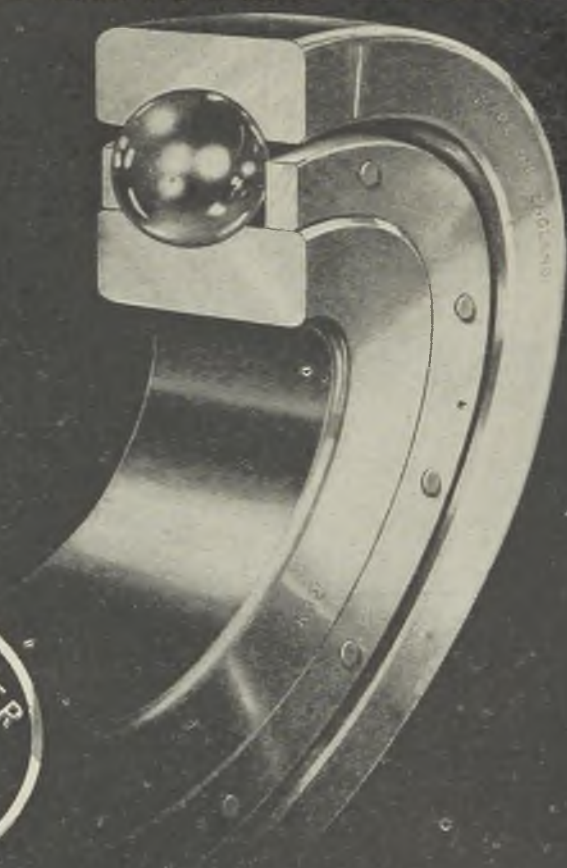
IMMEDIATE: If you have any **Wedge Tools** without Maintenance Instructions, send immediately for the necessary copies. Applications should be addressed to: — The Publicity Department, The Consolidated Pneumatic Tool Co., Ltd., Fraserburgh, Aberdeenshire.

**CONSOLIDATED PNEUMATIC
TOOL CO. LTD.**
FRASERBURGH, ABERDEENSHIRE

ISSUES: PNEUMATIC TOOLS, PORTABLE AIR COMPRESSORS, VACUUM PUMPS, CONTRACTORS' EQUIPMENT, ROCK DRILLS

Advert. Design and Production

DEMANDED for SERVICE MEETS SERVICE DEMANDS



RANSOME & MARLES
BEARING CO. LTD.



NEWARK-ON-TRENT
ENGLAND





CABLES



V.I.R. and Plastic Cables produced
by this Company are being used
for all essential war purposes

*Manufactured in accordance
with Government Specification*

Standard Telephones and Cables Limited

North Woolwich, London, E.16

Telephone : Albert Dock 1401



What is it?

It is a mixture of solder or pure tin and flux combined in the form of paint or cream. It does not separate and no stirring is required before or during use.

What is it for?

It can replace normal methods of soldering *i.e.* the use of stick solder and flux or hot dip tinning. It is particularly suitable for pre-tinning or sweat soldering.

How is it applied?

By brush or pad. Soldering or tinning is effected by blow-flame, soldering iron, hot plate or by stoving.

Is any special skill required to use it?

No. Satisfactory tinning or soldering can be done by unskilled labour. It is only necessary to apply the paint or cream and to heat. The method lends itself to mechanisation and mass production.

Will it do all soldering jobs?

No, but it offers a very wide field of application and can often successfully replace the ordinary methods of soldering. Our technical department will give further advice.

Can we get a sample?

Certainly, if you apply to us.

FRY'S

METAL FOUNDRIES LTD., TANDEM WORKS, MERTON ABBEY, S.W.19 Mitcham 4023

AND AT MANCHESTER, BRISTOL, GLASGOW AND DUBLIN

Birmingham Representative : 20 Stanway Road, Shirley, Birmingham.

Telephone: Shirley 1666

*What is the illumination
in your factory?*

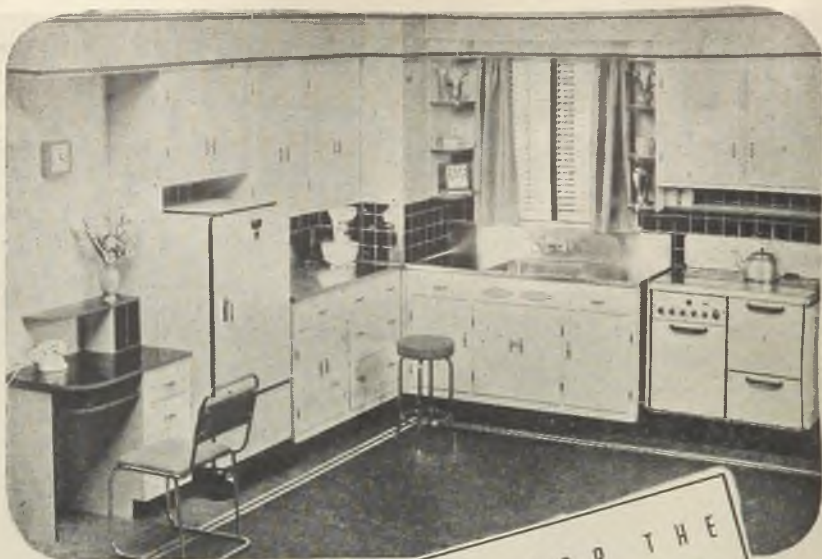
*Be enlightened
with the*

**DUAL
RANGE**
with Selector Switch
0-25-250
FOOT CANDLES

FERRANTI
Light Tester

FI 54

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



PREPARING FOR THE ELECTRICAL AGE . . .

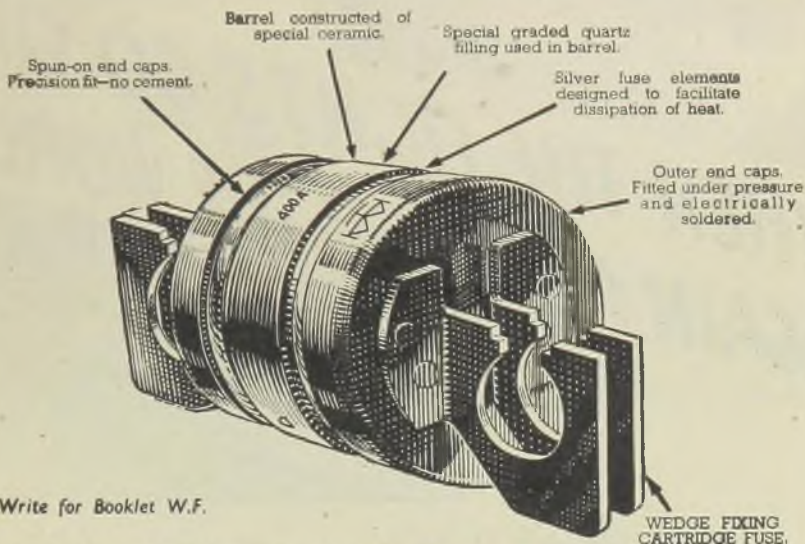
. . . **M**OFFATS will anticipate fashion trends. . . . We shall plan to meet the demands for the All-Electric Kitchen. Moffat models will please the most exacting housewife who will demand the last word in efficiency. For instance, this Model Kitchen displays distinctive streamlined Model 164 Electric Cooker, modern stepped-in base equipped with four efficient boiling plates, large bake-oven, separate Warming and Utility Compartments—with our M.45. (medium-size) Electric Refrigerator to match. Both Units in De-luxe Porcelain Enamel Ivory Finish. And . . . We shall have the IDEAL Electric Cooker for any size of kitchen, *all* available in French Grey and White, Two-tone Ivory, Ivory and Green. Other Moffat features will be available on all Cookers:—"Cookquick" Semi-radiant Boiling Plates; "Even-heat" Oven; Patent Balanced Drop-down oven door; Therm-o-matic Oven Heat control.



We are busy now on war work and priority equipment for factory canteens, etc., but we have post-war Kitchen requirements always in mind.

MOFFATS LIMITED · BLACKBURN · LANCASHIRE

Dependable H.R.C. Cartridge Fuses



Write for Booklet W.F.

The design of HENLEY H.R.C. Cartridge Fuses is based on accumulated practical experience and continuous technical study. HENLEY'S were the pioneers of the Short Break Cartridge Fuse for use in underground network boxes. Every HENLEY H.R.C. Cartridge fuse is a

Our Trade Mark



appears on all HENLEY H.R.C. Cartridge Fuses and is a symbol of efficiency and dependability.

scientifically constructed piece of precision apparatus. Efficient in operation and thoroughly reliable.



Contacts of the wedge type or the bolted type can be supplied as required.

HENLEY

H.R.C. CARTRIDGE FUSES

W. I. HENLEY'S TELEGRAPH WORKS, CO. LTD., MILTON COURT, WESTCOTT, DORKING, SURREY



**WHEN THE LIGHTS GO ON
AGAIN ALL OVER THE WORLD**



REVO *will be there!*

WHEN the time comes, and the Prime Minister calls "SWITCH ON," millions of people will revel in the luxury of safely lighted streets — streets lighted by REVO Street Lighting equipment, of which, in this country alone, there are many thousands. Others unfortunately, will have no lighted streets until new equipment has been installed. That means more planning—AND IT MAY NOT BE TOO SOON TO PLAN NOW. You can have all the assistance of our Public Lighting Engineers that you require for the asking.



STREET LIGHTING EQUIPMENT

REVO ELECTRIC Co. Ltd. TIPTON, Staffs.



FUSEGEAR

*Specify
'English Electric'*



and be Safe

WARNING

TO USERS OF
HIGH - RUPTURING - CAPACITY
CARTRIDGE - FUSE LINKS

Cartridge-Fuse Links bearing the same type references and/or list numbers as 'English Electric' but not of our Company's manufacture are being offered for sale. Although of similar appearance these do not give the same performance as the 'English Electric' high - rupturing - capacity fuse which is accepted as the standard of quality and performance the world over.

*Every genuine cartridge-fuse link
manufactured by our Company bears
the name 'English Electric'*

THE ENGLISH ELECTRIC COMPANY LTD.
— STAFFORD —

Inspection in the best possible LIGHT



by METROVICK
80 w. FLUORESCENT TUBES

The careful inspection and final O.K. of component parts in Works and Factories is work which calls for an extremely accurate eye.

Good eyesight should not be impaired by faulty lighting—the clear glareless light given by “Metrovick” Mercury Electric Discharge Tubes is a real aid to accurate inspection and increases production

CONSULT
METROVICK
ILLUMINATING
ENGINEERS

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
NUMBER ONE KINGSWAY, LONDON, W.C.2

TUNED VIBRATING SCREENS



One of the
many uses
for



"WESTALITE"
unit type 2A.

WESTINGHOUSE

Metal Rectifiers

Modern development provides a simple and static means of controlling the amplitude of vibration of screens and hopper feeds, by the use of a small bridge-connected rectifier, the D.C. output of which is injected into the circuit across the terminals of a low-voltage high-capacity electrolytic condenser. When the value of the injected D.C. is equal to the peak of the original magnetising current, the pull is quadrupled, while any lower value of D.C. will give reduced vibration. Thus a smooth control of amplitude is obtained with very small components.

Write for Descriptive Pamphlet No 11.

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



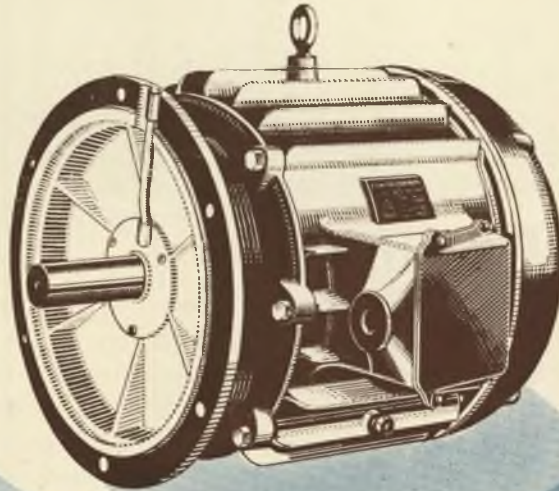
Clean and Cool. The Parkinson

“Klosd” Motor works happily in the most trying situations.

Complete enclosure keeps out dirt and damp while fan

and fins effectively dissipate heat. Available with flange

or foot mounting. ***Write for List of Motors in Stock.***



CROMPTON  **PARKINSON**
LIMITED

IN SUPPORT OF THE MINISTRY OF FOOD HERE IS ANOTHER RECIPE FOR YOUR DEMONSTRATIONS:

Beef Continental

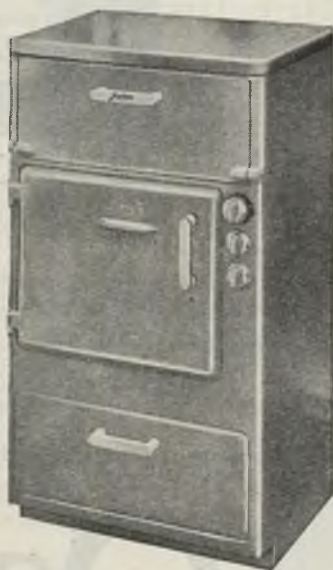
Ingredients—2 or 3 lbs. of topside (or any beef which is liable to be hard if roasted); $\frac{1}{2}$ pint water; 2 or 3 carrots cut lengthwise; 2 onions; a bay leaf, parsley, thyme and 2 cloves all tied up in muslin; 1 calf's foot, if available; dripping; salt and pepper.

Method—Melt the dripping in a pan, fry the piece of meat on both sides until well browned. Add the water, salt and pepper and the calf's foot, previously washed and soaked. Add the carrots, onions and herbs when the water is boiling. Cover the pan and allow to simmer very slowly for 3 to 4 hours. Turn the meat over occasionally whilst cooking. When the beef is tender, place on a hot dish with the carrots. Thicken the liquid in the pan to make a thick sauce or gravy and serve separately. The calf's foot can be reheated and served another time.



The Jackson

COOKING CABINET



Cat. No. 192J.

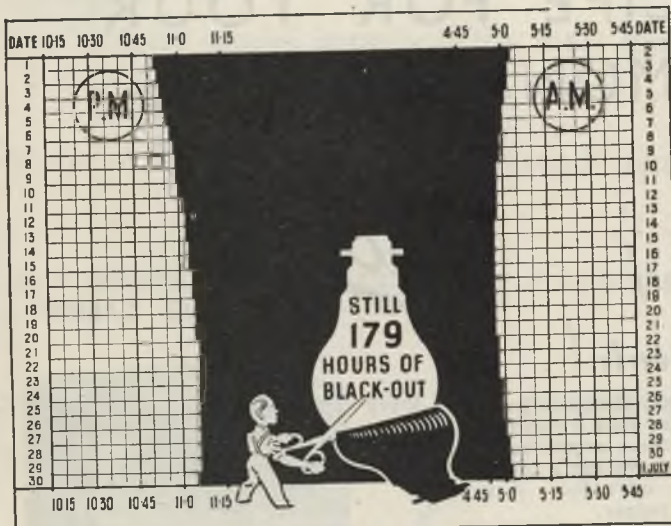
The Jackson

ELECTRIC STOVE Co. Ltd.

143 SLOANE STREET, LONDON, S.W.1

Before June is out

BLACK-OUT CHART FOR JUNE



*Times shown are those for the London area.

Reproduced from the Nautical Almanac by permission of the Controller of H.M. Stationery Office.

Before June is out the hours of black-out lengthen. The longest day has gone. Ahead, once again, is the problem of how to bring daylight seeing conditions into the blacked-out factory.

Only the best of good lighting is good

enough for making certain that output is maintained, for good lighting exhilarates and sustains the workers.

Choose carefully and wisely the lamps you use. Osram is a worth-while choice.

Osram

THE WONDERFUL LAMP

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

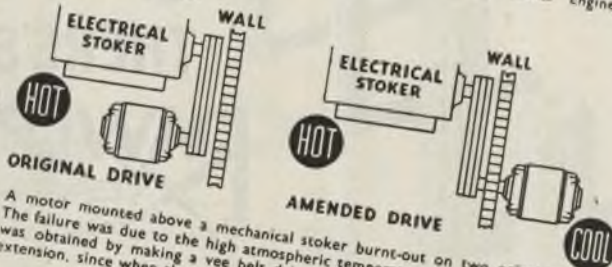


3

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 (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—

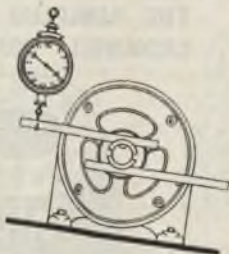
FULL LOAD TORQUE—

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

The torque of the motor is obtained in the manner shown diagrammatically here, the pull being read in lbs.-feet from the scale, the pull 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
SHEFFIELD • LEICESTER • LEEDS • NEWCASTLE • NOTTINGHAM



THERE'S A RAWLPLUG

FOR EVERY SIZE OF SCREW

Whenever you use a screw, use a Rawlplug too. They are invaluable for fixing electric, gas or sanitary fittings, wires, cables, machinery, fuse boxes, piping, shelves, picture rails, etc. Rawlplugs range in size from the small No. 3 for light wiring, to the large No. 28 which will withstand a direct pull of over 4 tons. Rawlplug fixing is *safer, quicker and neater* than any other method—and Rawlplugs are still obtainable from stock.

THE RAWLPLUG CO. LTD.,
CROMWELL ROAD, S.W.7

B-394



"... with powerful naval support."

The grey ships which the enemy can rarely like to see might almost have risen to action by magic. Yet even these had their birth in the critical and less dramatic atmosphere of the drawing office. Thus it is that in a designer's account of a sea battle there would be an important place for BX P.V.C. Extrusion Compound for the electrical cables.

BX *p.v.c.*

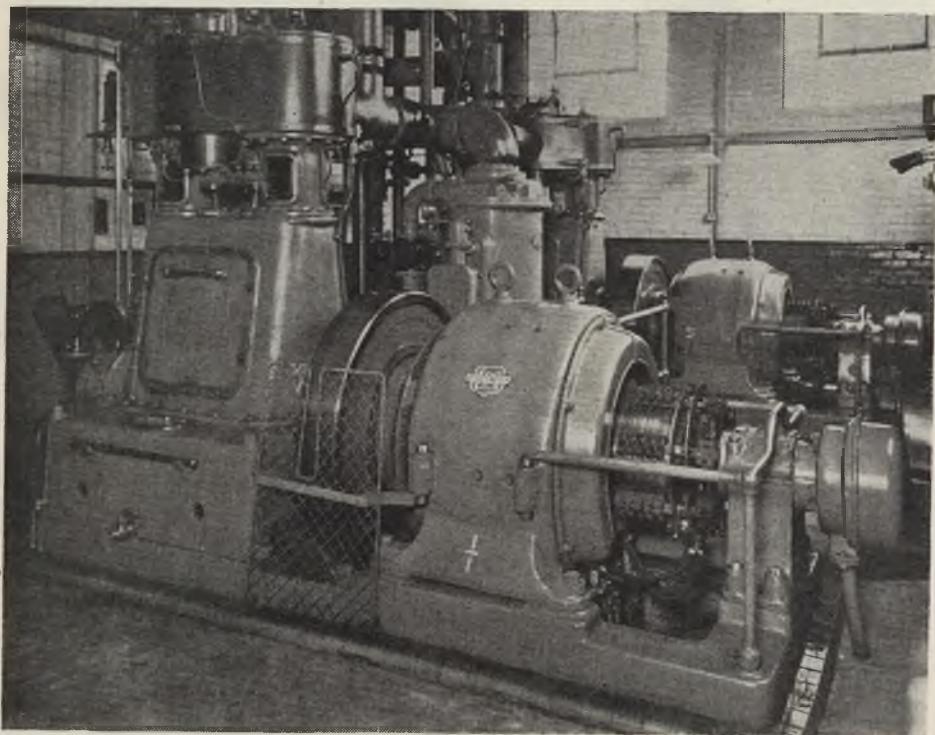
EXTRUSION COMPOUND

BX PLASTICS LTD., LARKSWOOD WORKS, LONDON, E.4

LH/BX214

L.D.C. MOTORS

for every industrial purpose



LANCASHIRE-CRYPTO Electrical Plant in a well-known London laundry

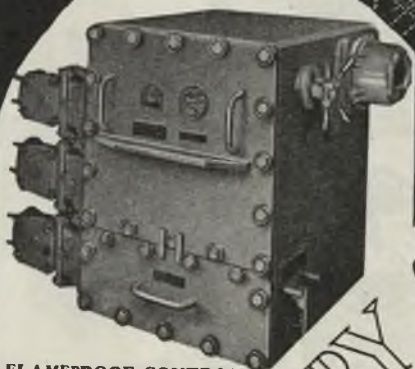
LANCASHIRE DYNAMO & CRYPTO LTD

TRAFFORD PARK, MANCHESTER, 17

WILLESDEN, LONDON, N.W.10

Associated Companies
FOSTER TRANSFORMERS & SWITCHGEAR LTD., WIMBLEDON, S.W.19

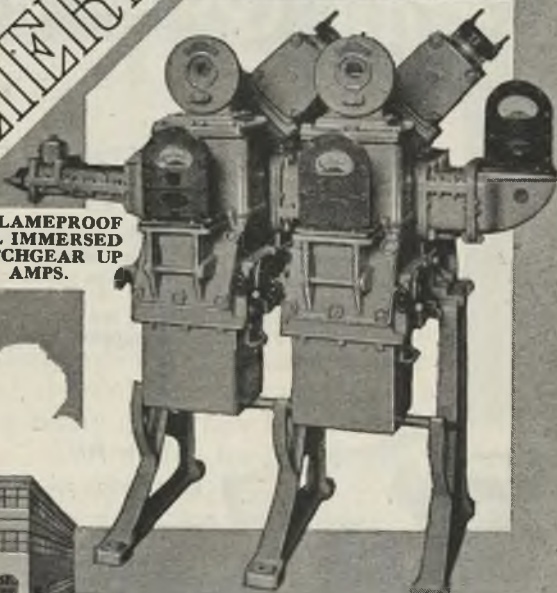
CRYPTON EQUIPMENT LTD., WILLESDEN, N.W.10



**FLAMEPROOF CONTROL
UNITS FOR HAULAGES
UP TO 120 H.P.**

**M. & C. S.
FLAMEPROOF
SWITCHGEAR
IS MAINTAINING
ITS REPUTATION
FOR DEPENDABILITY
UNDER THE SEVEREST
WORKING CONDITIONS.**

**FLAMEPROOF
OIL IMMERSED
SWITCHGEAR UP
TO 400 AMPS.**



**ENQUIRIES INVITED FOR
ALL CLASSES OF SWITCHGEAR.**

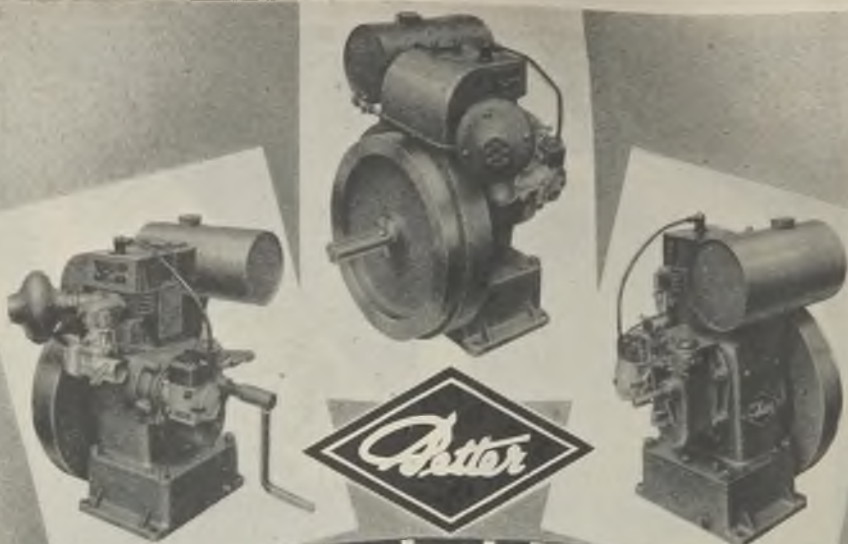


M. & C. SWITCHGEAR LTD.

KELVINSIDE WORKS, KIRKINTILLOCH, GLASGOW

SALES & SERVICE : OLIVE GROVE RD. SHEFFIELD, 2.

LONDON OFFICE : 36 VICTORIA ST., S.W.1



Air Cooled Engines

FROM every angle the Petter Air Cooled Engine is the ideal power unit for driving electric generators and similar machines.

The design and construction have received special consideration by our Technical Engineers in relation to service and with reference to power application.

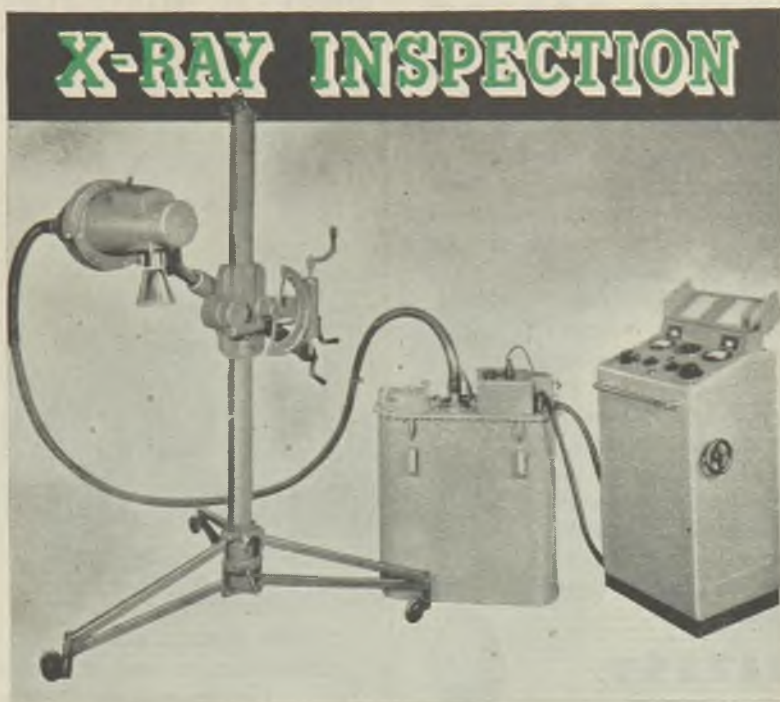
Petter Air Cooled Engines are built in sizes 1½, 2 and 3 B.H.P. and can be supplied to operate on petrol or paraffin.

Write for
information :—



PETTERS LTD

**LOUGHBOROUGH
ENGLAND**



PHILIPS MACRO 150 INDUSTRIAL X-RAY UNIT

An X-ray apparatus of proved merit designed from first to last for the industrial user. The Macro 150 is widely used for the examination of steel up to 2" and aluminium alloys up to 12" in thickness, and for many other raw materials and finished products. Write now for full details.

- ENTIRELY BRITISH MANUFACTURE.
- CONTINUOUSLY RATED FOR VISUAL WORK.
- SIMPLE AND SAFE TO OPERATE.
- DELIVERY FROM STOCK.

PHILIPS  **METALIX**

PHILIPS LAMPS LTD., CENTURY HOUSE, SHAFTESBURY AVENUE
LONDON, W.C.2

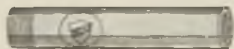
(5861)

Service behind the Switch . . .

A most comprehensive range of accessories and fittings, cables and conduits, produced in our several Works and Factories to rigid specification; plus an unremitting attention to customers' individual requirements, large or small. These have made the name "EFESCA" synonymous with **DEPENDABILITY**. Our constant aim is to maintain and extend that reputation. Now that supplies are so restricted, priority orders must be our first consideration. When trading is resumed in normal volume, we feel sure our friends will remember that for sound manufacture and efficient service they can rely on

HITEST CABLES

EFESCA WIRING ACCESSORIES



FALK, STADELMANN & CO. LTD.
89-93, FARRINGTON ROAD, LONDON, E.C.1
BRANCHES THROUGHOUT THE COUNTRY

WHAT IS MEASUREMENT?

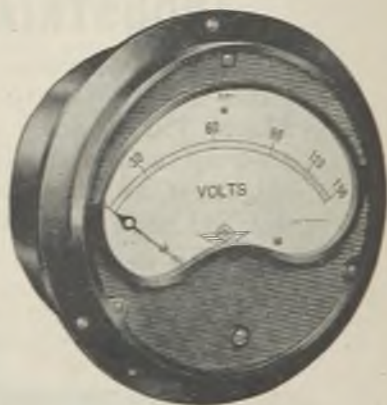


93,000,000 miles to the sun. You are not worried?—Maybe not. But things like amperes and volts can give you a headache if you don't know their values.

FOR ACCURATE MEASUREMENT USE ACCURATE INSTRUMENTS



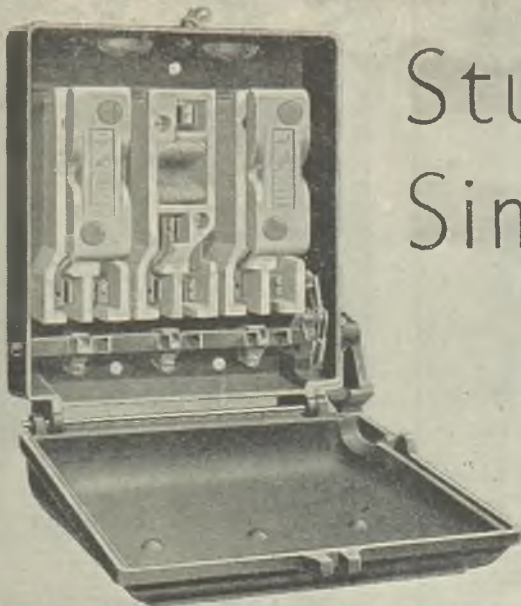
Excellent design, workmanship and manufacture have made M.I.P. Instruments standard equipment wherever Electrical Measuring Instruments figure in specifications.



The illustration shows Moving Iron Switchboard Voltmeter

MEASURING INSTRUMENTS (PULLIN) LTD.

Electrin Works, Winchester Street, Acton, W.3



Studied Simplicity

Compact and complete without unnecessary parts—that's the "Memrex," an ironclad switchfuse for industrial use having that simplicity of perfect functional design you find in all M.E.M. products. It is a simplicity that brings you ready accessibility, positive, unvarying action, low cost and ease of installation and maintenance. M.E.M. Switch and Fuse Gear is designed to render unflinching service by the simplest and most economical means.

M.E.M.

SWITCH, FUSE AND MOTOR CONTROL GEAR

AND LOCALISED LIGHTING EQUIPMENT

MIDLAND ELECTRIC MANUFACTURING CO. LTD., TYSELEY, BIRMINGHAM, 11

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

Obtainable from all Electrical Wholesalers. All Motor Control Gear, irrespective of rating, and Switch and Fuse gear above 60 amp. rating is now controlled under the Control of Industrial Electrical Equipment (No. 1) Order, 1943.

Ask your wholesaler for guidance on this new order



STATIC TWO-DIMENSIONAL visual delineation of any recurrent law.

RELATIVE TIMING OF EVENTS and other comparative measurements with extreme accuracy.

PHOTOGRAPHIC RECORDING of transient phenomena.

SIMULTANEOUS INDICATION of two variables on a common time axis

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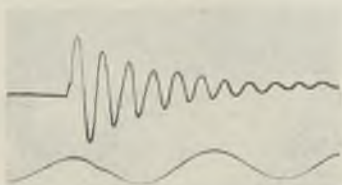
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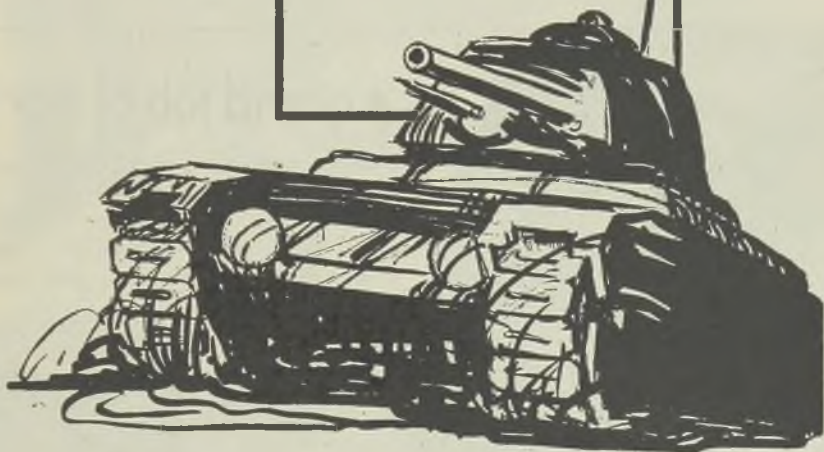
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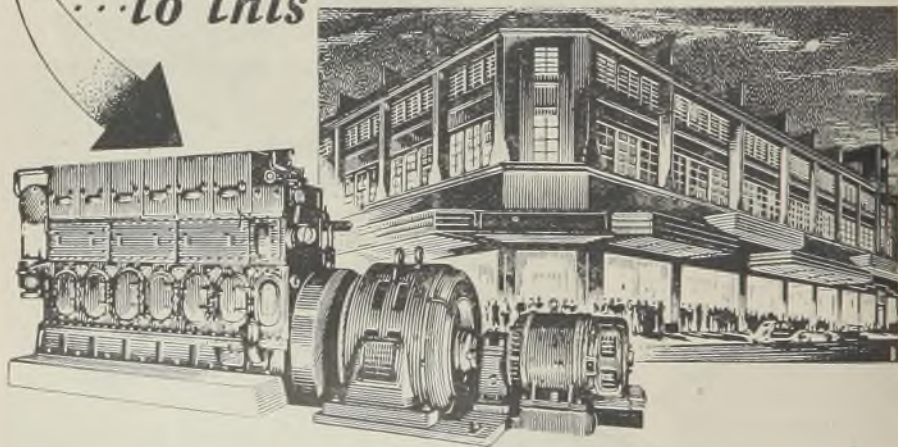
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ELECTRICAL REVIEW

May 26, 1944

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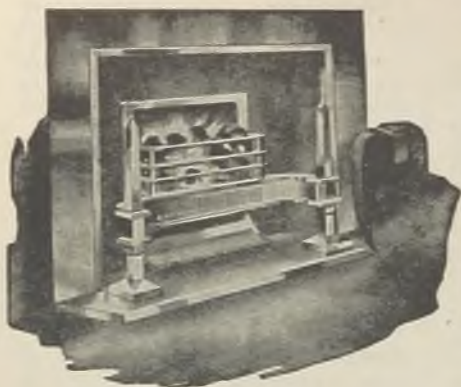
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THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIV. No. 3470.

MAY 26, 1944

9d. WEEKLY

Heating and Plastics

Possibilities and Limitations

IN the past the term "high frequency" when applied to heating processes in industry has usually referred to something of the order of 500 to 3,000 cycles per second, as in steel smelting in electric furnaces. Sometimes, as regards motive power, it was used in connection with high-speed portable tools supplied at under 200 cycles. Latterly, however, the expression has come to mean frequencies of upwards of 100,000 cycles in which, to a great extent, a different set of thermal values is involved. As in the case of voltages, any useful verbal distinction between "high" and "low" tends to become obliterated.

Earlier this year at the Institution of Electrical Engineers Mr. N. H. Bligh named three conditions in which very high frequencies can be used. In the first, eddy currents are induced in a conducting charge; in the second, the heating is by capacity currents in an imperfect dielectric; while the third is in effect a form of resistance heating in which capacities serve for the purpose of leading small currents into the charge.

Externally Applied Local Heating

At present the most promising field seems to lie in the moulding of plastics, the great advantage of the method being that the requisite heat can be applied externally, quite locally, and often without interfering with existing designs of moulds and in such a way as to avoid temperature gradients throughout the mass of the material treated.

In an article in this issue Mr. A. E. L. Jervis indicates the scope for development

in the drying, pre-heating and curing of materials, mainly insulators or partly so, in which remarkable savings in time can be made, with consequent overall economies. Whether or no the author proves to be correct in believing that in the not very remote future every plastics engineer will need to be a fully qualified electrical engineer, it is evident that there should be plenty of room in the plastics industry for electrical engineers with knowledge and practical experience of electronics and also that the liaison between the two industries will become closer.

Immediate and Future Applications

It is too early yet to envisage what may be the eventual outcome of the new technique. Numerous problems remain to be solved before its economic potentialities can be defined. Moreover, research will doubtless open up many new avenues for exploration. Cooking and space heating, for instance, are talked of as ultimate possibilities. For immediate purposes there is an obvious need for standardisation of nomenclature, including an acceptable name for the process itself. "Radio-frequency heating" has been used, but other terms have also been suggested. A question of some practical importance that has already been raised is whether the requisite power should be distributed in the works at mains frequency and high voltage to be converted by local oscillators or whether frequency conversion should be carried out at a central point.

With regard to general prospects a cautious attitude is justifiable for the time

being. Although overall economies can be demonstrated in many instances and the cost of the electricity used seems not to be high, the equipment is likely to be considerably more expensive than that required by existing ways of electric heating. Probably the main sphere of high-frequency heating will be in providing a substitute for present methods but rather in opening up new channels for electrical service.

OF the many hydro-electric possibilities discussed by Mr. W. A. Hatch in his lecture at Liverpool (reported in this issue) not the least striking in its appeal to the imagination is the one which envisages the electrifying of the Nile Delta. Such a project would be designed to exploit the difference in level between the Mediterranean Sea and the Qattara Depression, the water being caused to flow *via* El Alamein. If further investigation showed a scheme of this kind to be feasible, what a magnificent memorial it would make to the Eighth Army.

Railway Signalling Too much is surely claimed for improved electric signalling by Lord Monkswell who credits it, in a letter to the *Daily Telegraph*, with being the real reason why a greater number of trains can be run over a line with electricity than with steam. Its use need not, as he points out, depend upon the adoption of electricity for tractive purposes. It was not on the merits of modern electric signal systems, however, that the Weir Committee based its still unanswered arguments in favour of comprehensive railway electrification. In addition to the value of superior acceleration, there are savings in fuel, labour and maintenance to be taken into account.

Electrifying the Mines SOMETHING like three-quarters of the total coal output of this country is already cut mechanically, and approximately the same proportion is mechanically conveyed. Through the present urgency of circumstances the employment of electrically operated machinery in the mines is now being rapidly accelerated. To use and maintain the new apparatus a considerably larger number of trained operators will be needed. Methods employed so effectively in the training of Service personnel and factory operatives are now being adopted

to produce these skilled men, and in this issue we describe a training centre which the Ministry of Labour has set up at Sheffield for the purpose. The realistic atmosphere which is attained in the model galleries of this new centre should assist greatly in the successful performance of its function.

Graduates IN order to qualify for transfer to associate membership, graduates, who have already passed the A.M.I.E.E. examination, have to show that they have held positions involving personal responsibility—a term that escapes adequate definition—for several years. In so far as this indicates that a corporate member is something more than a “paper” engineer, it is to the good. Nevertheless, for reasons previously discussed in these columns, many graduates possessing the ability to apply their technical knowledge in the requisite manner may be unable to satisfy the conditions of promotion to the higher class. The new sections of the I.E.E. examination, which comes into force in October next year, will offer candidates an opportunity of giving oral as well as written evidence that they do possess the necessary executive and functional abilities.

Cheap and Abundant AT Sheffield recently the proposal that electricity should be supplied to the “working man’s home” on a “water-rate” basis was revived. Mr. J. R. Struthers, the general manager of the Corporation Electricity Department has scouted the idea as impracticable and denies that the saving in meters, meter readers and accounting would be anything worth while. With unmetered supplies domestic consumers would consume so much more electricity that charges to other users would have to be raised. In fact, says Mr. Struther, clinching the argument, “one might as well suggest that every working man’s home should have a piped supply of whisky, beer and champagne.” What a prospect this opens up!

Clean Air A SMOKELESS zone for the City of London and parts of Westminster and Holborn (such as would have been established already in Manchester but for the war) was suggested on behalf of the National Smoke Abatement Society at a conference of local authorities of Greater London. Apart from ensuring freedom

from atmospheric pollution, no attempt was made to prescribe the type of fuel or apparatus used, but only one kind would appear to meet all the conditions. It would involve no problems of delivery and storage. It would not add unduly to the congestion of the subsoil, since a multiplicity of mains could be avoided by supplying it at the high pressure necessary to cope with the immensity of the demand and transforming it locally to the pressure most convenient for serving the consuming devices.

Women and Electricity

MAJOR LLOYD GEORGE, speaking at last week's annual conference of the Electrical Association for Women, referred to the memoranda he had received upon the future of electricity supply and said that he hoped before long to be able to express the Government's views on the subject. He laid particular stress upon the need for standardising voltage and equipment, upon which all parties are agreed, and did not touch upon the more ticklish question of ownership and control of undertakings. Major Lloyd George paid the Association a well-merited tribute for its part in making women "electrically conscious."

ONE rather puzzling **Export Trade** remark was made by Major Lloyd George in the course of his address. He mentioned the importance of export trade, saying that he thought there would be a large market for generating plant, and then stated that he hoped to meet manufacturers to see what could be done to meet this demand for export. This appears to be a matter more for the Board of Trade than the Ministry of Fuel and Power unless, of course, it indicates the co-ordination of home power plant requirements with those of overseas countries.

COMPARED with the **Air** direct electric drive, plant **Compressors** operated by compressed air makes an extravagant use of power. For underground working at collieries, for example, the ratio may be as high as four to one. Much depends upon maintenance and avoidance of leaks, since a $\frac{1}{4}$ -in. leak at 100 lb. per sq. in. may waste more than 30 tons of coal in a working year of 2,500 hours, the amount varying as the square of the

diameter of the hole. A practical guide to the upkeep and operation of smaller air compressors and pipe lines (Fuel Efficiency Bulletin No. 29) has now been issued (free) by the Ministry of Fuel and Power. This gives a simple method of testing for leaks and includes a reminder that indiscriminate blowing down of receivers and pipe lines is strongly to be deprecated.

A Common Basis

THE need for a grasp by students of fundamental similarities of electrical machines in order that they may place more obvious differences in the right perspective lends force to the plea to writers and teachers which Mr. L. H. A. Carr makes in this issue. Since induction-motor leakage, alternator leakage and DC reactance voltage may be regarded as different aspects of the same problem, the adoption of a common type of formula should help to keep students' ideas clear on a complex subject.

Guidance for the Public

THE extent of the knowledge of those public mentors, the Sunday newspapers, is well exemplified by some comments in the *People*. It "suspects the motives behind the Association of Electric Power Companies' stand against the Labour Party's recent manifesto on nationalisation" and goes on to say:—"Hundreds and hundreds of these little companies protest that, if they were all taken over by the State, it would cost 'a mint of money' and subject the public to almost unendurable official control." It is contended that municipal supply is cheaper than that of companies "among which there is a scandalous disparity of charges between one district and another." The alleged "public demand" for drastic reorganisation of the industry consists largely of this sort of nonsense.

Still More

DAILY papers are not free from electrical inaccuracy either. It will be news to the Incorporated Association of Electric Power Companies that, according to the *Dundee Courier and Advertiser*, "officials of the Association stated in London yesterday that, roughly, 60 per cent. of the members are municipal and 40 per cent. company-owned electricity undertakings." We like that word "roughly."

High-Frequency Heating

Plastics Industry Applications

THE year just passed has seen the publication of numerous

By **A. E. L. Jervis**

(c) for complete heating and curing.

articles in the American Press and only a few in the British Press dealing with the application of high-frequency heating to the pressing of laminated materials and to the moulding of shaped articles. It is not to be deduced from this contrast that there has been less progress on this side of the Atlantic, but that for security reasons publication has not been encouraged. For the benefit of the reader a list is given at the end of this article of typical literature dealing with laminated and other materials, generally with particular reference to high frequency.

If high-frequency heating proves to be as important in the manipulation of plastics as recent literature would seem to indicate, the net result will be that the plastics and electrical industries will be drawn even more closely together. In fact, the day may not be far distant when every plastics engineer will have to be a qualified electrical engineer too.

High-frequency methods have already entered the laminated wood (plywood) section of the plastics industry with considerable éclat, according to the American technical journals, and should further advance the status of the wood technologist who, according to Ralph Casselman, has not always been so welcome. Mr. Casselman says ⁽¹⁾ "... not many years ago wood technologists and chemists were strangers in most plants, not understood in others and frequently resented by the production-minded men whose only interest lay in making more of their standard type of production with faster equipment, or cutting the corners further to lower the cost per unit." Now that high-frequency heating is available, with its quickening and cheapening effects, everyone should be satisfied.

High-frequency power (within the scope of this article) can be used (a) for drying materials, (b) for partial pre-heating and

describing "Thermex" processing the Girdler Corporation, U.S.A., recommends high-frequency drying for various materials ranging from paper to tobacco. Of particular interest to electrical readers will be its use for the drying of clays and ceramic articles in quick time. Another publication mentions the drying of tree trunks in a few weeks, whereas previously a year or two was necessary. Whether wood-workers and ceramists discover "snags" arising out of this hustling-up of the drying processes remains to be seen.

Partial pre-heating can be applied to both mouldings and laminates. Mr. J. P. Taylor (R.C.A.) refers ⁽²⁾ to the high-frequency heating of propeller blade blocks: It is just possible that by the time this method is perfected the development of jet-propelled aircraft will have reduced the demand for propellers, but as an example of the time saving effected by h.f. heating the propeller blade is hard to beat and is therefore one frequently used by the author.

According to Mr. Taylor the Tolerton Lumber Co. is producing really large laminated aircraft spars with the aid of high-frequency presses. Two spars each 17 ft. 6 in. by 6 in. by 1 in. are produced every six minutes.

Thicker spars, 3½ in. to be precise, are produced at the rate of two every 25 minutes.

Reverting to partial high frequency pre-heating, in Mr. G. Dring's paper ⁽⁴⁾ are additional remarks that "... the maximum heat treatment is not always necessary or even desirable. A strong case can often be made out for partial pre-heating by high frequency to a relatively low temperature, say 120 deg. C., and then moulding in the usual way. The moulding material thus has increased plasticity, but

still requires a relatively long curing time in the mould. ... the minimum curing time of 1 in. thick blocks of a general purpose moulding material after high-frequency pre-heating to various temperatures, even down

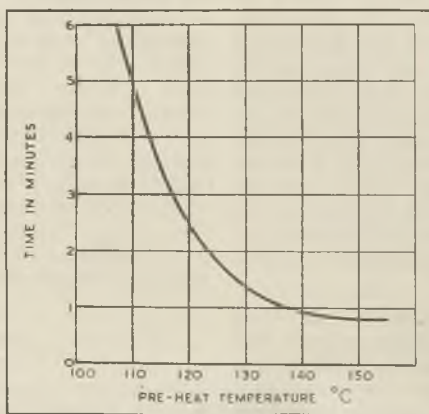


Fig. 1.—Minimum curing time for one-inch thick moulded block

as low as 120 deg. C. . . . is remarkably small for such a thick section." The Fig. 1 relationship shows that the higher the tem-

conduct heat through a non-conducting mass is an inefficient procedure.

To partly overcome this difficulty, pre-heating of the pellets in ovens at the side of the press was introduced; alternatively, the transfer process was used, in which pre-heated powder is forced by a plunger through a gate into the mould.

Mr. Dring is reported to have "assured the moulding industry that it need not understand all about electronics and valves and oscillators in order to use the new process of moulding in their works. The actual apparatus for producing high-frequency heating is the job of the electrical engineer and should be as simple to use as a radio set." This may be quite true, but I

cannot help thinking that it would be better, instead of tolerating an "ignorance is bliss" attitude for the moulding industry, to tell it at once that it should employ more and more electrical engineers who

perature to which the material is pre-heated the shorter is the curing time in the press. For the purposes of this article high-frequency moulding is divided into two classes. First there is what is often referred to as "heatronic" moulding, which description is intended to convey an association of heat and electrons, indicating a form of heating which is quite distinct from 50-cycle resistance heating or steam heating. Next, the term "laminating" is used, for want of a better expression, to distinguish laminated pressing from powder moulding. It seems that laminating will require high-frequency generating sets of much greater size than those needed for "heatronic."

The time saved by comparison with steam heating laminated 1 in. and 6 in. wood boards is indicated by Fig. 2, while the relationship of minimum curing time to thickness (Fig. 3) shows that the difference between $\frac{1}{4}$ in. and $\frac{1}{2}$ in. mouldings (wood-filled phenolic powder) in the case of curve B with high-frequency pre-heating to 150 deg. C. is only ten seconds, meaning that the time increase is very small, whereas in the case of curve A with conventional pre-heating for 30 minutes at 100 deg. C. the time factor is doubled.

In the case of the conventional moulding Mr. Dring explains that if cold powders (or pellets) are put into a hot mould the material in contact with the walls may be cured before the heat reaches the centre of the moulding powder. To endeavour to

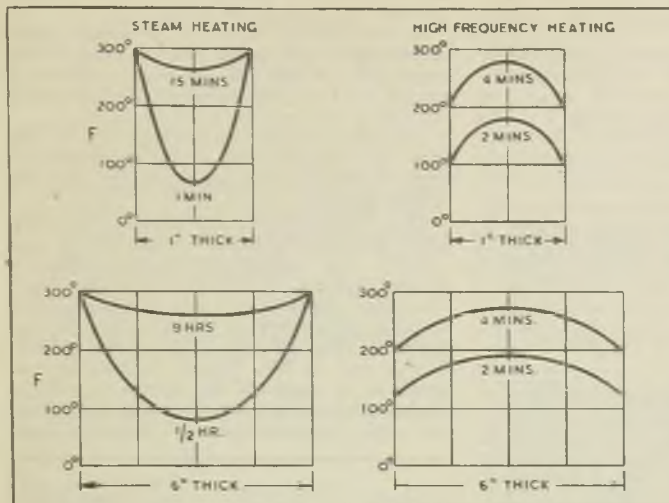


Fig. 2.—Time saving comparison of steam and electric heating

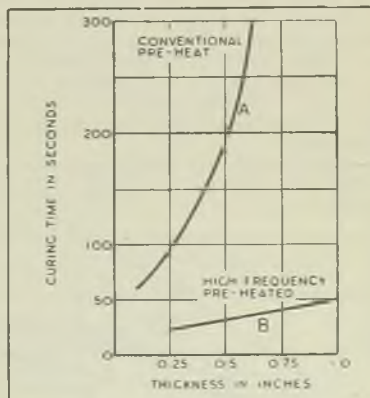


Fig. 3.—Relationship of curing time to thickness of moulding

are qualified in high-frequency practice and do know something about electronics and valves and oscillators.

The expenditure involved in this direction would be negligible compared with the time saved when expressed in terms of £ s. d.

Mistakes which might tend to prejudice the general acceptance of high-frequency heating would then not be so likely to occur.

Cost of Process

One of the first reactions of the reader will be "What is all this going to cost?" Unless the supply authorities insist on special rates for the input power to high-frequency generators, the actual electricity used in the heating will cost comparatively little. A curve (Fig. 4) taken from Mr.

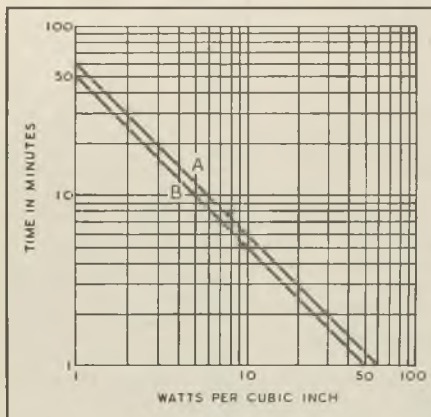
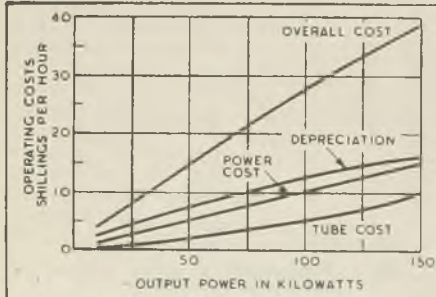


Fig. 4.—Wattage required for heating laminated wood

Taylor's paper shows the wattage per cubic inch required to raise the temperature of laminated wood to 320 deg. F. in a given time. The power in watts required is

$$4.18 \times pc \times \Delta t \times \text{volume} \\ \text{time in seconds}$$

where p = specific heat in calories per gramme per degree C.



" p " and " c " is for most woods between 0.25 and 0.35, so that the upper curve, A (Fig. 4) is for woods having " pc " values of 0.35 and the lower curve, B, for woods having " pc " values of 0.25.

In the case of a 2 cu. ft. propeller blade remaining in the press half an hour when using power from a 6-kW set, efficiency 50 per cent. (3 kW delivered to the press), the cost would only be a few pence.⁽⁶⁾

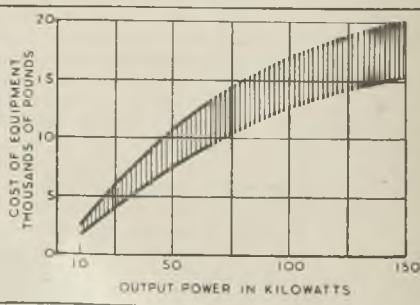
In order to arrive at a rough idea of the price per kilowatt, the reader is referred to Figs. 5 and 6 converted from data in Mr. Taylor's paper.

Mr. Dring mentions "small" moulding units serving one press taking 500 W and "fairly large" units serving a number of presses taking 2 to 3 kW whereas for "high-frequency laminating" current publications mention generators up to 600 kW. As this figure is right off the curves given by Mr. Taylor and as Mr. Dring's figures are too small to be read off the curves, it will be appreciated that the costs tabulated herewith are only approximate, although of real

Output in kW	Initial Capital Outlay (£)	Overall Cost per hour, Depreciation, Power, Tubes, etc. (Shillings)
10	2 to 3,000	5
50	8 to 11,000	15
100	12 to 17,000	28
150	15 to 20,000	38

value to those contemplating the use of this form of heating.

From the accompanying table a figure of 3d. to 6d. per kW per hour is obtained, which does not include the wages of the operators, technicians, etc. But, in the typical case of the aircraft propeller blade, as the



Figs. 5 & 6.—Operating and equipment costs of high-frequency heating

c = density (specific gravity) in gramme per cu. cm.

Δt = change in temperature.

According to Taylor the product of

production time is half an hour instead of nine hours by the steam-heated method, it is obvious that there will be a saving in this direction as well.

Coming to the high-frequency moulding costs one can deduce that a 500-W installation may only cost 1½d. to 3d. an hour to run.

Aircrew Propeller Blades

A diagrammatic representation is given in Fig. 7 of a laminated propeller block between a pair of electrodes connected to a generating

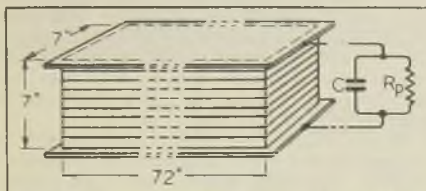


Fig. 7.—Arrangement of propeller blade block and electrodes

set, output 3 kW at a frequency of 30 Mc/s. To calculate the capacity of the laminated block:—Let C (in farads) = $8.85 \times 10^{-14} \times KA$ where K = dielectric constant, assumed to be 5; A = area in sq. cm. = $72 \times 7 \times 2.54^2$; d = separation of electrodes in cm. = 7×2.54 ; $KA = \frac{5 \times 72 \times 7 \times 2.54 \times 2.54}{7 \times 2.54} = 360 \times 2.54 = 914$; $C = 8.85 \times 914 \times 10^{-14} = 8 \times 10^{-11}$ farads approximately.

$$\text{Capacitance } X_c = \frac{1}{2\pi cf} = \frac{7 \times 10^{11}}{44 \times 8 \times 30 \times 10^6} = \frac{7 \times 10^{11}}{1056 \times 10^7} = \frac{70,000}{1,056} = 70 \text{ ohms approx.}$$

Equivalent resistance $R_p = \frac{X_c}{PF}$. The power factor is assumed to be 0.05 so that $R_p = \frac{70}{0.05} = 1,400$ ohms.

The power (given as 3,000 W) = $i^2 R_p$; therefore current $i^2 = \frac{3,000}{1,400} = 2.2$ and $i = 1.5$ amps. Thus the voltage needed $i R_p = 1.5 \times 1,400 = 2,100$, say 2 kV.

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(9) "High Frequency Heating in Plywood Manufacture." *Engineering*, August 6th, 1943.

(10) "High Frequency Gluing of Resins." Godfrey and Bilhuber. *Modern Plastics*, September, 1943.

(11) Brake and Schutze. *Elektrische Nachrichten*, p. 120, Vol. 12.

Water Power

Possible Large-Scale Schemes

SOME hydro-electric possibilities were outlined in a popular lecture delivered at Liverpool under the auspices of the Mersey and North Western Centre of the Institution of Electrical Engineers by MR. W. A. HATCH. He said that the Kaieteur Falls in British Guiana, having a vertical drop of 740 ft., were attractive as bauxite was available, thus enabling aluminium to be produced locally with the help of electrical energy. In Britain there were water power resources in Scotland, and the tidal properties of the River Severn could be utilised.

In the Mediterranean area there were three possibilities. The first of these was lowering the sea level by placing a dam and locks (with power station) across the Straits of Gibraltar and at the Dardanelles; this would make possible the generation of some millions of kilowatts. Secondly, by boring tunnels from El Alamein to the Qattara depression in Libya electrical energy could be generated by admitting sea water into what would become an enormous lake whose level would settle down to 150 ft. below the sea, the influx being disposed of by evaporation. The scheme would provide much needed electrical energy to the whole Nile delta, making imported coal unnecessary. Thirdly, if a dam were constructed at Kefr-Kab in Syria across the Euphrates a reservoir about the size of Nottinghamshire could be formed capable of supplying a hydro-electric station and enabling the surrounding country to be irrigated. In addition, a canal could be constructed between the Mediterranean and the Euphrates which would be fed from this reservoir, thus reducing the sea distance to Basra by about 3,000 miles. This area was once part of the "Fertile Crescent" and could be made to flourish again through the agency of electricity and irrigation. Antioch would once more become an important seaport.

Two at least of the African rivers could be utilised. The Nile at the Asswan dam might generate electricity at comparatively small expense, enabling synthetic nitrates to be produced locally. The Congo lent itself to a dam and huge power station at Stanley Pool, so creating a vast lake higher up the river in territory which at present consisted of swamps and virgin forest. An extension of the scheme would be a canal between that reservoir and Lake Chad. By means of locks, ships would have access from the Atlantic to the heart of Africa.

Swedish Electrification Scheme

The Railway Board is submitting a proposal to electrify the line from Stockholm to Tillberg and Köping (146 km.) at the present session of the Riksdag. The total cost is estimated at 28.74 million kr.—*Reuter's Trade Service*.

Plastics in the Building Trade

Electrical, Plumbing, Heating and Lighting Applications

MOST of the available information about the numerous uses of plastics in the building trade has been surveyed by a Committee, convened by the British Plastics Federation under the chairmanship of Mr. H. V. Potter (Bakelite, Ltd.), whose report is published as No. 3 in the series of Post-war Building Studies being prepared for the Ministry of Works.

Part I refers to sources from which such materials are derived, their properties and processes of manufacture, with a caution that plastics are not suitable for all purposes. Among their several merits are their good dielectric properties, but they also have their limitations so that the utility of the finished article is dependent upon the right choice of material for a particular purpose and suitability of design. It must be realised that one style of design may be more suited to the moulding process than another. It is, for instance, simpler to mould a switch cover plate and a threaded ring separately than to mould a threaded switch cover. Therefore the need to take full account of the process of production demands close collaboration between the designers of both the article and its mould.

Part II deals with a variety of applications of plastics to buildings that are already well established, mentions some that are being tried tentatively and indicates that the appropriateness of many others has still to be determined by experiment. Typical illustrations in this section of the report include large laylight glazing, moulded convection heater, air extractor, mains switch and fuse box and watt-hour meter cases.

Electrical Uses

Wall skirting boards could be made from laminated sheet in lengths (at present) up to 8 ft., or could be extrusion moulded to any desired length with channels to accommodate electrical wiring. Mouldings designed to be employed as skirting boards have also been produced experimentally with electric heating elements embedded in the material, which method lends itself also to the manufacture of heating units. Heat-resisting paints for radiators and heating panels are usually based on synthetic resins.

Plastic tubing promises to be useful as conduit for bare or insulated electric wiring, and metal screening can be incorporated in the course of manufacture. It is understood that such tubing is already being employed in Germany to accommodate bare wiring in domestic and industrial buildings, this method of wiring being subject to VDE 0288 specification.

There is wide scope for plastic substances in the manufacture of fittings of all kinds for electrical, plumbing, heating and lighting services. One of the appendixes to the report enumerates 41 direct applications to electrical equipment and lighting, additional to telecommunications, vacuum cleaners, refrigerators, lifts and elevators, heating and ventilating, although the report does not purport to be exhaustive in its treatment of the subject.

Manipulation and fixing have seemed to suggest a need for a new kind of craftsman, termed "plastics fixer," but the report considers it doubtful whether any such need for another specialist really exists. The more logical course, especially at the present stage of development, would be to include instruction in the curricula of technical schools.

Improvements in Moulding Methods

The high pressures required to ensure adequate flow in the mould and the slow rate of diffusion of heat to the centre of the moulding have both imposed restrictions on the size of moulding that could be produced. But developments in the preforming methods have already reduced the need for excessive pressure; in addition, heating electrically with AC at high frequencies, which is independent of thermal diffusion, so allowing large mouldings to be raised quickly and uniformly to the curing temperature, has substantially reduced the moulding pressures utilised. Such improvements may be expected to extend the scope of plastics moulding processes.

Future costs cannot be closely estimated, but the report states that the trend is almost certain to be downward. Insufficient information is available about some of the properties of these substances; much fundamental research must be done, the whole subject demanding study over long periods.

Part III of the report deals briefly with design and standardisation, a list of British and other relevant specifications being given in an appendix. Mention is made of the "hall mark" scheme that is being drawn up by the British Plastics Federation in collaboration with the British Standards Institution.

Part IV contains the Committee's conclusions and recommendations. The latter are for collaboration between the building and plastics industries; for training to enable workers in the building trades to learn more about plastics and acquire skill in their manipulation; for research; and for the needs of the building, transport and electrical industries to be co-ordinated with a view to eventual, though gradual, standardisation.



Electricity's Future

Minister of Fuel's Address to E.A.W.

THE need for continued fuel economy, electricity's part in the war effort, the desirability of a standard system of supply, investigations into the use of waste heat and district heating, railway electrification and export were among the topics touched upon by the Minister of Fuel and Power, Major G. Lloyd George, in an address to the Electrical Association for Women at its annual conference in London on May 18th.

Major Lloyd George said that on the eve of very great events fuel economy was still of the greatest possible importance. The problem was not only whether there was enough coal available, but also the question of transport and the plant used to get the coal. Next winter the country's fuel difficulties would be no less in number and magnitude than in 1943-44 and the housewife's ability to get solid fuel was not going to grow easier. There was a temptation to use electricity or gas instead, and although it could not be denied that in certain circumstances the use of these alternative fuels was an economy, it would be

of little avail if coal was saved at the expense of an undue strain on electricity and gas undertakings. The Ministry of Fuel endeavoured to build up stocks of coal in the summer and the rate of growth of the stocks was dependent on the amount of savings.

For this reason he had decided to continue the economy campaign throughout the summer with the slogan "Summer Savings Bring Winter Warmth."

Referring to the record of the electrical industry in the war, Major Lloyd George mentioned the case of supplies to airfields which had often been undertaken at very short notice. Electricity had, in fact, contributed in no small measure in making Great

Britain the largest air base in the world. Praising the grid system, he said that, besides bringing electricity to all parts of the country, it had helped enormously in the development of the war effort and in the dispersal of industry when it became necessary. In some cases the latter had brought about a situation where the demand exceeded the supply in certain areas, but adjustment had been made possible because of the availability of alternative grid supplies. At the same time the total power requirements for war production had increased at a rate unprecedented in this country. Despite this added strain the grid system had needed relatively little added

Major G. Lloyd George addressing the E.A.W. On the Minister's right are the Dowager Lady Swaythling, president, and Miss Caroline Haslett, director



strength and throughout the war there had been no important hold-up of production due to lack of power or breakdown of the system.

As to the future, the Minister said he had received a number of memoranda from all sections of the industry in recent months and hoped before long to be able to give the Government's views. He referred particularly to the desirability of standardising

voltages and equipment, pointing out that of the consumers connected barely more than half received the standard 230 AC supply. As the matter was of such importance to consumers it had been decided that a great effort would have to be made to effect standardisation or at any rate to reduce the number of areas in which non-standard supplies were given. He wished attention would not only be given to appliances but installations, too, and he could not understand why plug-points could not be placed at a height and position which could be reached without stooping.

The aim of the industry must be a standard system of electricity universally available throughout the country at more or less uniform prices, backed by a first-rate service. We owed it to the women to free them from unnecessary labour and in our rebuilding and reconstruction we must remember to make provision for the housewives of the future. The luxuries of to-day would be the necessities of to-morrow and it was up to the manufacturers to find means of producing electrical appliances, such as those proposed for Lord Portal's prefabricated houses, in the greater numbers needed at a far lower cost than hitherto. In designing this equipment manufacturers should call on the experience of women who would after all be its principal users.

Women everywhere were growing more and more conscious, very largely through the work of the Electrical Association for Women, of the value of electricity in the home. This was just as true of housewives in rural districts as those in towns. The extension of electrification in rural areas, was, therefore, engaging his particular attention as also was the need for a more uniform tariff structure.

Increased exports were going to be necessary after the war and more and more would these depend on the skill of the workers. Before the war electrical appliances formed a considerable part of the export trade of this country and he thought there would be a large market for generating plant. He hoped to meet manufacturers to see what could be done to meet this demand for export.

Investigations were proceeding on the question of harnessing the tidal waters of the

Severn and on the practicability of using waste heat for domestic or industrial supplies. Extension of railway electrification would affect the electrical industry both from the point of view of power and plant.

Annual Meeting

At the annual general meeting of the Association which preceded Major Lloyd George's address it was announced that all the officers of the Association had been re-elected and that Lady Cripps had been appointed as a new vice-president. A resolution passed unanimously by the Council expressed to Lord Portal the Association's appreciation that so much consideration had been given to the needs of the housewife in the factory assembled house, and stated that they had heard with special pleasure that the houses might be adapted for a full electrical



Members of the Central Electricity Board staff: Mr. O. A. Sherrard, Mr. D. W. Coates, Mr. Harold Hobson and Mr. E. R. Wilkinson, with Capt. J. M. Donaldson (second from right), were present to listen to Major Lloyd George

service. The conference was presided over by the Dowager Lady Swaythling, and a review of the annual report of the Council to which we referred briefly in our issue of May 5th, was given by the director, Miss Caroline Haslett.

Proposed Hammersmith Showrooms

THE Hammersmith Electricity Committee recommends that the Borough Council shall take up the lease of premises opposite the Town Hall for conversion into showrooms to replace the present temporary demonstration centre. The stated rental is £550 per annum, but the lessors have agreed to charge a very low rental for the rest of the European war period; to charge a quarter for the first twelve months thereafter; and a half for the second twelve months. It is estimated that the total cost of adaptation will be £6,000.

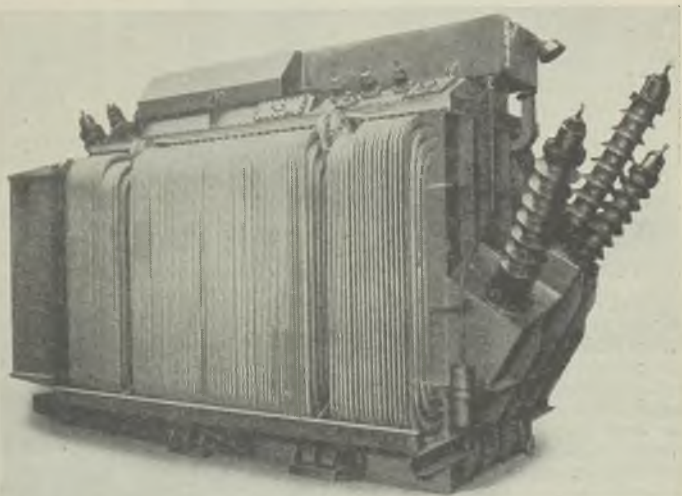
British Plant for Russia—IV

Large Transformers

Transportable Units Immediately Available on Site

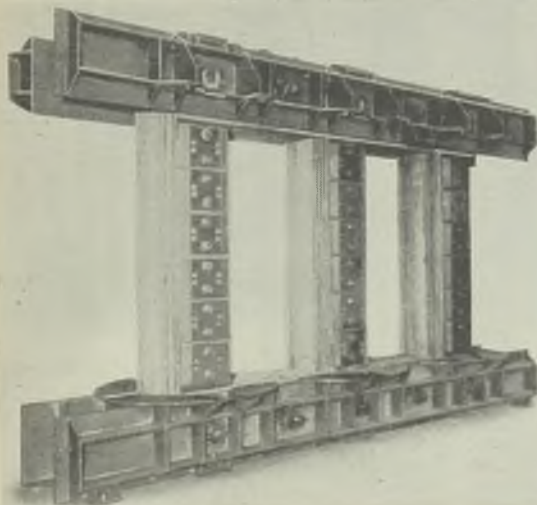
IT is a high tribute to the electricity supply authorities of this country that there has been so little disruption of supply during this war, and one of the contributory factors of this achievement is the foresight of the Central Electricity Board in asking the transformer makers to build a number of transportable transformers of various sizes and voltages for emergency use. These are specially designed so that they can be moved by road or rail in a completely erected state and filled with oil; they are thus ready for service immediately after being connected up. There have been several cases of disastrous enemy action, after which the availability of such transformers resulted in the electricity supply being reinstated in a very short time. Our Russian friends followed this good

example, and they asked the English transformer makers to supply a number of transportable transformers for similar service in Russia. The English Electric Co., Ltd., has already dispatched several 10,000-kVA and some 7,500-kVA transformers of this type. They are provided with three separate windings,



Above: The transformers are specially designed so that they can be transported by road or rail in a completely erected state

Left: The core is of the three-limb construction, with the yoke laminations interleaved with those of the limbs



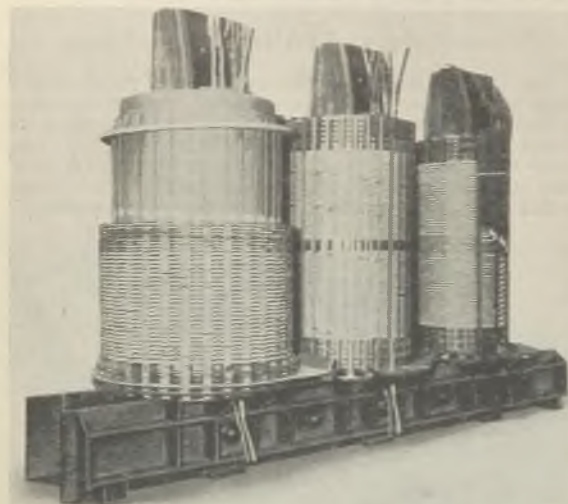
each of the full transformer capacity, for service at 110 kV, 38.5 kV and 6.6 kV. The construction is such that the transformers, completely erected and ready for service, except that the bi-directional rollers must first be removed, can be transported on the Russian railways on existing flat-bottom trucks.

The transformers are three-phase units of core-type construction, and they are of the naturally-cooled oil-immersed type, and are arranged for outdoor service. The core is of the three-limb construction, with the yoke laminations interleaved with those of the

limbs. The limbs are clamped with a single row of insulated bolts, with individual clamping plates. The main frames are clamped to the yokes by five insulated bolts passing through the laminations. For the

of coils. The 38.5-kV winding comprises a stack of disc coils wound continuously in series, each disc having a number of single-turn layers of a single rectangular wire. The 6.6-kV winding comprises a single-layer disc-spiral coil, the conductor being formed by a number of rectangular wires in parallel. Mild-steel clamping rings surmount the windings and transmit the pressure from large-diameter adjusting screws, eight per limb for the 110-kV windings, and four per limb for both the

The conductors of all three windings are paper insulated; mild-steel clamping rings surmount the windings



10,000-kVA size three saddles at the top and bottom bridge each pair of main frames, and between the top and bottom saddles there are insulated bolts of high-tensile steel passing up between the core and windings of each phase. A beam is attached to the three upper saddles for lifting,

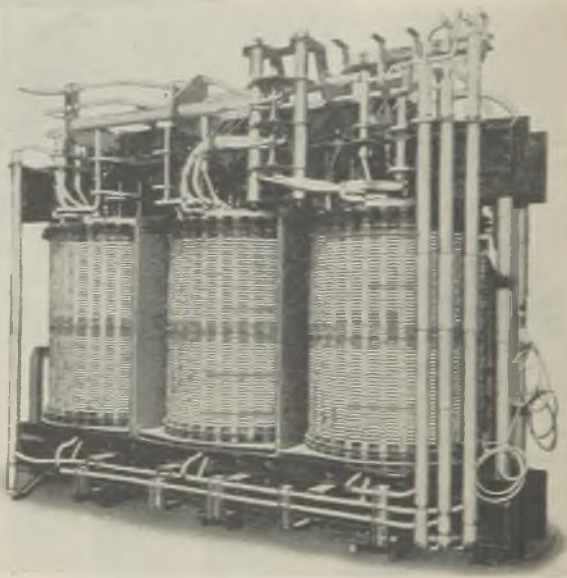
The three-phase tapping switches for each of the 110-kV and 38.5-kV windings are in tier formation with spacers of bakelised-paper tube between them; 38.5-kV and 6.6-kV connections and 38.5-kV tapping switch

and the strain of lifting the complete core and windings is taken through the tie bolts to the bottom saddles in which the core is carried. For the 7,500-kVA size the top saddles are bolted to the top main frames and there are no tie-bolts between the top and bottom frames. The main frames are suitably shaped to form adequate support for the windings and to provide means for clamping them.

The conductors of all three windings are paper covered. The 110-kV winding comprises a stack of pairs of disc coils all connected in series, each disc having a number of single-turn layers of a single rectangular conductor continuous throughout each pair

38.5-kV and 6.6-kV windings, mounted in the top frame.

Tappings are provided to allow for $\pm 2\frac{1}{2}$ per cent. and ± 5 per cent. variation about the normal pressure on both the 110-kV and 38.5-kV windings, and in each case the tappings are located in the middle of the winding. Adjustment of the tappings is



achieved by means of externally-operated tapping switches. A separate switch for each phase consists of a circle of copper studs in a bakelised-paper board, through the centre of which passes a spindle of insulating material bearing an arm with a spring-loaded segmental contact which bridges a pair of adjacent studs in each of the respective tap

positions. The three switches are in tier formation with spacers of bakelised-paper tube between them, and have a common operating spindle coupled to a handwheel mounted in the cover. This hand-wheel can be so locked as to prevent unauthorised interference, but only in a correct tap-position, indication of which is given by a pointer and scale.

The interphase connections are of paper-taped copper tubes, and supported vertically by being threaded through bakelised-paper tubes bracketed from the core frames, or over the horizontal portions by channel-section fullerboard struts. The 110-kV bushings are of the oil-filled condenser type with suitable porcelain rain shields. The three line leads are mounted in a pocket at one end of the tank, and the neutral lead is similarly mounted at the other end of the tank. The design is such that a porcelain can be replaced without removing the condenser bushing or draining any oil from the main tank. The 38.5-kV and 6.6-kV leads are brought through porcelain bushings located in the main tank cover.

Special Tank Construction

The tank is fabricated of heavy-gauge boiler plate and specially stiffened to permit transport of the complete unit filled with oil. A girder construction is welded inside the bottom of the main tank to the base and sides, and is co-ordinated with the main supporting structure which embodies both jacking and

lifting lugs for slinging on a crane. The conservator lies along the top of the cover and is specially shaped to suit the loading gauge when available trucks are in use. Internal baffle-plates prevent surging of the oil to and fro during transport. A double-float Buchholz protective device is mounted in the pipe between the main tank and the conservator. A silica gel breather ensures that only dry air enters the space above the oil in the conservator. An explosion diaphragm is mounted at the end of the tank near the 110-kV line bushings. A dial-type thermometer with maximum pointer and alarm contacts indicates the oil temperature, and a distant reading thermometer with 80 metres of flexible lead and armoured cable is provided, the resistance element being located in the hot oil.

The necessary surface for natural cooling is provided by rows of elliptical tubes welded into the long sides of the tank, in addition to which groups of detachable radiators are mounted at the ends of the tank. The arrangement is designed to conform to the minimum loading gauge through which the transformers are required to pass with all radiators in position. The cooling elements are spaced with respect to the windings in accordance with the "English Electric" special method, so as to achieve the minimum difference of oil temperature between the top and bottom of the tank and ensure that the maximum temperature in any part of the winding is as low as possible.

X-Ray Equipment for Stalingrad

Designed for Easy Installation

A NUMBER of fairly high-powered X-ray installations were required at short notice to equip the hospitals of Stalingrad.

They were to be complete in every detail, yet capable of being fitted up by Russian engineers probably having limited knowledge of this highly specialised branch of electrical engineering. The equipment eventually supplied was a special adaptation of the "Röntgen IV" generator and the "R.500" tilting couch, both manufactured by Watson & Sons (Electro-Medical), Ltd.

The type "RS-1" generator comprises a four-valve high-voltage transformer having an output of approximately 90 kV (peak) at 200 mA, contained in an oil-filled tank together with the high-voltage rectifying valves and both valve and tube filament transformers. Shockproof

high-voltage cables for connection to the X-ray tube are plugged into the top of the transformer housing. Connection between mains, trans-



Part of a consignment
of X-ray generators
for Russia

former and control table is by leads enclosed in flexible metallic tubing having large multiple sockets which are simply plugged into corresponding receptacles on the apparatus. Each

socket is clearly marked with a number corresponding to its appropriate plug, thus preventing a wrong connection. This system is a departure from the standard practice of carrying connecting leads in conduit and simplifies the work of installation, enabling it to be carried out by unskilled persons working to comprehensive installation instructions furnished by the manufacturers.

The control table is mounted on castors and incorporates a line voltage compensator together with the necessary controls and measuring instruments for the tube voltage and current. The latter is so interlocked with the timing circuit that it becomes impossible for the operator to overload the tube. A delay relay incorporated in the exposure circuit automatically ensures that the tube and valve filaments are fully heated before the exposure is made.

A milliamperes-seconds meter is automatically connected in circuit for exposures up to 0.5 sec.

It is electrically re-set to zero before the next exposure is made. The X-ray tube is of the oil-immersed shockproof type fitted with an air circulator. It has a double focus, change-over from the fine to broad focus being effected at the control table. The couch is a standard product adaptable to all types of radiography in the horizontal, vertical or tilted position. The tube stand is so arranged that, if necessary, patients may be examined on stretchers alongside the table. The only electrically controlled feature of the couch is the Potter-Bucky diaphragm, which may be released automatically just before the exposure is made.

Russia is already using a considerable quantity of British-made X-ray equipment, which has been supplied since the early days of her entry into the war. The majority of the sets thus supplied are 90/30 "Mobilix" trolley sets similar to those which are in use by the British Army.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Magnetic Sorter

FOR the sorting of ferromagnetic materials, both mixed bars and finished components, a convenient form of AC inductive balance has been produced by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17.

Two similar coils constitute the inductive arms of a bridge and two resistances the non-inductive arms. The detector is a 50 cycles per

All specimens that produce the same balance as that obtained with empty coils are strictly comparable with the standard in composition and in mechanical history. The two coils are mounted together as a plug-in unit, so that alternative coil sets can be used for testing components of other sizes or shapes. The coils are so chosen as to obtain the maximum effect of self-inductance. The consumption of this set is of the order of 15 W and it can therefore be energised from the ordinary 50 c/s lighting circuit.

Electric Pens

The incorporation of means of adjustment is a feature of the "Actograp" etching pens offered by LORANT & CO., LTD., 98, Croydon Road, London, S.E.20. This makes it possible to engrave lines of normal thickness as well as exceptionally fine lines.

The latest model operates at 2 to 4 V instead of the 6 V needed by the older pattern. The vibrator carrying the armature has been redesigned so that a straight writing point can now be used without a loop on top. Pen points are being made of new materials in place of tungsten, which is not easily obtainable; they have the additional advantages of less tendency to splutter at the point of contact and capability of being resharpened by grinding or with the aid of a smooth file. These engraving pens are energised by a small step-down transformer which has also been rearranged to provide for both normal and fine etching.

Spot Solderer

The same transformer as above is supplied for energising the "Lorsol" spot solderer. This consists of an electrode holder with an insulated handle at one end and a collet and nut at the other for securing sleeves to hold carbon tips of various diameters, which are machined to different shapes and sizes. Two of them may be fitted together, of the same or different sizes, one at a right angle and the other slanting to simplify soldering in awkward positions. The heat developed can be varied by adjustment of the transformer.



"Metroflux" magnetic sorter for checking small iron bolts against a standard

second vibration galvanometer with means of sensitivity control. The bridge is first balanced with the coils empty and then checked when the sample and standard pieces are inserted in the coils. Any unbalance will indicate that the sample differs from its standard.

One model of this "Metroflux" device is designed for comparing small bolts of the same nominal dimensions. The standard bolt is shown entering the rear coil and that under examination similarly entering the front coil.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE public utility companies and undertakings of the towns of Chatham, Rochester and Gillingham, have selected **Mr. H. F. Knell**, area manager of the Kent Electric Power Co., to be their spokesman on Britain's first Full Employment Council, recently launched in the district. The aim of the Council, which will be attained through four specialist committees concerned with production, distribution, economics and development, is to collect and correlate all information and ideas that may help in providing work in the area for all who are likely to be in search of it when the war is over. The Council hopes that the result of its fact-finding survey will be to open the way for the fullest possible development of the Medway basin as an industrial centre and port.

Mr. J. I. Law-Brooks, whose photograph we reproduce, has, as announced in our last week's issue, just been appointed manager of the Lon-



Mr. J. I. Law-Brooks



Mr. W. Symes

don office of the Metropolitan-Vickers Electrical Co., Ltd. **Mr. W. Symes** has been appointed works manager of the main Trafford Park works of the company.

Mr. S. T. Davies, clerk and treasurer to the Stalybridge, Hyde, Mossley and Dukinfield Joint Transport and Electricity Board, has been appointed temporary acting transport manager in succession to **Mr. A. G. Grundy**, the retiring manager.

Flight-Lieutenant P. R. Levy has been elected a director of **George Cohen, Sons & Co.** He is the younger son of the vice-chairman of the company, **Mr. George Levy**. For the past two and a half years he has been serving with the R.A.F. in the Middle East, his duties being concerned with engineering.

Mr. P. J. Ellis has been appointed general manager of **R. B. Pullin & Co., Ltd.**, and **Mr. B. T. Dyett** has been appointed secretary.

Mr. E. M. Deloraine, general director of the laboratories division of the Federal Telephone & Radio Corporation, has been elected a director of the International Telephone & Telegraph Corporation. **Mr. Deloraine** was born in Paris and after a period of technical training joined the French Army Signal Corps in 1917; after the Armistice he was engaged in research work at the Eiffel Tower under **General Ferrié** and he also graduated in physics. In 1921 he joined the

International Western Electric Co. (later the International Standard Electric Co.) under **Sir Frank Gill** and in 1933 was appointed European technical director. He took up his present position in the United States in 1941. **Mr. Deloraine** has a great deal of radio-telephone development to his credit, notably communication with ships, ultra-high-frequency transmission, high-power broadcasting (including the 120-kW Prague and Budapest stations) and automatic radio compasses for aircraft.

Mr. C. W. H. Glossop has been appointed a director of the Electrical Distribution of Yorkshire, Ltd., and its associated companies. He is already a director of the Yorkshire Electric Power Co.

Mr. M. Burningham has been elected deputy chairman of **Keith Blackman, Ltd.** He joined the board in 1929, having been with the company since 1896, and secretary since 1925.

The examining board, appointed by the Association of Supervising Electrical Engineers to adjudicate in the competition for papers read before branches of the Association during 1943-44, has just announced its decisions as follows: First prize: "A Comparison of Starting Methods for 3-phase Squirrel-cage Motors," by **Mr. S. H. Harding** (North West London). Second prize: "An Introduction to the High Frequency Induction Furnace," by **Mr. J. S. Smith** (Sheffield). Third prize: "Static Electricity," by **Mr. W. T. Partington** (Liverpool). The authors are to read their papers at the Association's meeting to be held at 6.15 p.m., on Tuesday, June 13th, at the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2.

Mr. F. Meyer, B.Sc., A.M.I.E.E., has been appointed technical director of the Sterling Varnish Co., Ltd. For the past seventeen years **Mr. Meyer** has been in charge of the insulation department in the Development Laboratory of the General Electric Co., Ltd., Witton, representing this company on many E.R.A. committees dealing with insulation. Before this, he was engaged on insulation work in the Technical and Research Department of **A. Reyrolle & Co., Ltd.**



Mr. F. Meyer

Mr. T. H. Carr, city electrical engineer and manager, Bradford, gave a luncheon talk on "Electricity Supply Matters" to the Bradford Rotary Club on May 12th, when there was an audience of over a hundred.

Mr. A. P. B. Renshaw has resigned from the board of the Philco Radio & Television Corporation of Great Britain, Ltd.

Mr. A. A. Harris has retired from the position of senior clerk and administrative assistant in

the Coventry Corporation Electricity Department with which he has served for forty-five years. At a recent gathering of his colleagues he was presented with an electric clock and a cheque by the city electrical engineer and manager (Mr. F. W. Godden).

The Londonderry Corporation Finance Committee has approved a resolution recommending that the salary of the city electrical engineer, Mr. R. V. Macrory, should be increased to £1,350 as from June 1st, no cost-of-living bonus to be paid.

Mr. W. H. Rogerson, sales director of Richard Johnson & Nephew, Ltd., is retiring on July 1st owing to ill-health. He has been with the company for fifty years and has been to a large extent responsible for the sales structure of the wire industry.

Mr. S. H. Parsonage, A.M.I.E.E., chief engineer of Compound Electro Metals, Ltd., has been appointed manager of the company.

Major-General Sir Evan Gibb, K.B.E., who is associated with Sir Alexander Gibb & Partners, has been re-elected president of the London Chamber of Commerce.

Mr. Max Falk has retired from the chairmanship of Falk, Stadelmann & Co., Ltd., but retains his seat on the board. Mr. Gustav Falk has been appointed chairman of the company and will retain his position as joint managing director.

Sir William Murray Morrison, vice-chairman and managing director of the British Aluminium Co., is chairman of the British Non-Ferrous Smelters' Association, whose formation was reported in our May 12th issue.

Mr. John Grainger, assistant lighting superintendent to Newcastle-on-Tyne City Council, has been appointed lighting superintendent in succession to Mr. R. Davison, who has retired. Mr. Grainger has been in the lighting department for twenty years.

Obituary

Sir William Chamberlain, Regional Transport Commissioner for the North West, who died at Manchester on May 19th, received his early electrical training with the Lancaster and Wallasey Corporations and was afterwards appointed assistant electrical engineer to the Mersey Docks and Harbour Board. In 1902, he joined the Oldham Corporation Electricity Department as mains superintendent, becoming joint electrical engineer in 1914 and later tramway manager. Subsequently he held similar positions at Leeds and Belfast. Sir William was appointed chairman of the North Western Traffic Commissioners in 1930 and was knighted in January, 1939. He was a past-president of the Municipal Passenger Transport Association.

Mr. Henry C. Duncan, who two years ago retired from the position of commercial assistant to the St. Helens electricity undertaking, died recently at the age of sixty-seven. He had been in the Corporation's service thirty-eight years.

Mr. F. Schofield, whose death occurred recently at the age of seventy-five, was engaged in the transport business for thirty-seven years. He was originally with the Bradford Corporation Tramways and was appointed tramway manager

by the Leyton Corporation in 1905. When the Leyton system was taken over by the London County Council in 1921 he also transferred and later upon the establishment of the London Passenger Transport Board became northern divisional superintendent of tramways, a position from which he retired in 1934.

Mr. A. Strange.—We regret to learn from Messrs. E. R. & F. Turner, Ltd., and Bull Motors of the death on May 12th, following a cycling accident, of Mr. Arthur Strange, head of their Buying Department. Mr. Strange had been with the company for about thirty-eight years.

Mr. H. C. Norman.—In our issue of May 5th, referring to the death of the former general manager in Australia of W. T. Henley's Telegraph Works Co., Ltd., we inadvertently gave his name as H. C. Morgan.

Illuminating Engineers

Annual Meeting and Address

THE annual meeting of the Illuminating Engineering Society was held at the Institution of Mechanical Engineers, London, on May 9th. The report for the past year was summarised by the president (Dr. H. Buckley), who drew attention to the formation of new centres at Bath and Bristol and new groups at Derby, Huddersfield and Stockton-on-Tees. The report explained the new method of organisation into seven areas, each with its own committee which in turn is represented on the Areas Joint Committee. About 240 new members joined during the year. The number of meetings held, upwards of 60, exceeded the pre-war figure.

It was reported that the new officers and members of Council were as follows:—President: Mr. E. Stroud; Vice-Presidents: Mr. H. C. Weston, Mr. Dean Chandler, and Mr. Howard Long; Hon. Treasurer: Mr. N. V. Everton; Hon. Secretary: Mr. J. S. Dow; Members of Council: Messrs. P. V. Burnett, W. J. G. Davey, W. Hetherington, R. Maxted, C. W. M. Phillips, George Smith, J. M. Waldram and G. T. Winch.

Tolerances in Measurement

Following the transaction of formal business, an address was delivered by Sir Charles Darwin (Director, National Physical Laboratory) on "Tolerances and their Effect on Physical Measurements."

One of the many examples chosen by the speaker was the optical "resolving power" worked out by Lord Rayleigh about seventy years ago. In that case the tolerance was fixed by the wavelength of light in respect of the ordinary microscope, but the electron-microscope limit depended on the voltage of the electrons; at 60,000 V it was about 10^{-8} cm., although other problems of design rendered it impossible to see single atoms, as that figure might suggest.

The essence of the conclusion propounded by the lecturer was that, while the electron might have position and velocity, both quite definite, one could never find them both with precision at the same time; that idea was embraced by the "uncertainty principle" which was perhaps only one of a number of limitations to tolerance in nature.

CORRESPONDENCE

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

Aluminium Alloys for Cookers

WE have read with interest in your issue of May 5th the account of the I.E.E. paper on domestic appliances, and were particularly intrigued to note the remarks of the authors with regard to reduction in weight of cookers, etc. We were, however, disappointed that no mention was made of the possibilities of aluminium alloys for many portions of cookers and similar equipment, as we believe that a valuable reduction in weight could be made by the proper application of suitable alloys. It may not be generally realised that the aluminium alloys available to-day cover a wide range of mechanical properties, and they can be treated to provide excellent surface finishes.

Present conditions make it difficult for rapid progress to be made in the development of new applications of aluminium alloys, but the Advisory Service Bureau of the Wrought Light Alloys Development Association, 63, Temple Row, Birmingham, 2, is ready to provide all available information on this subject to designers and manufacturers.

Birmingham.

E. G. WEST, Ph.D.,
Manager.

Plugs and Sockets

FOR months now the "trade" has been discussing the retrograde proposal to introduce a new 10-A plug suggested by Mr. Jacobi and others at the I.E.E. This proposal has been condemned right and left by factors and contractors as providing another unnecessary accessory to saddle the trade and public with. We have more sizes of plugs now than is actually necessary, but we have, at least during the past ten years or so, attained some sensible degree of standardisation.

Now, to crown all, we are faced with another suggested universal plug, 2 to 13 A of a bastard size and different in every respect from all existing standard plugs. I have seen some illustrated descriptive matter of the new gadget and cannot understand why the makers should have decided to try and inflict this oddity on the trade and public in existing circumstances.

The actual article is not yet available, and so my criticisms are founded on the printed and illustrated descriptions. One of the main points about the new plug is that one size will be suitable for anything from 2 to 13 A, although it is very little larger than the existing 2-A plug. The pins and terminals appear to be very close together; in fact dangerously close. The pins are, I gather, loose in the plug top and as the "live" and "neutral" pins are of the same size as one another, I assume that they are interchangeable in the holes so there

is nothing to prevent the "live" or fused pin from being inserted in the neutral hole or *vice versa*, so that if this is done, and it would often be done, by accident or ignorance, the circuit would be without a fuse on the "live" side at all.

As either a 2-A or a 13-A fused pin can be screwed into the plug it is easy to see that safety is going to vanish as the 13-A fused pins would very soon be used to control all circuits whether they were for reading lamps, radio, or any other current consuming device.

The terminals in the plug top appear to be so close together that, in my opinion, endless trouble would ensue through strands of flex getting across. The so-called rubber ring cord grip does not appear to be an effective cord grip at all, and as the plug is supposed to be big enough for 15 A it would have to take all sizes of flex from 14/0076 for reading lamps up to 110/0076 for 3-kW radiators. How does the rubber ring effectively grip the above two sizes of cord and all other sizes in between?

There are other points which, to me, appear to be unsatisfactory about this new plug, but not being able to see one, it is difficult to form definite conclusions. I am, however, firmly convinced that it is not wanted by the trade, neither is it necessary as we have, at present, all that is required and all, or nearly all, manufacturers are making to a definite and sensible standard at present.

In the *Electrical Review* of May 12th a note on fused pin plugs refers to terminals of improved form. Open slot terminals are not new at all as this type of terminal was invented by me and patented in 1919 (Patent No. 132700) in connection with my open slot connector for use in conduit boxes. The connectors were also used for tapping on to small aerial wires.

In conduit systems, the idea in those days was to save looping and therefore save wire, one of my main claims being: "the through wire need not be cut."

Of course, my patent rights ran out years ago so anyone may now use it, but it is not a new idea by any means.

Bradford.

HARRY MOSS.

IN the past there never has been a domestic standard plug. The nearest approach was three different B.S.S. sizes for 2-A, 5-A, 15-A. The necessity for introducing a fuse into the plug point, to enable a larger number of plugs to be employed in small and medium sized post-war houses, points to the desirability of having a domestic standard fused plug and socket. The objective stands out clearly, but there are so many avenues of approach that there is danger of confusing the issue.

With the exception of the solution of which I am an exponent, which I will deal with later, there are three main proposals, to (1) label the present 5-A B.S.S. 546 10-A, and to introduce a fuse into the socket, on the assumption that nothing larger is likely to be wanted; (2) introduce flat-pin plugs with alternative socket holes to take the various sizes of plugs; (3) use the present 15-A size, embodying a fuse, throughout the installation.

It is easy to descant on the merits and demerits of these proposals, but the only observation which matters is that they are all too expensive for general use and so none of them is likely to become universal practice.

When it was proposed to introduce a fuse into what was to be a general service domestic plug point we all made the mistake of trying to do with existing standards, instead of realising at once that this new problem required a new solution.

It was only after months of design and experiment that it became apparent that the 2-A, 5-A, and 15-A B.S.S. 546 sizes are hopelessly out of scale and that everything for which these three sizes are wanted in a domestic installation can be done more efficiently and more cheaply by one size only, viz.: 3-kW, 230 V, which need not be of much larger overall size than the 2-A. This is a matter of fact, which can be verified by anyone possessing elementary facilities.

Interchangeability, like Mesopotamia, is a blessed word, but whatever solution is adopted, there can be no large measure of interchangeability with old plugs. If, for instance, all the sockets in new houses were made to take B.S.S. 546 5-A plugs, it is obvious that the following would not fit. B.S.S. 2-A and 15-A plugs; flat-pin plugs; and last, but by far the most numerous, 2-pin 5-A and 2-A plugs, which held the field up to 1934. The only ones which would fit would be 3-pin 5-A plugs made subsequently to 1934 and very far from universally adopted.

Now that it has been established beyond peradventure that one small size only is not merely advantageous on technical grounds, but would reduce the cost of wiring the post-war houses contemplated by the Government by many millions, it is to be hoped that those who have the responsibility of guiding the industry will not allow preconceived ideas to stand in the way of a move towards real and practical standardisation.

London.

R. AMBERTON.

Compulsory Registration

ON page 711 of your issue of May 19th there is a report of Mr. L. C. Penwill's remarks on statutory regulations, etc. In the middle of the page is an editorial statement that the recent I.E.E. report did not favour compulsory registration but considered that statutory wiring rules would be sufficient.

This is not correct. The I.E.E. report says

that there is no evidence of a sufficiently serious nature as to justify so drastic a measure as that of compulsory registration or to justify the enactment of compulsory regulations at the present time. The report also refers to a tendency to over-emphasise the dangers of electrically caused accidents and fires in comparison with those due to other causes.

The self-styled National Committee has consistently over-emphasised these dangers and it is important that the reassuring report of the I.E.E. Committee should be equally well known. The I.E.E. Report has at least the merit that it is entirely disinterested.

London, S.E.1.

"CONSUMER."

[The actual words of the report were:—"An appraisalment of the technical aspects of the available evidence does not support a need for the compulsory registration of contractors and operatives, or for the enactment at present of compulsory wiring regulations. If necessary, the proposed Basic Safety Regulations could later be given the force of law."—Editors, *Electrical Review*.]

AS one of the advocates of compulsory registration and rules I am disappointed at the lack of enthusiasm in a matter that is of vital interest to all bona fide contractors. The views expressed by the I.E.E. Sub-Committee are difficult to understand in view of the fact that there is ample evidence to support the necessity for compulsory registration and rules. The Sub-Committee has evidently not had an opportunity of examining some of the innumerable horrible examples of installation work in existence. Surely also if only one person is killed per annum by faulty installations in domestic circles, that in itself warrants "something being done about it."

The advocates of compulsion do realise the impossibility of securing an absolutely infallible scheme and many realise the utter uselessness of the N.R.E.I.C. To educate the public to employ only reliable contractors is not only a slow and painful process but is also more or less useless, because the public are primarily concerned about cost.

Mr. L. C. Penwill is to be congratulated on his strong stand to drive home the necessity for compulsion, but he exaggerates a little when he says that an army of inspectors would be required. If it is possible to reach our goal, i.e., compulsion, then it would also be possible to inflict a nominal fine for a contractor's first offence, a heavier fine for a second, and if he risked a third he would no longer be able to continue as a contractor.

There surely must be other reasons for the apathy towards the elimination of the present voluntary system and what those reasons are can only be conjectured. Any electrical contractor who takes a pride in his work is an enthusiast for compulsory registration and rules and sometimes when fighting for the "right" the minority can win.

Glasgow.

ALEX. MILNE.

American Farm Equipment

Progress in Rural Electrification

MORE than four out of every ten American farms are now served with electric light and power by private and public utilities and by systems financed

This intensive development of rural electrification in the United States has brought many inquiries and specialists from other lands. Twenty-six engineers from thirteen

Latin American nations, and two from Puerto Rico, have completed a year of work with the R.E.A. and the plan may be used as a pattern for the development of rural electrification in many other nations.

The accompanying pictures illustrate typical examples of equipment used in the farmhouse and about the farm. A very



by the Rural Electrification Administration, which was established by an Act of the U.S. Congress in 1935.

Co-operative power systems, voluntarily organized by farmers' groups and financed by the R.E.A. now operate 385,000 miles of transmission and distribution lines in 46 of the 48 States, as well as in Alaska and the Virgin Islands.



modern range is seen in the top picture along with a refrigerator and other appliances. The feed mixer in the centre picture was economically constructed from plans provided farmers by the R.E.A. The motor can readily be moved from one machine to another.

A small portable motor (lower left) operates the mechanical corn sheller, shown in the bottom illustration, efficiently and economically. In the background is a portable feed mixer to which the motor can be attached.

COMMERCE and INDUSTRY

Water-Power Plant Assessment. International Standards.

Industry and Education

A TWENTY-PAGE report has been prepared by the Education Committee of the Federation of British Industries setting forth views upon the nature of the education required for entrants to industry and the part to be played by industrialists in securing the right kind of education before and after entry.

It is pointed out that young people from elementary schools largely lack powers of expression and also discipline and a sense of responsibility. Those from secondary and technical schools are generally better but show evidence of having been "crammed" for examinations. The education of those entering industry from the universities and technical schools is thought to be too factual; insufficient weight is given to the study of principles and the development of imagination. Suggestions are made for overcoming these deficiencies and hope is placed in the proposed reorganisation of secondary education.

Industrial firms are urged to co-operate with local authorities in carrying out the obligations imposed by the Education Bill and methods of securing this co-operation are suggested. The establishment of works schools is considered to be a valuable means of ensuring vocational and general training. Adult education is also to be encouraged.

E.I.B.A. Acknowledgments

Six contributions of £100 or more were received by the Electrical Industries Benevolent Association during the first four months of the year. They were from Venner Time Switches, Ltd., £250; E.D.A. (special effort), £240 11s. 9d.; Edmundsons Electricity Corporation, Ltd., £200; I.M.E.A., £105; Girdlestone & Co., £100; and Philips Lamps, Ltd., £100. The Association also received £96 18s. 9d. from its Dublin Branch (special scheme), £65 from the Chloride Electrical Storage Co., Ltd., £52 each from Davies, Kent & Stewart, Ltd., and the E.C.A., and £50 from each of the following: Hackbridge Electric Construction Co., Ltd., Marryat & Place, Ltd., M.K. Electric, Ltd., Mullard Wireless Service Co., Ltd., and the Newcastle & District Electric Lighting Co., Ltd.

Power Plant Valuation

The Secretary of State for Scotland last year set up a committee to review the practice in Scotland in relation to rating, one of three inquiries being on the valuation and rating of hydro-electric undertakings. It is now stated that an interim report has been received by the Secretary of State in which the point is made that, whereas a steam undertaking for the production of electricity is allowed to deduct the very large sums expended annually on coal and other fuel, a hydro-electric concern, in addition to having no fuel costs to deduct is prohibited from deducting any part of the annual charges on its civil engineering works, which are the counterpart of fuel costs.

An example of this anomaly was worked out

independently by the Electricity Commissioners and the Grampian Company for hypothetical equivalent steam and hydro-electric stations. Two such stations, of 120,000-kW capacity would, under the existing system, pay in local rates £35,000 in the case of steam power and £106,900 in the case of water power. The Rating and Valuation Committee, it is stated, recommends that the system governing the valuation and rating of water-power schemes should be adjusted to that which has applied to steam plant for the last half century.

Plans for Post-war Television

A *Reuter* report from Philadelphia states that under the leadership of Mr. F. J. Bingley, a native of Bedford and formerly assistant to Mr. J. L. Baird, research engineers are working day and night in the Philco Corporation laboratories to establish a technique for a future television "chain." In an interview Mr. Bingley said that soon after the war there would be an Atlantic television broadcasting chain made possible by means of radio relay stations ten to fifty miles apart and the same procedure would be applicable in Britain. The company's television research work would be placed at the disposal of its sister company in London.

Britain's Manpower

A well-produced booklet has been prepared by the Ministry of Information for the Ministry of Labour and National Service on the subject of "Manpower." Its aim is to show the people of this and other countries how the whole of the nation's men and women have been moulded into a machine for the prosecution of total war. The building up of our fighting services and industrial forces is effectively described and illustrated by many excellent pictures. The cost of the booklet is 9d., and it is obtainable through the usual channels or from the Stationery Office.

Standards Co-ordinating Committee

It has been decided, as a temporary measure, pending the return of full international co-operation, to provide a centre available for the immediate co-ordination of standards in the field of communications of all kinds, both transport and telecommunication, and the development of standards for use in connection with the transfer across borders of raw materials and partly or wholly finished articles. These standards will provide agreed methods of expressing and testing the properties of materials, appliances, symbols, terms and definitions, and will include dimensional standardisation to secure interchangeability where the replacement of parts is an important consideration.

The scheme evolved provides for the establishment of a United Nations Standards Co-ordinating Committee, with offices in London and New York, with the object of promoting the maximum possible co-ordination and unification of standards necessary for the war effort and the immediate post-war period. The promulgation of the standards will be the

responsibility of the national standards bodies. Membership of the Committee will be open to national standardising bodies of such of the United Nations as may desire to participate in and support the work of the Committee.

Handling Commodities

The British Federation of Commodity and Allied Trade Associations, of which the London Metal Exchange and the Rubber Trade Association of London are members, has issued a review of British organised commodity markets in which views as to the future are expressed.

The review describes the normal work and functions of merchants and shows the large and important part which these and the services of British organised markets played in our own and in the world's peace economy. It provides some hitherto unrecorded statistics relating to pre-war international trade and the contribution made by British markets to this country's "invisible" income.

It is considered that the restoration of our export trade after the war and the solving of the problem of our international balance of payments will, to a large extent, depend on ensuring the utmost measure of freedom possible at the earliest moment to the British organised markets. Commodity conditions at the end of the war and the stages by which decontrol should be effected are discussed and the view is put forward that "futures" markets, in certain staple commodities, form an essential part of the trading machinery for the protection of producer and consumer alike.

International trade agreements and internationally controlled "buffer pools" (except as a temporary measure) as devices for the regulation of raw material prices are not favoured as they are said to tend to make business a political rather than an economic issue, can never be wholly effective, and produce uneconomic prices.

Toroidal Potentiometers

The second paragraph of the reference to continuously variable resistances in our May 12th issue (p. 673) may be somewhat misleading. The actual values of the four sizes available are from 10 to 8,000 ohms at 25 W rating, 12 to 14,000 ohms at 50 W, 12 to 25,000 ohms at 100 W, and 12 to 30,000 ohms at 200 W.

Gauging Wall Thickness

Attention is directed by the U.S. Office of War Information to an instrument for determining the "wall" thickness of tubular metal objects, which does not require access to the inner side of the tube. The object is irradiated with gamma rays, or a beam of neutrons; measurement of the intensity of the scattered radiation enables the thickness of the "wall" upon which the rays impinge to be

calculated because the scatter increases with thickness of the metal. The *Oil and Gas Journal* explains that liquid levels in tubes and tanks can be ascertained in this way while continuous recording of the gravities of liquids flowing through pipes may be possible by the same means.

Lighting in Industry

The British Thomson-Houston Company's lighting engineers recently arranged a display for an exhibition in the provinces organised by the Royal Society for the Prevention of Accidents. As our reproduction shows, the demonstration of glare in the exhibit makes it



A display arranged by B.T.H. lighting engineers to demonstrate the importance of good lighting to avoid accidents

impossible to read the wording on some of the cards.

Engineers for the Merchant Navy

Pointing to the lack of facilities for the training of engineers for the Merchant Navy, the Council of the Institute of Marine Engineers recommends the establishment of a Merchant Navy Engineering College. The full course of training should last five years, including at least two years' heavy workshop experience. Entry to the College would be by competitive examination.

Raw Materials Position

Upon the whole the position as regards the supply of essential raw materials during 1943 was not radically different from that prevailing in the preceding year. Rubber supplies remained stringent and the enormous development in electrical instrument production for aircraft and military purposes gave rise to anxiety regarding mica, particularly certain critical grades.

These facts are given in the second annual report of the Combined Raw Materials Board which also says that in other directions, notably aluminium, magnesium, mercury and some alloying metals, the situation was easier. In fact, towards the end of the year there was a surplus of some materials, particularly metals, and were it not for other limiting factors—

manpower, transport and plant capacity—a more lenient consumption policy could be justified for the time being. As it is, it remains for each country to decide for itself whether certain pressing civilian needs can be met.

Electricity Supply Wages

An award of 1d. per hour increase has been made to employees covered by the agreement of the National and District Joint Industrial Councils for the Electricity Supply Industry by the Industrial Court in its Award No. 1961. The increase operates as from April 28th. An advance of 2d. per hour was claimed.

E.T.U. Conference Postponed

The conference of the Electrical Trades Union which was to have been held at Southport on July 24th and subsequent days has been postponed.

The Joint Memorandum

The Memorandum on Electricity Distribution prepared by the Incorporated Municipal Electrical Association, the Provincial Electric Supply Association, the London Electricity Supply Association, and certain individual power companies, has now been approved by the respective Associations and has been forwarded to the Minister of Fuel and Power.

This Memorandum, it is claimed, embodies the views of the overwhelming majority of undertakings in the industry, both municipal and company, upon matters affecting the development of electricity supply in the interests of the consumer. It does not offer any views on political questions as the parties to the Memorandum have expressly excluded such questions from their considerations. Those responsible for the Memorandum feel that when the reforms now suggested are made there will be a wide measure of uniformity throughout the country and increased benefits should be enjoyed by all types of consumers.

Retail Business Summons

Mr. Ernest Bowes, an electrician, of Consett, applied for permission to open a shop in Station Road. The application was rejected by a branch committee of the Board of Trade, but he was allowed to carry on repair work and sell goods by service and installation. At Consett police court last week when he was summoned for opening premises and carrying on a retail business in electrical and radio equipment it was stated that no goods were displayed in the window and ostensibly the shop was a service depot. Two inspectors of the Board of Trade, however, entering the shop individually, bought an electric lamp and two wireless valves for which they paid cash. Defendant said that the sales were made contrary to his instructions to the assistant. A fine of £3 was imposed.

U.S. Government Sues Cable Makers

The U.S. Government has filed a civil suit in the Federal Court against the Anaconda Wire & Cable Company. The action is for damages on the basis of alleged fraudulent claims filed with the Government for inferior field wire, assault wire, insulated electric cable and submarine cable, produced by the company's works at Marion, Indiana, for use by the American

armed forces and the Allied governments. At the end of December, 1942, the U.S. Government filed a civil action against the company claiming £1,500,000 damages following an indictment by the Federal Grand Jury at Fort Wayne against the company and five of its employees. The charges then made were that there had been a conspiracy to foist defective wire and cable on the armed services. Russia complained that 50 per cent. of wire manufactured by the company and sent to Russia for use in communications lines was defective. The president of the company said that employees were dismissed following complaints and investigations by the company.—*Reuter*.

TRADE MARK APPLICATIONS

THE following applications have been received for British trade marks. Objections may be entered within a month from May 17th:—

HOWELLS. No. 624,143, Class 7. Electric motors (not for land vehicles), dynamos, buffing machines and grinding machines. No. 624,144, Class 11. Electric fans.—Howells (Electric Motors), Ltd., 105, York Street, Hanley, Stoke-on-Trent, Staffs.

B.V.C. No. 624,512, Class 7. Pneumatic conveying plant. No. 624,513, Class 9. Stationary and portable electric vacuum cleaning apparatus and vacuum dust extractors; dust collecting bags of textile material for use with and being parts of all the said goods.—British Vacuum Cleaner & Engineering Co., Ltd., Goblin Works, Ermy Way, Leatherhead.

PHILOX. No. 627,733, Class 7. Electric welding machines. No. 627,734, Class 9. Electric welding apparatus (not being machines), and welding electrodes.—Philips Lamps, Ltd., Century House, Shaftesbury Avenue, London. W.C.2.

GENSIGN. No. B626,566, Class 9. Signalling and telephonic apparatus.—General Signal & Time Systems, Ltd., 73, Great Peter Street, London, S.W.1.

LIGHTFOOT. No. 625,309, Class 11. Refrigerating apparatus and parts thereof not included in other classes.—Lightfoot Refrigeration Co., Ltd., Abbeydale Road, North Circular Road, Wembley.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Standard Insulating Co. present address.

PHENOGLAZE system of varnishing.

FAIRY electric cooker.

METALUX electric kettle.

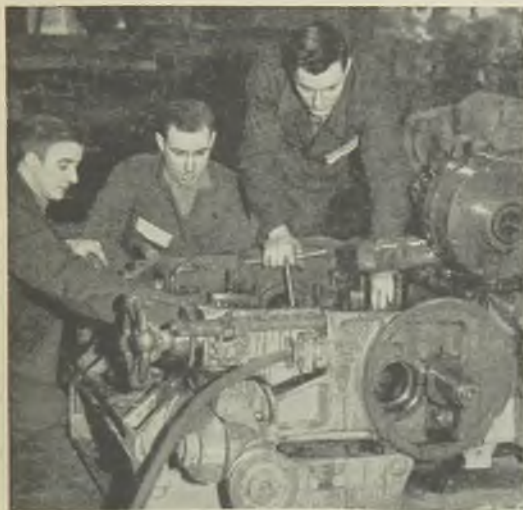
Mechanised Mining

Training for Operation, Maintenance and Repair Work

A REPLICA of actual galleries in a coal mine is one of the features of a coal mining mechanisation centre set up by the Ministry of Labour and National Service, on behalf of the Ministry of Fuel and Power, to facilitate instruction in the use of the most up-to-date mechanical appliances. Trainees and the machines thus operate under exactly the same conditions as in the mines, except that no coal is actually cut.

two 48-V 300-Ah batteries housed in the sides. For connection to other machines mentioned the gate-end boxes installed are of a number of different types so that the trainees can get to know the features of each.

In addition to the model galleries, the training facilities include lecture rooms, complete with film and epidiascope equipment; an electrical wiring room, where initial instruction is given in elementary circuits and methods of cabling, connections, etc.; and elementary and advanced DC and AC generation and distribution departments, the final section covering such things as connections in parallel, transformers, lighting, telephones, bells, battery charging, pumping equipment, coal-cutting machinery and mining machines generally. Three bays are provided at the centre for welding and general pit equipment repairs.



Dismantling a coal-cutting machine, and (right) a battery-driven shuttle car for carrying coal from the face to the conveyor belt



Training at present covers a dozen different types of machine, both British and American, comprising coal cutters, "Joy" loaders, duck-bills, shuttle cars and belt and scraper-chain conveyors. All these are electrically driven and their general principles of operation are fairly well known, with the exception of the shuttle car. This new American machine is employed for transporting the coal from the coal face to the conveyors, and, carrying 3½ tons, will unload in 30-60 sec.

It is 20 ft. long by 7 ft. wide and 3 ft. high and has, for convenience of manipulation in the restricted situation in which it operates, a reversible driving seat. The two 4-HP motors driving it are run from

Four different courses are being run at present, and there are prospects of a fifth being added shortly. Scheme I gives a month's training to electrical and mechanical fitters who are at present in the mines. They are selected from the various collieries in which it is anticipated the first consignments

of mechanised equipment available will be installed. The scheme caters for approximately 25 men, half of them mechanics and half electricians, and the course is devised so that the electrical men receive as much mechanical training as possible and the mechanics as much electrical training as possible, the object being to produce men capable of dealing with breakdowns on either side. The first 100 men have already been through the course.

Scheme II is designed to produce first-class colliery electrical mechanics in preparation for the time when a larger measure of mechanisation is achieved. Under it colliery managements nominate men who are already miners who wish to advance and become mechanics and wages are paid during training. The six months' specialised intensive training covers fitting in all its branches, machine operating, direct and alternating electrical work and a good knowledge of welding procedure.

The third scheme, which has, however, not yet been approved by the Ministry of Fuel and Power, is for men who have volunteered or been directed into the mines, but have an engineering background. Men accepted under this scheme would be given

an examination based on the syllabus of Scheme II and then trained accordingly. Provision is made to train 600 men under Scheme II (or Schemes II and III if the latter is adopted) working on a two-shift basis (7½ hours each).

The two remaining courses known as IVa and IVb are similar to Scheme I and each lasts a week. Catering between them for up to 50 men at a time, they are intended respectively for operators only (coal cutters, not mechanics) and "overmen" in charge of operators. Arrangements can also be made under Scheme II for a four months' course for electricians only, or, alternatively, for mechanical fitters only.

The training centre, which is under the management of Mr. L. T. Davis, is staffed entirely by Ministry of Labour personnel but receives expert advice from the Ministry of Fuel and Power regarding specialised training. The Ministry of Fuel and Power has a Local Advisory Committee the chairman of which is Professor Statham, Sheffield University, and serving under him are representatives of managements, electrical and mechanical engineers, and the miners themselves, who are invited to suggest improvements for future courses.

New Zealand Power Position

Minister's Explanation

IN March a meeting of representatives of the Auckland provincial power boards and other interested parties called upon the New Zealand Government to acquire immediately a steam generating plant to relieve the growing shortage of power. It was stated that the power position was becoming "alarming" and it was urged that a delegation be sent abroad at once to procure the necessary equipment to relieve the situation.

A few days later the Minister of Works (Mr. Semple) replied that the Government was making inquiries in England, Canada and the United States to see if steam generating plants could be purchased there on definite delivery dates. He said that it was far better to get Mr. Nash (the New Zealand Minister in Washington) to press the Dominion's claims with British manufacturers than to send from New Zealand a delegation with far less standing overseas to do the same thing.

There was an allegation that the New Zealand Government had been offered, but had not accepted, a 40,000-kW plant made by a Swedish firm. That was true, but it had not been disclosed that the South African Electric Supply Commission for which the plant had been manufactured had not yet consented to its being released to New Zealand, if New Zealand decided to accept it. Nor had it been disclosed that the plant consisted of a generator only, not including boilers, which would take about a year to manufacture. Even then delivery was dependent upon the war situation and it was possible that the South African

Commission, if it had been given a definite delivery date, would not care to release the plant to New Zealand.

Similarly, New Zealand could not be assured of the delivery of plant from Switzerland. It was far better to concentrate on getting delivery of the plant already ordered and being manufactured in England.

Mr. Semple gave a detailed account of the circumstances which had led to the present position. He said that between 1934 and 1940 236,400 kW of generating plant had been ordered—double the amount of the Government's installed hydro-electric plant. Up to 1940 63,200 kW of plant had been brought into service but since that time the position had gradually deteriorated owing entirely to the war. In 1940 173,000 kW of plant was on order. Of this 21,600 kW due for service by March, 1941, had been held back by reason of war conditions and restrictions imposed in England. This plant had not been delivered but it was hoped to have it in service by March, 1945.

Plant due for service by March, 1942 (21,600 kW) had also been held back by war conditions and was not expected until March, 1946. The remaining 20,000 kW of plant due for service in March, 1942, had been installed and was in operation after a year's delay; a similar amount due for March, 1943, was also installed after a year's delay. In addition there was 60,000 kW due for service by March, 1944, which was not expected to be ready until 1946 and a further 30,000 kW due for service in March, 1945, which was not expected to be in operation until 1947.

ELECTRICITY SUPPLY

Voltage Change Costs. Stirling Decision.

Berwickshire.—**RURAL SUPPLIES.**—The West Berwickshire Area of the National Farmers' Union has passed a resolution that the conferring of a monopoly of supply on the local electricity companies should carry with it a corresponding obligation to supply all reasonable requirements of outlying places at a flat rate. The practice of taking only the lucrative cream and leaving the rest unsupplied, it was stated, is wrong.

Chesterfield.—**ELECTRIC PUMPING.**—Having considered terms submitted by the Corporation Electricity & Gas Departments for supplying motive power to a pumping station where the existing gas engines and reciprocating pumps are worn out, the Chesterfield and Bolsover Water Board has decided to accept those of the Electricity Department. The total estimated cost, including cables, transformer and switchgear, is £1,586.

Clackmannan.—**PROPOSED SUBSTATION.**—The County Council is considering an application from the Scottish Central Power Co. for permission to build a transformer substation.

Dundee.—**ELECTRICITY FOR MENTAL HOSPITAL.**—The Public Health Committee at its last meeting agreed to ask Professor William Kerr, Royal Technical College, Glasgow, to advise the Corporation in connection with the supply of electricity to the Mental Hospital.

Exeter.—**COST OF STANDARDISATION.**—The city electrical engineer, in a report to the Electricity Committee on post-war planning proposals, pointed out that the voltage laid down by the Electricity Commissioners for the country had been fixed at 230, whereas the voltage in Exeter was 210, having been changed from 105 some years ago at a cost of approximately £21,200, which was borne entirely by the electricity undertaking. Furthermore, the cost of changing the frequency, which amounted to £16,600, was also borne by the undertaking, but in this case half the interest payments were the subject of Government grant. If any standardisation of voltage were to be carried out the cost should, in his opinion, be the subject of a levy on the whole supply industry, similar to the levy which was made by the Central Electricity Board for standardisation of frequency. The Committee expressed agreement with this view.

London.—**SCHOOL LIGHTING.**—The L.C.C. Education Committee reports that temporary electrical installations for alternative emergency lighting have been provided in a number of gas lighted schools at present occupied by other services. Consideration has been given to the retention of these temporary installations when the premises are vacated by occupying services, but adjustments would be required and the lighting, although helpful in the case of day schools, would still be below the standard normally provided. The availability in day schools of electric lighting in place of gas would, however, be an advantage on dull days and would effect a considerable saving of fuel. The Committee proposes that each building shall be considered as the need arises.

Newcastle (Staffs).—**SUBSTATION EQUIPMENT.**—The Electricity Committee is to obtain tenders for a 500-kVA transformer, switchgear, etc., for a substation.

Stirling.—**SALE OF UNDERTAKING DISCUSSED.**—Having considered a report by R. W. Gregory & Partner, consulting engineers, the Electricity Committee recommended that the Town Council should approach the Electricity Commissioners for consent to the steam plant in the generating station at Colquhoun Street being shut down and dismantled. After a sub-committee had visited the Commissioners, the Committee instructed the town clerk to submit an application for consent to the closing down of the steam generating plant. The Committee then recommended the Town Council to obtain a report and valuation from Mr. R. W. Gregory of the assets of the undertaking, and then to instruct the Committee to enter into negotiations with the Scottish Central Electric Power Co. with a view to the sale of the undertaking.

When the minutes came before the Town Council it was agreed that they should be discussed in private. The Council, by the casting vote of the Provost, agreed to negotiate a new agreement with the Scottish Central Electric Power Co., with special reference to the coal clause. The voting was nine in favour of the sale of the undertaking and nine for a new agreement.

Stockton-on-Tees.—**POST-WAR DEVELOPMENTS.**—It is expected that after the war the Corporation will spend about £100,000 on developments in its electricity undertaking. The borough electrical engineer stated that this work could not be started until detailed arrangements were made with the North-Eastern Electric Supply Co., Ltd., as to the future of electricity supply in the town, and that he was in touch with the company on this subject.

Watford.—**H.V. EXTENSION.**—The Electricity Committee is to extend the 6,600-V transmission system from Apsley substation to a position in Boxmoor at a cost of £3,500.

Overseas

Australia.—**BRISBANE COMPANY'S REPORT.**—The report of the City Electric Light Co., Ltd., of Brisbane, for the year to January 31st last, mentions the payment of the standard dividends and says that a supplementary agreement has been entered into with the State Electricity Commission of Queensland with regard to the terms of purchase of the company's undertaking. This aims at compensating the company for loss of earnings arising from war conditions. During the year the installation of a 25,000-kW turbo-alternator set was completed and an order was placed for another set of the same size. Owing to slow progress with the programme of capital work it was not considered necessary to raise additional capital during the year.

Canada.—**QUEBEC OUTPUT.**—The Quebec Public Service Board has issued its annual summary of production and sales of electricity in the province by the principal public services.

It shows that production in 1943 amounted to 23,401 million kWh, an increase of 11.9 per cent. over 1942, while total sales were 22,264 million kWh (13.2 per cent. increase).

Spain.—NEW POWER PLANTS.—The Spanish journal *Metalurgia y Electricidad* reports that the Sociedad Hidroeléctrica de Guadiela has received authority to proceed with the establishment of two new power stations in the province of Cuenca, one at Canizares (7,000-HP turbine) and the other at Beteta (2,600-HP turbine).

TRANSPORT

Darlington.—SUNDAY TROLLEY-BUSES AGAIN.—The Corporation's trolley-bus service which it was decided to suspend on Sundays to save fuel, has now been reintroduced.

Glasgow.—TRAMWAY OPERATION DIFFICULTIES.—Mr. E. R. L. Fitzpayne, general manager of Glasgow Corporation Transport Department, stated recently that the Department's power station had less than one week's reserve of coal. The coal supplied was of very inferior quality. Mr. Fitzpayne, who was speaking on wartime difficulties of operating passenger transport services, said that early in the war the department had to make special arrangements at a cost of £100,000 to secure an alternative electric supply should the Department's power station have suffered from enemy action. He described tramways as the backbone of the city's transport system. Because of the age of the cars maintenance had been more difficult.

Manchester.—RAILWAY IMPROVEMENTS.—The Post-War Reconstruction Committee last week decided to ask the Corporation Transport and Town Planning Committees to confer with representatives of the railway companies. One of the suggestions was that there should be a scheme for the electrification of railways serving Manchester and its main suburbs, with underground lines connecting main points in the city.

Southend-on-Sea.—NEW TROLLEY BUSES.—The Ministry of War Transport has intimated to Southend Corporation that the Minister is prepared to allocate six 4-wheeled double-deck trolley vehicles to the Corporation, delivery probably to be made between May, 1945, and January, 1946. The Corporation has accepted the offer.

Rotherham.—DAMAGED P.O. CABLE.—The Post Office Engineering Department recently found that one of its underground lead-covered cables had suffered damage and it was suggested that this might have been caused by electrolytic action due to leakage currents from the tram rails or from other DC electric mains. Tests were accordingly carried out by the Corporation Transport Department in conjunction with the Post Office engineers. The transport manager, reporting to his Committee, says that there appeared to be no leakage from the tram rails, but further tests were to be made in the near future.

West Hartlepool.—TROLLEY-BUS PROFITS.—The transport manager has submitted a report to the Corporation giving limited details of the working of the transport services during the year ended March 31st, 1944. Traffic receipts from the trolley-buses amounted to £46,582, an increase of £4,122 on the previous year, while the passengers carried numbered 8,510,971, an increase of 722,681.

Broken Drills

Electrical Methods of Removal

THE breaking of drills, or taps and reamers, invariably means that the broken tool tip is so firmly lodged in the hole that it has to be tediously removed by prying and gouging. Two quicker methods are pointed out by the U.S. Office of War Information. If aluminium castings, for instance, are immersed in a solution of ammonium sulphate in water with the whole metallic system forming the anode in a 24 to 50 V circuit, then the embedded (steel) tool tip will be rapidly dissolved electrolytically whereas the aluminium will acquire an anodic coating of oxide that protects it against dissolution. The resulting hole is declared by the *Scientific American* to be free from corrosion. When batch immersion is not practicable special apparatus can be devised to localise the electro-chemical action.

Another means of extraction is "spark drilling." A tubular copper electrode of a diameter equal to the core of the broken tool to be removed is fixed to the cylindrical head of a "disintegrator," which is mounted in any suitable drill press (the latter does not revolve, but is utilised merely as a convenient holder) so that the centre of the broken tool can be held in contact with the copper electrode. The operating head is attached to a pump by a single combination connector, which is both a water hose and an electrical conductor; within it is a solenoid that vibrates the hollow electrode against the broken tool stump at the rate of 120 times a second, causing electric sparks to oxidise small particles of the tool steel, which are carried away by the water flowing through the electrode into a drip pan while the combination hose serves the additional purpose of an earthing conductor.

Heat generated is dissipated by the cooling water. When the core of the embedded tool has been spark-drilled throughout its length, at the rate of about $\frac{1}{2}$ in. per minute, the tool flutes collapse and can be easily extracted. *Business Week* explains that broken studs can be disintegrated in the same way, but, since they are not fluted, they have to be backed out with an appropriate tool. Hardened dies and similar components can be spark-drilled without drawing their temper.

Irish Farm Electrification Subsidies

THE Eireann Minister for Industry and Commerce (Mr. Lemass) stated last week that the Government planned to extend the national electricity supply to every farmhouse in the country without capital charge to the farmer and at an attractive rate. The capital cost at pre-war values was estimated at £20,000,000 and the Government would provide half of it. It was hoped to complete the scheme in ten years during which it would provide continuous work for 5,000 men. The equipment for the distribution and use of electricity would be made in Ireland, so far as was possible, and for this purpose special legislation was being prepared. Mr. Lemass said that the post-war demand for electricity would greatly exceed the pre-war demand and the Government had plans for new turf, coal and water power generating stations.

Bulk Export Selling

Wartime Justification

THE war has been the means of bringing into sharp relief the possibility of import and export business between countries being carried on by official buying and selling agencies dealing with bulk orders only, and there is inevitably speculation regarding the chances of this form of trading continuing or even extending after the war.

Electrical goods were late comers in the export field, as export businesses of considerable magnitude had been operating for many years before electrical manufacture acquired the status of an industry. It is necessary, therefore, to seek the origins of bulk selling in conditions which preceded the emergence of the electrical industry as an important contributor to the country's export trade; in fact, we have to examine the reasons behind exports, whatever their description.

The fundamental purpose of British overseas trade consists in the exchange of goods with overseas customers, to the advantage of both parties. The purpose is unchanged to-day although in the immediate pre-1914 period and to some extent in the inter-war years it was largely obscured because, in general, this country was able to obtain the imports it required by trading on reserves in the form of invisible exports rather than on balances established by visible exports. From the national viewpoint, any variation in the value of visible exports therefore appeared to be of little or no consequence, and not unnaturally manufacturers' attention was focused on the large, sheltered, and generally more profitable home market, in which prices and conditions of business could be protected through trade associations and in which the irksome restrictions on trade in most export markets had no counterpart.

But it is necessary to return to the original conception and the true function of export, which will be more and more apparent as lend-lease and other assistance diminishes, has been stated many times in recent months, probably never better than by Mr. E. Shinwell M.P., in a Commons debate. "... it is necessary to have an export trade ... because we have to pay for imports. What is the sole advantage, the exclusive advantage of exports? It is when you get goods coming into the country that cost less than it would cost to produce them at home. ... If, as a result of your trading process you fail to

For a number of sound reasons, close control of overseas trade, including bulk buying and selling, has been exercised by governments during the war. Will circumstances or experience result in a continuation of this system when the war is over?

increase your national income you have gained nothing. You must always

buy them at a rate cheaper than that at which they could be produced in this country. That is the reason for our export trade. It has nothing to do with employment or social services. It is just a business arrangement."

Nevertheless, there are other factors to be considered to get a complete picture of the position and in my opinion bulk trading is one of the most important of these factors. In the past, bulk purchasing by overseas governments has often been practised in the

belief that a government can obtain better conditions, prices, and priority by going direct to suppliers than by trading through normal channels, such as merchants and agents. The usual procedure has been to

appoint a buying agent in the United Kingdom or to establish a buying office in London. To offset such advantages as these arrangements offer, there is the inevitable reaction of United Kingdom manufacturers, firstly, to assume that foreign competition can be largely if not entirely discounted and, secondly, to take the view that as the inquiries are issued in the United Kingdom they ought properly to be regarded as home market inquiries.

The tendency to a price reduction which can be attributed to the size of the expected orders therefore is somewhat countered by the tendency to inflate prices above the normal export levels if, as is usually the case, these are well below the home levels. These methods of trade, however, are not true bulk selling as the normal trade channels are left open for purchasers in the overseas territory concerned other than its government. The situation changes when all purchasers are compelled by their government to purchase through the single official channel.

The Russian Example

The first important instance of this kind occurred with the U.S.S.R. in the inter-war period. Impoverishment of the country from various causes demanded drastic measures of control if any regime was to survive, and after the initial period of trial and error the country settled down to government monopolistic schemes under such arrangements as the Five-Year Plan. A country which desperately required imports of capital goods and would be hard pressed to find adequate amounts of primary goods to give in exchange

and, moreover, could raise practically no credit abroad, had no real alternative to exclusive trading through government channels. Many electrical manufacturers in the United Kingdom had considerable difficulties in their dealings with Russian buying corporations (such as Machinimport and Technopromimport) during this period owing to there being no official British counterpart to such organisations. Manufacturers, in fact, often felt themselves to be the victims of a sort of Dutch auction. The plain fact, of course, was that due to emergency conditions the Russian authorities had been obliged to adopt measures of which we had no previous experience and with which our export trading system was not designed to cope.

It is this emergency nature of the bulk trading principle that I consider to be important. It is believed that the Russian state of emergency never really passed, as immediately after the initial period of equipment of the country with capital goods in the form of machine tools and plant for the purpose of making it reasonably self-supporting, the German war potential reached a stage where the Russians could not afford to ignore it. The consequence was that they had to concentrate on building up a military machine rather than aiming at a more favourable standard of living, and it is doubtful whether Soviet Russia has yet been in a position to consider trading other than through government agencies.

A Dominion Agency

In that connection it must be borne in mind that government-sponsored organisations die hard in whatever country they are born, even when they are demonstrably an inefficient or unnecessary feature of the national economy. In the present war more than one of the Dominions has sponsored a central purchasing agency for certain raw materials and manufactures on the grounds that higher priority would be obtainable by this means, and in one case it was proposed that the consequent administration expenses be paid by a levy or commission of the order of 15 per cent. The fact that a large merchant house offered to perform the functions as the government agency for an overriding commission of 2½ per cent. did not prevent the government plan going through but the merchant houses generally have been allowed to participate in the scheme as distributors.

In this instance the war is solely responsible for the bulk trading methods adopted and evidently some qualms have been felt about the advisability of throwing the organisations of private enterprise upon the scrap-heap in case post-war conditions should show the government scheme to be undesirable. Nevertheless, it must be borne in mind that even after the war emergency has

finished the personnel of the government agency might find themselves unable to obtain equally remunerative employment elsewhere. Political considerations could count for a good deal in deciding the future of any such organisation and mere demonstration of its inefficiency compared with private channels of trade would not necessarily suffice for its abolition.

The Commissioner of Supply in the Dominion concerned has recently stated that "bulk buying on the basis of Government-to-Government will be discontinued at the earliest point where we feel sure that supplies will be obtained better through normal trade methods." This statement, of course, can mean a great deal or very little, depending on the view taken by the government in power and the pressure which can be exerted by the various sections of the electorate.

Exclusion of Electrical Goods

In passing, it may be noted that in this instance electrical goods are very largely excluded from the schedule of bulk-bought goods, and it is perhaps not unreasonable to hope that this in some way reflects the realisation of the importance attached by engineers overseas to the continuance of the supplies of a particular make or brand. Respect for such preferences, of course, tends at once to offset much of the advantage which, from superficial considerations at any rate, is obtainable by bulk buying.

Turning again to trade with the U.S.S.R., it may be noted that under war conditions, United Kingdom manufacturers now have the benefit of the intermediary services of British Government Departments at all times, so that they no longer labour under the disadvantage of having to compete single-handed with a foreign government monopoly. The costing of contracts for the U.S.S.R. is based on an even spread-over of all overhead charges whereas in the past electrical manufacturers rarely looked forward to obtaining the same margin of profit on their exports as on their supplies for the home market. The stage has therefore been reached where the advantages of bulk selling have mainly been discounted and, in fact, the buyer is now placed in the disadvantageous position of being treated more nearly as a home buyer in so far as price is concerned.

Pursuing the question of bulk trading to its logical conclusion, consideration should be given to the possible set-up, in the event of two or more governments of countries accustomed to trade with one another on a large scale, adopting completely monopolistic trading methods through official channels. On the one hand we might expect one monopolistic organisation in the capacity of buyer running a Dutch auction by playing off against each other two or more rival government selling agencies. On the other hand the

governments concerned might agree to a division of economic territory and spheres of influence for trading purposes. This is clearly getting into the realm of power politics and from some aspects the latter alternative might appear to lead to a trading Utopia in which the only people who indulge in import and export trade are those who through their governments have entered into unanimous agreement with regard to types of goods, quantities to be handled, prices, conditions of contract, terms of payment and guarantees.

Much contemporary thought, especially as expressed by trade associations, is along such lines as these and I am of opinion that such monopolistic methods could be very successful in the immediate post-war period. During this period, of course, all or nearly all the goods which are in demand will be correspondingly scarce, so that delivery, rather than price or guarantees or terms of payment, is likely to be the essence of every contract placed. Unfortunately, for many concerns, this period will be one of spoon-feeding by government orders at more or less agreed profitable prices and there is a risk that manufacturers and perhaps even merchants operating under these conditions will tend to forget the real meaning of competition.

In my view, bulk buying and selling will come to an end just when they appear to have become permanent features in the economic landscape and the whole scheme of things will collapse suddenly, the signal for the collapse being the repudiation by a nation of a government committed to a bulk trading policy. Sooner or later a conviction is bound to arise in some country that bulk purchasing is synonymous with "buying dear." In these circumstances, public opinion, whether it is correctly informed or not, would probably more than offset the force of any arguments in favour of the use of bulk trading as a political pawn in international negotiations.

German Methods

"Buying dear," of course, is what many European peoples discovered they were doing in trading with Germany before the war under various trade agreements involving barter or blocked currencies, and the dangers of a policy of putting all eggs into one basket were perhaps never made clearer. Germany's emergency in this case was largely one of her own creation, namely that of preparing for aggression without adequate financial resources of the orthodox kind, so that she had to resort to buying, borrowing and (later) stealing the means, namely currency or goods, for filling the gaps in her programme of rearmament. A long tradition of government-backed or government-sponsored trading schemes in Germany may well result in this method having become an ingrained habit and if, as is expected, Germany emerges from the war as a trade competitor of this

country and other industrialised countries dependent on exports, as hitherto, it would be as well to recognise the fact at the outset without waiting for the various possible guises of government trading to be revealed.

The retention after the war of bulk-trading organisations such as the United Kingdom Commercial Corporation, therefore, may be well advised on purely security grounds even though their continued existence will inevitably cause anxiety among electrical traders; it is necessary only to make provision for ensuring that the emergency nature of the United Kingdom Commercial Corporation, or any equivalent post-war organisation, is not lost sight of, and that its services are only enlisted on the side of orthodox traders when the latter are threatened by the activities of monopolistic trading concerns in other countries.

NEW BOOKS

Introductory Magnetism and Electricity. By T. M. Yarwood, B.Sc. (Hons.), senior physics master, Kilburn Grammar School. Pp. 158; illus. Macmillan & Co., Ltd., St. Martin's Street, London, W.C.2. Price 2s. 6d.

For so small a book an extraordinary amount of ground is covered. Apart from the fundamental facts of electricity and magnetism, there are chapters on the magnetic, heating, lighting and chemical effects of electric currents; the moving-coil principle and the electric motor; measuring instruments; electromagnetic induction; the telegraph and telephone; the electric field; valves and rectifiers; and the basis of radio communication. In addition there are eight pages of questions.

While inevitably restrictions of space have resulted in a very cursory treatment of some aspects of the subject, suggestions for experimental work should stimulate further study. The book is intended for anyone having no previous knowledge of the subject, but it also has a more immediate application since it covers most of the ground required for students wishing to join the Services in a technical capacity.—W.R.C.

Electricity Simply Explained. By H. M. Winstanley, M.Con.E., M.I.E.E., M.I.Mech.E. Pp. 76. Princes Press, Ltd., 7, Princes Street, Westminster, S.W.1. Price 5s. 6d.

Although intended primarily for members of the Air Training Corps, this little book should prove equally useful for anyone else desiring a simple explanation of first principles. It comprises a series of lectures to members of a squadron of the A.T.C. on the subjects prescribed in the syllabus of the corps. In the simplest possible form and with the least use of mathematical formulæ, the work covers fundamental principles, circuits, simple tests, resistances, fuses, magnets, telephones, generators, ignition, measuring instruments and batteries.—W.R.C.

Jig and Fixture Practice. By H. C. Town, M.I.Mech.E., M.I.P.E. Pp. 120; figs. 97. Paul Elek (Publishers), Ltd., Africa House, Kingsway, London, W.C.2. Price 10s. 6d.

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.

ACME Wringers, Ltd., and J. Tennent and D. C. Ross (both legal representatives of J. W. Burt).—"Domestic washing machines." 10107. July 20th, 1942. (561015.)

A.C.—Sphinx Sparking Plug Co., Ltd., and D. H. Corbin.—"Spark-plug manufacture." Cognate applications 15726/42 and 845/43. November 6th, 1942. (561118.)

Automatic Telephone & Electric Co., Ltd., and C. F. Campbell.—"Thermionic valve oscillators." 15527. November 4th, 1942, (561160.)

Automatic Telephone & Electric Co., Ltd., C. Gillings and C. E. Beale.—"Telephone or like systems." 15236. October 30th, 1942. (561155.)

Automatic Telephone & Electric Co., Ltd., C. Gillings and L. J. Murray.—"Cross-bar selector switching units." 386. January 8th, 1943. (561096.) "Cross-bar switch mechanisms for use in automatic telephone or like systems." 1068. January 21st, 1943. (561097.) "Telephone or like systems." 2207. February 10th, 1943. (561098.)

J. Bibby & Sons, Ltd., and A. Ibison.—"Electrostatic separators." 13420. September 24th, 1942. (561020.)

C. H. Booth and J. F. Bridge.—"Electric etching or engraving apparatus." 15301. October 30th, 1942. (561094.)

G. W. Braham.—"Magnetic and electro-magnetic clutches, brakes and the like." 14365. October 13th, 1942. (561023.)

British Insulated Cables, Ltd., G. H. Walton, J. C. Quayle and P. Jones.—"Making of joints, terminals or repairs to electric cables." Cognate applications 17695/42 and 13551/43. December 12th, 1942. (561162.)

British Thomson-Houston Co., Ltd.—"Electrical busbar systems." 17210/42. December 3rd, 1941. (561034.) "Production of resinous condensation products." 8528/42. June 27th, 1941. (561044.) "Manufacture of synthetic resinous materials." 8663/42. June 27th, 1941. (561045.) "Manufacture of synthetic resins." 10614/42. July 30th, 1941. (561076.) "Resinous condensation products." 10615/42. July 30th, 1941. (561077.) "Electric valve converting circuits." 13732/42. October 1st, 1941. (561086.)

British Thomson-Houston Co., Ltd., and H. E. Cox.—"High-voltage electric gas-blast circuit-breakers." 15479. November 3rd, 1942. (561157.)

C. Crofton & Co. (Engineers), Ltd., and R. W. Mann.—"Electrical plug couplings." 17617. December 10th, 1942. (561037.)

D. Curtis.—"Electric lighting fixtures." 15216/42. January 7th, 1942. (561090.)

D. Dalin.—"Control of steam superheaters and like heat exchangers." 14950. October 24th, 1942. (561153.)

C. H. Flurscheim, and Metropolitan-Vickers Electrical Co., Ltd.—"Air- or gas-blast electric switches." 10682. July 30th, 1942. (561078.)

L. Fuller, and E. W. Sudlow.—"Electric secondary batteries of the so-called dry type." 13563. September 28th, 1942. (561056.)

W. F. F. Martin-Hurst, and British Thermostat Co., Ltd.—"Electrically controlled fluid pressure operated jacks." 14524. October 16th, 1942. (561024.)

Kapella, Ltd., and R. E. Reason.—"Electrical measuring apparatus." 10608. July 29th, 1942. (561141.)

A. Love and E. E. G. Boite.—"Electrical measuring instruments." 17285. December 4th, 1942. (561161.)

Marconi's Wireless Telegraph Co., Ltd.—"Hermetic seals." 15350/42. November 1st 1941. (561111.)

H. J. Modrey.—"Electrical plug and socket connectors." 7189. May 27th, 1942. (561043.)

E. C. Richardson.—"Spot lamp." 15148. October 28th, 1942. (561064.) "Lamp housing." 15149. October 28th, 1942. (561065.)

Rotax, Ltd., E. E. Robinson and E. W. J. Barrington.—"Ignition coils." 13912. October 3rd, 1942. (561150.)

Standard Telephones & Cables, Ltd., J. D. Holland and D. D. Robinson.—"Radio receivers." 15264. October 30th, 1942. (Addition to 556319.) (561091.)

W. B. Stockwell.—"Miners' lamps." 17955. December 17th, 1942. (561039.) "Miners' lamps." 17956. December 17th, 1942. (561040.)

Teletype Corporation.—"Printing telegraph system." 13845/42. September 20th, 1941. (561148.)

Vickers-Armstrongs, Ltd., and R. Caldwell.—"Construction of electrical plug and socket connections." 9840. July 15th, 1942. (561049.)

Western Electric Co., Inc.—"Wave transmission networks." 15057/42. November 25th, 1941. (561088.)

Westinghouse Brake & Signal Co., Ltd., L. E. Thompson and A. Jenkins.—"Alternating electric current rectifiers of the selenium type." 10229/43. October 30th, 1942. (Divided out of 556152.) (561101.)

Forthcoming Events

Friday, June 2nd.—Birmingham.—Imperial Hotel, 6 p.m. I.E.S. Birmingham Centre. Annual meeting and address by Mr. J. S. Dow.

Tuesday, June 6th.—Coventry.—At Corporation Electricity Showrooms. Coventry Electric Club. "The Stellar Universe and its Relation to Electricity," by Mr. V. A. S. Bradley (Post Office Engineering Department).

Tuesday, June 13th.—London.—Lighting Service Bureau, Savoy Hill, 6.15 p.m. A.S.E.E. Three winning papers in branch papers competition.

Wednesday, June 14th.—London.—I.E.E., 3.30 p.m. Measurements Section. Continued discussion on "The Consumer's Supply Control Unit of the Future and its Effect on the Design of the Electricity Meter." The meeting will be preceded by an informal Section luncheon to be held at the Connaught Rooms, Great Queen Street, at 12.30 for 1 p.m. (tickets, 9s. 6d. each).

Leakage Reactance

Similarity in all Dynamo-Electric Machines

DUE to the fact that alternators, induction motors and direct-current machines are generally dealt with separately in books on design, the many points of similarity between them are apt to be overlooked, and this is particularly true with regard to the phenomenon known as "reactance" or "reactance voltage." In all three classes of machine the primary coils are of the same general type, having two coil sides embedded in slots and two ends free in air. Further, in all three cases the primary winding carries an alternating current, even though in the DC machine this has a flat-topped wave form.

The magnetising effect of the primary current can be separated into two parts:—(1) The "armature reaction" which, interacting with the magnetising effect of the current in the secondary winding, affects the main flux of the machine or the flux which links both stator and rotor. (2) The "reactance," or better "leakage reactance" effect due to flux which leaks out between the primary and secondary windings and only links with one of them. This flux, when alternating in character, produces a voltage, the leakage reactance voltage, in the winding with which it links.

For a primary coil of given dimensions, slotting, etc., so long as the arrangement of the secondary winding is not altered, the primary leakage flux per ampere is a fixed figure irrespective of the use to which the machine is put. This generalisation has largely been obscured by the use of different types of formula for the various classes of machine. It is here urged that teachers should use the same type of formula throughout, so as to impress on students the similarity of leakage-reactance effects in all classes of dynamo-electric machines.

In building up formulae for voltage from the basis of flux per ampere, certain differences arise due to the differences in conditions of working, but again, this is most valuable if these differences are properly understood by students.

For example in the two AC cases the maximum current is $\sqrt{2}$ times the virtual value, and since the voltage depends on the maximum flux, this factor $\sqrt{2}$ is carried over into the voltage formula, a condition that does not arise in the DC case.

Further, in the two synchronous cases (*i.e.*, the alternator and the DC machine) the secondary leakage flux remains stationary relatively to the secondary winding and hence

there is no secondary leakage reactance voltage. In the induction motor, on the other hand, a secondary leakage-reactance voltage is produced, and since this must be balanced by a corresponding EMF in the primary winding, its equivalent value reappears in the primary circuit as part of the total leakage-reactance voltage.

While primary and secondary leakage-reactance voltages can be calculated separately for the induction motor, they are difficult to separate on test and, as the total leakage-reactance voltage is the factor which is usually required, it is common practice to evaluate the total figure rather than deal with its components.

These points become clearer as the full reactance voltage formulæ are built up from first principles. For simplicity the effect of the space harmonics (or the harmonic leakage, as it is sometimes termed) is omitted, as is usual for all but advanced work. Let ϕ be the leakage flux in lines over the whole coil for one ampere conductor per slot. Let e be the corresponding induced volts per conductor at fifty cycles. Then ϕ may conveniently be built up of four components indicated by ϕ_1 with suitable subscripts.

These components are:— ϕ_1 , the primary slot-leakage flux in lines per ampere conductor per slot calculated from the cross permeance of the slot by standard textbook methods (1^{st}); ϕ_2 , the secondary slot-leakage flux (induction motor only) calculated in a similar manner; ϕ_3 , the tooth head or zigzag leakage which may be calculated for the primary only in the case of the alternator and the DC machine (1^{st}) or for combined primary and secondary in the case of the induction motor (2^{nd}); ϕ_4 , the end winding leakage.

It has been explained elsewhere by the writer (*) that in view of the complexity of the problem the only practicable solution is empirical in form. A simple expression of this type which may conveniently be adopted is $\phi_4 = K L^2 / \tau$, where L represents the length of free half turn and τ is the primary slot pitch.

The various voltage formulæ may then be built up as follows, using appropriate values of K as determined from average test results, the figures quoted corresponding to dimensions in centimetres. For the alternator (primary only) $\phi = \sqrt{2} \phi_1 + \sqrt{2} \phi_3 + K L^2 / \tau$ and $e = 1.11 \phi \cdot 10^{-6}$. The constant K may be given so as to include the factor $\sqrt{2}$,

By Laurence H. A. Carr,

M.Sc.Tech., M.I.E.E.

in which case it is approximately equal to 0.23 for a concentric winding or 0.35 for a barrel or basket winding. For the induction motor (primary and secondary) $\phi = \sqrt{2} \phi_1 + \sqrt{2} \phi_2 + \sqrt{2} \phi_3 + KL^2/\tau$ and $e = 1.11 \phi 10^{-6}$.

In the foregoing, L is taken as the stator length of free half turn and K has the values given in the following table for various types of windings:—

Stator winding	Rotor winding	K
Concentric	Barrel	0.35
Concentric	Sq. cage	0.25
Barrel	Barrel	0.55
Barrel	Sq. cage	0.40

If it is desired to separate the stator and rotor leakage reactances the stator value can be calculated from the alternator rule and the difference between that figure and the total value gives the required figure for the rotor winding.

For the DC machine (primary leakage only) $\phi = \phi_1 + \phi_2 - KL^2/\tau$. It might be expected that the value of K could be obtained by dividing the corresponding alternator figure (0.35) by $\sqrt{2}$. This, however, does not follow as the width of the "phase band" is no longer one-third of the pole pitch, but is only the small section undergoing commutation simultaneously. Consequently there is less mutual inductance from adjacent conductors. Tests indicate that K is about equal to 0.14 for a DC machine.

For determining the leakage reactance voltage, two methods are available. The first follows AC theory, $e = 1.11 \phi 10^{-6}$. To correct this to the true voltage obtained the effective periodicity must be determined which is such that the total time of commutation corresponds to half a cycle. The reactance voltage thus calculated is a virtual value and makes the tacit assumption that commutation is sinusoidal.

A better method is to follow Clayton⁽¹⁾ and calculate the EMF per conductor e^1 directly from the flux change. Taking the value per conductor, or half turn, to line up with the first method, if t is the total time of commutation $e^1 = \frac{\phi}{t} \times 10^{-8}$. This gives the average EMF per conductor per ampere conductor per slot, and inspection shows that it bears the correct relation of 1.00/1.11 to the virtual value calculated by the first method.

List of References

- (1) "The Performance and Design of Direct-Current Machines." Clayton.
- (2) "The Performance and Design of Alternating-Current Machines." Say and Pink.
- (3) "Zigzag Leakage." Carr. *The Electrician* July 15th, 1921.
- (4) "Induction Motor Leakage." Carr. *Metropolitan-Vickers Gazette*, May, 1937.

Electrodeposition

THE processes of electrodeposition, both in the form of the electroplating of thin films of metal for the decoration or protection of metallic articles, and the deposition of thick adherent layers of nickel or hard chromium, have attained a very considerable importance. Furthermore, these processes are increasingly operated by the primary manufacturer rather than entrusted to specialist firms. It is thus often necessary for the engineer to acquire a knowledge of a subject which is somewhat outside his usual training. "The Principles of Electrodeposition," by Samuel Field, A.R.C.Sc. (pp. 314; figs. 85; Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2; Price 25s.) is intended to supply the theoretical background to the subject, the practical aspects of which have been so successfully set out by the same author, in conjunction with A. D. Neill, in his previous book "Electroplating."

The subject of the present book is more correctly expressed by its sub-title "The Electrochemistry of Electroplating." An enormous amount of information on electrochemistry is available, but most of this has been obtained because of the philosophical interest in the relations between electricity and matter. The author's choice has tended to entail undue space for the conditions in the solution and for a treatment which is applicable only with difficulty to practical electroplating processes. Thus the first half of the book is devoted to classical electrochemistry; conductivity of electrolytes is considered at length and the laws of dissociation are derived from the gas laws. Two chapters on thermochemistry follow, leading to consideration of electrode potentials. The author's treatment assumes an elementary knowledge of chemistry and avoids excessive recourse to mathematics, but it is well illustrated by quantitative data.

Consideration of the physical and metallurgical properties of the deposit is somewhat brief, which is much to be regretted. The specialist electroplating literature of recent years affords much material of which a critical review would have been valuable. Discussion of the conditions leading to desirable properties of the deposit, such as strong adhesion, high lustre or absence of porosity are almost entirely omitted. A discussion of the non-uniformity of thickness of deposit on irregular articles and its rectification by "throwing power" is included and is fully justified by the increasing control of thickness by specification tests. The book concludes with a curious chapter on bi-polar electrodes.—G. E. G.

Sequel to Substation Accident

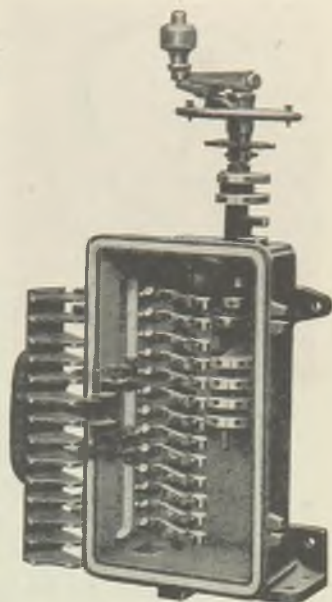
A FATALITY at Marton (Blackpool) electricity substation, where Ernest Williams, an employee of Preston Corporation electricity undertaking, was killed, had a sequel at Blackpool on May 10th when Preston Corporation was summoned for failing to make "dead" a part of a switchboard on which work had to be done. James Melling, an employee, was summoned in connection with the same matter. After a six hours' hearing the Bench dismissed the case against the Corporation. Melling was fined £5. He admitted that he forgot to earth the top circuit after he had done the bottom one.

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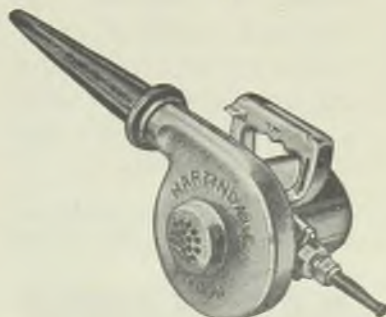
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PARLIAMENTARY NEWS

By Our Special Reporter

Meter Rents

IN the House of Commons on May 16th Mr. De la Bere asked the Minister of Fuel and Power, whether he had had an opportunity of completing his inquiries regarding the system adopted by American gas and electricity undertakings in connection with the charging of meter rents to consumers.

Mr. Tom Smith said he understood that in the United States it was the general practice of gas and electricity undertakings not to make a specific charge for meter rent. Undertakings must, however, recover from their consumers, in some form or another, not only the original cost of providing the meter, but also the cost of its maintenance and reading. He understood that it was the practice in the United States to take account of these costs in the calculation of the fixed charges in the tariffs for gas and electricity.

Mr. De la Bere asked whether the Minister would endeavour to get something of this sort done in this country, in view of the great objection by the public to the meter charge.

Mr. Smith said that further information on this subject was being sought and the matter would then be considered.

District Heating

Mr. Wakefield asked the Minister of Fuel and Power, if, in order to save fuel, and in particular the waste of heat which now took place when generating electricity, he had considered the advisability of introducing schemes of district heating similar to those now being used successfully in the United States and in Russia.

Mr. Tom Smith replied that this important question was receiving close attention by the Ministries concerned, and in particular by a technical sub-committee of the Committee on Heating and Ventilation.

Electricity for Farms

On May 18th Mrs. Beatrice Wright asked the Minister of Agriculture, whether there were any funds available to him with which to subsidise the provision of electricity to farms.

Mr. R. S. Hudson said that there were no funds at his disposal for the specific purpose of subsidising the provision of electricity to farms, though where electricity was installed as part of a plan for providing a water supply, the cost of the electrical installation might be taken into account in calculating any grant.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Babcock & Wilcox, Ltd.—In a brief address issued with the annual report, the chairman (Sir John Greenly) says that the problems of the post-war period are being studied with a view to resuming full peacetime activity at home and abroad with the least possible delay when the necessary labour and material became available to the company.

As has already been reported, the net profit for 1943, at £638,583, shows little change and the dividend on the ordinary shares remains at 11 per cent.

The Brush Electrical Engineering Co., Ltd.—A year of continued progress was reported by Sir Ronald W. Matthews, chairman, at the annual general meeting last week. The company's main subsidiaries, Petters, Ltd., and Brush Coachwork, Ltd., had, he said, made valuable contributions towards the increased turnover of the parent company. During the year the company and the Metropolitan-Vickers Electrical Co., Ltd. had fused their interests in the battery electric vehicle industry, and since the close of the year a new company, Brush (S.A.) (Pty.), Ltd., had been incorporated in Johannesburg, which, though initially concentrating on the manufacture of coachwork, would ultimately handle other products of the company and its subsidiaries.

Appreciating the importance of craftsmanship, the company had opened a craft selection school through which all youths passed and were graded into different trades before being

indentured. Though the energies of all concerned were being increasingly directed to making the maximum contribution towards winning the war, the directors were not unmindful of their responsibilities in regard to the development of the country's trade when peace came. If we were to do all the things we wanted to do as a nation after the war it was essential that industry, the profits of which provided the great bulk of revenue from taxation, should be freed as soon as possible from all hampering restrictions and controls and that initiative, enterprise and adventure should be given full scope.

Glenfield & Kennedy, Ltd., announce that their net profit for 1943-44 was £60,871, as compared with £63,149, after meeting income tax and E.P.T. Income tax reserve and general reserve each receive £5,000 (against nil) and the ordinary dividend and bonus is maintained at 20 per cent.

Enfield Rolling Mills, Ltd.—The accounts for 1943 show a net profit of £25,174, as compared with £24,062 for 1942. As already reported, the dividend has been increased from 2½ to 5 per cent. and the balance carried forward is £123,058 (against £111,884).

The Pressed Steel Co., Ltd., after providing for depreciation, etc., reports a trading revenue of £533,232 for 1943 (against £951,673). This large reduction is said to be due to a lower turnover following the completion of contracts, reduced prices and higher labour costs. Production in the coming year promises to be on a substantial basis. A reduction in the taxation charge from £757,000 to £340,000 about

counterbalances the loss in revenue and the ordinary dividend is maintained at 27½ per cent. by a final payment of 17½ per cent.

Ransomes, Sims & Jefferies, Ltd., are again paying an ordinary dividend of 7½ per cent. for the past year. The net profit was £47,314 (against £44,985) and £27,240 (against £20,000) is being put to reserve for post-war reconstruction and contingencies.

Ozonair, Ltd., reports a gross profit for 1943 of £3,232 and a net profit of £1,822. After paying the preference fixed dividend, which takes £543, plus a participating dividend of 1½ (making 8½ per cent.) and a dividend on the ordinary capital of 8½ per cent., £500 is allocated to reserve and £1,873 (against £1,902) is carried forward.

Hopkinsons, Ltd., from a net profit of £74,043 for 1943-44 (against £62,598), have declared a final dividend of 12½ per cent., again making 17½ per cent. for the year.

The British Columbia Power Corporation, Ltd., announces that the consolidated gross revenue for 1943 was \$23,834,571, as compared with \$21,456,653 for 1942. The net income is \$2,357,231 (against \$2,705,696). The dividend on the "A" shares for the year is \$2. For the first quarter of the current year the dividend has been reduced from 50 cents. to 40 cents. on account of higher taxation.

The River Plate Electricity & Other Securities Corporation, Ltd., reports a net profit of £31,537 for 1943-44, against £28,643 in the preceding year. The final dividend is 5 per cent., again making 7 per cent. for the year.

New Companies

Arthur Cook & Co. (Electrical Engineers), Ltd.—Private company. Registered May 10th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, artificial lighting apparatus, electrical plant and accessories, motor accessories, etc. A. Cook, 50, Penciseley Crescent, Llanduff, Cardiff, is the first director. Registered office: Major Read, Canton, Cardiff.

Delta Transformers, Ltd.—Private company. Registered May 11th. Capital, £1,000. Objects: To carry on the business of electrical equipment and radio specialists, electrical and motor engineers, etc. Directors: M. Deech and Mrs. P. Deech, both of 5, Hill Top, N.W.11. Registered office: Broadmead House, 21, Panton Street, S.W.1.

Dulci Co., Ltd.—Private company. Registered May 12th. Capital, £10,000. Objects: To carry on the business of manufacturers of, and dealers in, microphones, gramophones, sound and picture producing and reproducing or transmitting apparatus, dictaphones, radio sets, batteries accumulators, etc. W. Barr, 8, Balnacraig Avenue, N.W.10, is a permanent director. Registered office: Coventry House, South Place, E.C.2.

Companies to be Struck Off Register

The names of the following companies will, unless cause is shown to the contrary, be struck off the Register at the expiration of three months of May 12th, and thereby be dissolved: Rational Electrical & Neon Co., Ltd., and Wigan Electro-Metallurgical Works, Ltd.

Companies' Returns

Statements of Capital

Julius Sax & Co., Ltd.—Capital, £10,000 in 3,000 7 per cent. preference shares of £1 and 35,000 ordinary shares of 4s. Return dated January 4th. 2,650 preference and 18,000 ordinary shares taken up. £5,051 paid on 2,650 preference and 12,005 ordinary shares. £1,199 considered as paid on 5,995 ordinary shares. Mortgages and charges: Nil.

Increases of Capital

Victoria Instrument Co., Ltd.—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £15,000.

London Electrical Co. (Blackfriars), Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £27,500.

Mortgages and Charges

Insulation Equipments, Ltd.—Mortgage on freehold land at Shady Lane, Old Oscott, Perry Barr, Birmingham, dated May 3rd, to secure £2,750. Holders: Alfred G. Snell, Georgian House, Monmouth Drive, Sutton Coldfield.

Liquidations

Witty & Wyatt (Cardiff), Ltd.—Meeting to be held at 5, Burt Street on June 20th, to consider a resolution for the voluntary winding up of the company and the appointment of Mr. W. R. Gresty, Midland Bank Chambers, Bute Street, Cardiff, as liquidator.

Arun Electrical Supplies, Ltd.—Meeting June 15th, at 165-167, Moorgate, London, E.C.2, to receive an account of the winding up by the liquidator, Mr. B. Hennell.

Trippe Lights, Ltd.—Winding up voluntarily. Liquidator, Mr. P. Lockwood, 8, Ward's End, Halifax.

Bankruptcies

H. L. Smith and A. T. Hockley, lately trading as Woolbrook Services Co., Woolbrook, Nr. Sidmouth, Devon, electrical engineers. Application of H. L. Smith for a review of order refusing discharge to be heard on June 8th, 1944, at The Castle, Exeter.

A. B. Greenbaum, lately trading as "Green's Electrical Supplies," 110a, Highbury New Park, London, N.5, and 2, Iliffe's Garages, No. 1, St. Patrick's Road, Coventry. Trustee, Mr. T. J. M. Macleod, 4, Bucklersbury, London, E.C.4, appointed May 12th.

S. W. Godfrey, electrical and radio engineer, formerly carrying on business at 141, Mansfield Road, and 289, Alfred Street Central, Nottingham.—First and final dividend of 4s. 3½d. in the £, payable May 31st at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham.

W. S. Fray, electrician, trading as "R. E. Warren" at 1, Albert Road, Torquay.—Order made April 13th for discharge as from April 20th, 1944.

STOCKS AND SHARES

TUESDAY EVENING.

ATENTION in the Stock Exchange markets is fixed, as everywhere, upon the possibilities connected with the Second Front invasion. In view of the critical nature of the times, the volume of business now in progress is certainly as considerable as could be expected. The investor's appetite is sharp set for any good securities which come on offer, especially those with favourable post-war prospects. The speculation in radio shares has died down to some extent, but prices hold their ground with noteworthy strength.

Railways and the Air

The main feature in the Home Railway market is the continued firmness shown by the prior-charge issues of the Big Four and the London Passenger Transport Board. The pre-ordinary issues of the L.P.T.B. are none too easy to buy. Southern preference, however, is $2\frac{1}{2}$ down. The railway companies have accepted the offer of the Government in connection with the provision of post-war air services within this country and the continent of Europe. The companies have to provide, on equal terms with other operators, comprehensive air services without subsidy. Detailed proposals are to be placed before the Government at the earliest possible moment.

Railway Finance Corporation

The Railway Finance Corporation, which recently published its accounts for 1943, was formed in order to raise and lend money to the Great Western, London & North Eastern, London, Midland & Scottish and the Southern Railway companies, in various proportions. Loans have been made to the extent of £28,000,000. The $2\frac{1}{2}$ per cent. guaranteed debenture stock dated 1951-1952, issued in January, 1936 and 1937, stands at 98 $\frac{1}{2}$, business was done last week at 99 $\frac{1}{2}$. Principal and interest, in the case of the London Electric Transport Finance and the Railway Finance Corporations, are guaranteed by H.M. Treasury. This gives them the status of full trustee stocks.

Electricity Supply Shares

Investment declines to be disturbed by the controversies that centre around public v. private control of electricity, gas and coal. The vigorous statement of the case for private enterprise, issued by the Incorporated Association of Electric Power Companies, served to inflame afresh the champions of official direction. But the silent testimony of Stock Exchange prices is of an eloquence equal to the noisy witness of advocates for outside interference. If the investor thought there were any likelihood of official control being

established, he would probably be selling his electricity supply shares, to the natural weakening of the prices. The latter hardly ever move, however, and when they do change, it is more often than not in the upward direction. This week, the list is practically unaltered, falls of 6d. in Midland Electric Power & Mid-Cheshire ordinary being offset by a point rise in London Power 5 per cent. debenture, and 6d. in County of London Electrics.

Prices Still Rising

High-priced industrials make a good showing in the present week's lists. De la Rue ordinary have risen 5s. to £9, the company's plastic interest being still the chief attraction. Such matters as wartime dividends, and the yield arising therefrom, are of minor consequence by comparison with post-war prospects. Consolidated Signals at 6 $\frac{1}{2}$ have gained 2s. 6d. Westinghouse Brakes are 75s.; they had a 3s. rise last week.

A rise of half-crown brought International Combustion shares to 6 $\frac{1}{2}$. British Thermostat at a guinea are 1s. 6d. up. Advances have also been made by Automatic Telephones, 67s.; Reyrolle, 70s.; Telephone Condenser Co., 21s. 3d.; Thorn Electrics, 25s.; and Associated Electrical ordinary, 53s. English Electrics at 50s. 6d. are the pence to the good. Johnson & Phillips are also 6d. higher at 74s. 6d. It may be of service to mention that 5,000 Johnson & Phillips have been on offer at this price. On the company's present-paid dividend of 15 per cent. the yield is but a few pence over 4 per cent. The security, however, is first-rate of its kind. Crabtrees at 38s. are a little better.

The deferred stock of the British Electric Traction Co. is again to receive 30 per cent. dividend, making 45 per cent. for the year ended March 31st last. The revenue of £760,293 is £7,700 up. The annual meeting is to be held on June 23rd. The price of the stock has hardened to 1175, affording at that price £3 16s. 7d. per cent. on the money.

Tube Investments

Shares in the heavy industries are again in demand and of these the ordinary shares of Tube Investments occupy a high place from the point of view of sound security. The company has declared an interim dividend of 10 per cent. on the ordinary stock, the same as that of a year ago. At the current price of 97s. the yield is about 4 $\frac{1}{2}$ per cent. on the money. Tube Investments are regarded as being amongst the best shares in the heavy group; as, indeed, the price implies.

Brush Electrical

The Brush Electrical Engineering Co. has started a new company, Brush (S.A.), (Pty.), Ltd. Incorporated in Johannesburg, it is

(Continued on page 761)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend		Middle Price May 23	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price May 23	Rise or Fall	Yield p.c.
	Pre-vious	Last					Pre-vious	Last			
Home Electricity Companies						Public Boards					
£ s. d.						£ s. d.					
Bournemouth and Poole ..	12½	12½	60/6	..	4 2 8	Central Electricity: 1955-60 (Civil Defence) ..	3	3	100	..	3 0 0
British Power and Light ..	7	7	33/-	..	4 4 10	1955-75 ..	5	5	115	+1	4 7 0
City of London ..	7	5½	28/-	..	3 18 7	1951-73 ..	4½	4½	107	..	4 4
Clyde Valley ..	8	8	41/6	..	3 17 0	1963-93 ..	3½	3½	103½	..	3 7 8
County of London	8	8	41/-	+6d.	3 18 0	1974-94 ..	3½	3½	100	..	3 5 0
Edmundsons:						London Elec. Trans. Ltd. ..	2½	2½	97	..	2 11 3
7% Pref. ..	7	7	34/6	..	4 1 4	London & Home Counties 1955-75	4½	4½	113	..	3 19 8
Ord. ..	6	6	29/-	..	4 2 9	London Pass. Trans.: A ..	4½	4½	122½	..	3 13 6
Elec. Dis. Yorkshire	9	9	45/6	..	3 19 6	B ..	5	5	122½	..	4 1 8
Elec. Fin. and Securities ..	12½	12½	55/-	..	4 11 0	C ..	3	3½	72	..	4 10 3
Elec. Supply Corporation ..	10	10	46/6	..	4 6 0	West Midlands J.E.A. 1948-68 ..	5	5	108½	..	4 12 4
Isle of Thanet ..	Nil	Nil	18/-	..	—						
Lancs. Light and Power ..	7½	7½	36/-	..	4 3 4	Telegraph and Telephone					
Llanelli Elec. ..	6	6	26/-	..	4 12 4	Anglo-Am. Tel.: Pref. ..	6	6	121	..	4 19 2
London Assoc. Electric	3	4	23/6	..	3 8 1	Def. ..	1½	1½	30	..	5 0 0
London Electric	6	6	28/-	..	4 5 9	Anglo-Portuguese	8	8	26/-	..	6 3 1
London Power Red. Deb. ..	5	5	104½	+1	4 14 7	Cable & Wireless: 5½ Pref. ..	5½	5½	113½	..	4 17 0
Metropolitan E.S. ..	8	8	40/-	..	4 0 0	Ord. ..	4	4	82½	..	4 17 7
Midland Counties ..	8	8	40/6	..	3 19 0	Canadian Marconi \$1 Nil	4cts.	9/3	—3d.	—	—
Mid. Elec. Power ..	9	9	44/-	-6d.	4 1 9	Globe Tel. & Tel.: Ord. ..	8½*	5*	39/6	..	2 10 8
Newcastle Elec. ..	7	7	30/6	..	4 12 0	Pref. ..	6	6	30/-	..	4 0 0
North Eastern Elec. Ordinary ..	7	7	33/6	..	4 3 7	Great Northern Tel. (£10) ..	Nil	Nil	21½	+1	—
7% Pref. ..	7	7	35/-	..	4 0 0	Inter. Tel. & Tel. Nil	Nil	Nil	16	..	—
Northampton ..	10	10	48/-	..	4 3 4	Marconi-Marine ..	7½	7½	34/-xd	..	4 8 3
Notting Hill 6% Pref. (£10) ..	6	Nil	11	..	—	Oriental Tel. Ord. 16	10	45/-	-6d.	..	—
Northmet Power: Ordinary ..	7	7	38/6	..	3 12 9	Telephone Props. 6	Nil	17/-	—
6% Pref. ..	6	6	30/6	..	3 18 8	Tele. Rentals (5/-) 10	10	11/9	..	4 5 0	—
Richmond Elec. ..	6	6	25/6	..	4 14 1						
Scottish Power ..	8	8	40/-	..	4 0 0	Traction and Transport					
Southern Areas ..	5	5	23/-	..	4 7 0	Anglo-Arg. Trans.: First Pref. (£5) Nil	Nil	2/6	..	—	—
South London ..	7	7	28/-	..	5 0 0	4% Inc. ..	Nil	Nil	6	..	—
West Devon ..	5	5	23/6xd	..	4 5 1	Brit. Elec. Traction: Def. Ord. ..	45	45	1175	+10	3 16 7
West Glos. ..	4½	3½	24/6	..	2 17 4	Pref. Ord. ..	8	8	175	..	4 11 5
Yorkshire Elec. ..	8	8	43/-	..	3 14 5	Bristol Trams ..	10	10	56/6	..	3 10 10
						Brazil Traction ..	\$1	\$1½	26½	+½	6 10 10
Overseas Electricity Companies						Calcutta Trams ..	5½	6½	38/6	+1/-	3 7 6
Atlas Elec. ..	Nil	Nil	6/3	+3d.	—	Cape Elec. Trams 5	6	26/-	..	4 12 4	—
Calcutta Elec. ..	6*	6*	38/-xd	+6d.	3 3 2	Lancs. Transport 10	10	45/6	..	4 8 0	—
Cawnpore Elec. ..	10	10	35/-	..	5 14 3	Mexican Light: 1st Bonds ..	5	5	102½	..	4 17 7
East African Power 7	7	7	33/-	..	4 4 10	Rio 5% Bonds ..	5	5	105½	..	4 14 9
Jerusalem Elec. ..	7	5	28/6	..	3 10 2	Southern Rly.: 5% Prefd. ..	5	5	79	..	6 6 7
Kalgoolie (10/-) 5	5	5	10/-	..	5 0 0	5% Pref. ..	5	5	117½	-2½	4 5 1
Madras Elec. ..	4*	Nil	23/-	..	—	T. Tilling ..	10	10	59/6	+6d.	3 7 3
Montreal Power ..	1½	1½	23	-½	6 10 5	West Riding ..	10	10	44/6	..	4 10 0
Palestine Elec. "A" 4*	5*	41/-	..	2 8 9							
Perak Hydro-elec. 6	7	10/-	..	—							
Shawinigan Power 33cts.	90cts.	15	-½	—							
Tokyo Elec. 6% 6	6	15	..	—							
Victoria Falls Power 15	15	4½	..	3 12 7							
Whitehall Inv. Pref. —	6	23/6	..	5 2 2							

(Continued on next page)

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend		Middle Price May 23	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price May 23	Rise or Fall	Yield p.c.
	Pre- vious	Last					Pre- vious	Last			
Equipment and Manufacturing											
Aron.Elec.Ord.	10	15	60/-		£ s. d. 5 0 0	General Cable (5/-)	15	15	15/-		£ s. d. 5 0 0
Assoc. Elec. :						Greenwood & Batley	15	15	42/6		7 1 2
Ord.	10	10	53/-	+6d.	3 15 3	Hall Telephone(10/-)12½	12½	12½	28/6		4 7 9
Pref.	8	8	39/6		4 1 0	Henley's (5/-)	20	20	26/9		3 14 9
Automatic Tel.& Tel. 12½	12½	12½	67/-	+1/-	3 14 9	4½% Pref.	4½	4½	24/-		3 15 0
Babcock & Wilcox	11	11	50/6xd	+3d.	4 7 3	Hopkinsons	15	17½	66/3		5 5 8
British Aluminium	10	10	47/6		4 4 1	India Rubber Pref.	5½	5½	23/6		4 13 9
British Insul.Ord.	20	20	5½		3 14 0	Intl. Combustion	30	30	6½	+½	4 12 4
British Thermostat						Johnson & Phillips	15	15	74/0	+6d.	4 0 6
(5/-)	18½	18½	21/-	+1/6	4 8 1	Lancashire Dynamo	22½	22½	95/3	+½	4 14 6
British Vac. Cleaner						Laurence,Scott(5/-) 12½	12½	12½	13/-		4 16 2
(5/-)	15	30	30/-		5 0 0	London Elec. Wire	7½	7½	39/-		3 17 0
Brush Ord. (5/-)	8	9	9/-	-3d.	5 0 0	Mather & Platt	10	10	50/-		4 0 0
Buroc (5/-)	15	17½	15/6		5 13 0	Metal Industries(B)	5	8	47/6		3 7 6
Callender's	15	20	5½		3 16 0	Met.Elec.CablePref.	5½	5½	21/3		5 3 6
Chloride Elec.Storage15	15	80/-			3 15 0	Murex	20	20	105/9		3 15 6
Cole, E. K. (5/-) . .	10	15	30/-		2 10 0	Pye Deferred (5/-)	25	25	27/6		4 11 0
ConsolidatedSignal	24	27½	6½	+½	4 8 0	Revo (10/-)	17½	17½	41/8	-1/-	4 4 4
Cossor, A. C. (5/-)	7½*	10*	25/-		2 0 0	Reyrolle	12½	12½	70/-	+½	3 11 5
Crabtree (10/-) . .	17½	17½	38/-	+3d.	4 12 1	Siemens Ord. . . .	7½	7½	33/-		4 11 0
Crompton Parkinson						Strand Elec. (5/-)	7½	10	7/9		6 9 0
Ord. (5/-)	20	22½	30/6		3 14 9	Switchgear & Cow-					
E.M.I. (10/-) . . .	6	8	30/9		2 12 0	ans (5/-)	20	20	18/6		5 8 1
Elec. Construction	10	12½	52/-		4 16 2	T.C.C. (10/-) . . .	5	7½	21/3	+½	3 10 7
Enfield Cable Ord.	12½	12½	58/-	-1/-	4 9 3	T.C. & M.	10	10	53/-		3 15 6
English Electric	10	10	50/6	+6d.	3 19 0	TelephoneMfg.(5/-)	9	9	11/3		4 0 0
EnsignLamps (5/-)	25	15	21/3		3 10 8	Thorn Elec. (5/-)	20	20	25/-	+½	4 0 0
Ericsson Tel. (5/-)	22*	20*	55/6		1 16 0	Tube Investments	20	20	97/-		4 2 4
Ever Ready (5/-) . .	40	40	41/-		4 17 7	Vactric (5/-) . . .	Nil	Nil	14/9		—
Falk Stadelmann	7½	7½	33/6		4 9 7	Veritys (5/-) . . .	7½	7½	7/6		5 0 0
Ferranti Pref. . . .	7	7	30/-		4 13 4	WalsallConduits(4/-)	55	55	48/6		4 10 7
G.E.C. :						Ward & Goldstone					
Pref.	6½	6½	34/-		3 16 6	(5/-)	20	20	26/9		3 15 6
Ord.	17½	17½	93/-		3 15 1	WestinghouseBrake12½	14	14	75/-		3 14 9
						West, Allen (5/-)	7½	7½	7/3		5 3 5

* Dividends are paid free of Income Tax.

Stocks and Shares (Continued from page 759)

intended ultimately to handle products made by the Brush Company and its subsidiaries, concentrating at first on the manufacture of coachwork. This Sir Ronald Matthews stated at the meeting last week. He disclaimed any idea of being a pessimist, but "if we are to do all the things we want to do as a nation after the war," he maintained, "industry should be free as far as is reasonably possible from all hampering restrictions and control; enterprise, initiative and adventure being given full scope". The price of the shares has recovered to 9s. There had been a certain amount of selling lately on behalf of people who, having bought the shares considerably cheaper, preferred to take their profit.

Brazilian Traction

Brazilian Government bonds have been rising in price by leaps and bounds, but Brazilian Traction have shown little disposition to sympathise with this movement. The price is ¼ better at 26½. Holders of the shares admit impatience at the slowness of their stock to respond to the call of Brazilian

Government issues, and they ask why it is there should be this attitude of indifference, on the part of investor and speculator alike. The shares are now deemed to be on a dividend basis of \$2 per share, which, at the present price, offers a good yield on the money. Speculative investment is for the time being neglecting the shares, possibly in favour of others which happen to be more popular.

Free of Tax

To investors who like to see their dividends paid to them free of tax, it may be of service to draw attention to shares which are quoted in our lists, and to mention a few others which do not appear in the weekly group. Amongst the former, Ericsson Telephones at 55s. 6d. pay £1 16s., and A. C. Cossor, at 25s., 2 per cent. Calcutta Electrics, at 38s., give £3 3s. 2d. per cent. Palestine Electric "A", at 41s., return £2 8s. 9d. Delhi Electric Supply & Traction ordinary shares are on offer at 49s., to give £3 13s. 6d. Taking tax at 10s. in the £, the yields just mentioned must be doubled in order to show a gross return comparable with that of other dividends that are paid less tax. The calculations are made upon the last-paid dividends in each case.

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.

Salford.—Electricity Department. May 31st. Street lighting standards (36), steel or concrete. (May 19th.)

West Midlands.—Joint Electricity Authority. July 25th. Circulating water pumps and pump house. (May 19th.)

Orders Placed

Newcastle-on-Tyne.—City Council. Accepted. 3-cwt. electric hoist (£128).—Herbert Morris.

Oldham.—Electricity Committee. Accepted. Installation of upward jet system of water distribution in two cooling towers, Chadderton works.—Davenport Engineering Co. Eleven inverse time limit relays.—Ferguson, Pailin.

Rochdale.—Electricity Committee. Accepted. Renewal of cable contract for further twelve months.—W. T. Glover.

Western Australia.—Government Tender Board. Accepted. Electric lamps for twelve months.—British G.E.C.

Workington (Cumberland).—Electricity Committee. Accepted. Paper-covered cables (contract extended for twelve months).—British Insulated Cables.

Contracts in Prospect

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

Alloa.—Completion of Hutton Park housing scheme for Town Council; Robert Beatson, builder, Alloa.

Amble.—Central kitchen, Red Row; R. & G. Brown, 34, Albert Street, Amble, Northumberland.

Bedlington.—Central kitchen at Colliery (£2,266); J. W. Urpeth, Front Street, Bedlington.

Bolton.—Farm school, Springbank, Turton; C. Herbert, borough engineer, Town Hall.

Cardiff.—Factory; J. B. Fletcher & Sons, architects.

Hutments for nurses, Caerau Hospital; city engineer.

Chesterfield.—Electric pumps, transformer, switchgear, housing, etc. (£1,500); Chesterfield and Bolsover Water Board, Saltergate.

Darlington.—Alterations in Northgate for W. T. Avery, Ltd., and workshop for Sherwood Bros.; H. B. Richardson, architect, 3, Skinnergate, Darlington.

Davertry.—Pumping station for waterworks; A. H. S. Waters, consulting engineer, 25, Temple Row, Birmingham, 2.

Denny (Stirlingshire).—Building to accommodate six classes at Denny Public School; burgh surveyor.

Derbyshire.—New buildings for Chesterfield Grammar School, Brookside Bar, Brampton; J. Harrison, county architect, County Offices, Derby.

Edinburgh.—Club buildings at West Pilton Drive, Edinburgh, for Youth Centre Committee; E. Wilcock, hon. secretary, 15 Easter Drylaw Place, West Pilton, Edinburgh.

Hebburn-on-Tyne.—Loading bays for A. Reyrolle & Co., Ltd.; Cackett, Burns Dick & McKellar, Ellison Place, Newcastle-on-Tyne.

Jarrow-on-Tyne.—Works additions; Bewley & Scott, contractors, Dunston-on-Tyne.

Kent.—Extensions, Chartham Hospital (£1,250), youth centre, Chartham (£1,250); nurses' accommodation, County Hospital, Dartford (£2,500); additions, County Hospital, Pembury (£3,860); dining room, Welling Central School (£1,500); huts at Technical School, Ashford (£1,250), William Gibbs School, Faversham (£1,500) and Girls' School, Sittingbourne (£1,250); additions to Technical Institutes at Gravesend (£4,900) and Maidstone (£1,400); children's home, Hadlow; nursery, Crofton Avenue, Orpington (£2,500); and A.R.P. depots (£3,200); county architect, Maidstone.

London.—School and hospital repairs (£39,000) and partial development of housing site, Camberwell (£10,000); L.C.C. architect.

Lewisham.—Works reconstruction, Courthill Road, for S. W. Farmer & Son; T. P. Bennett & Son.

Factory additions, 13-25, Leathwell Road; Foster & Foster.

Manchester.—Central kitchen for 1,000 meals at Hulme; G. N. Hill, city architect, Town Hall.

Newcastle-on-Tyne.—Factory and offices; Page, Son & Bradbury, architects, King Street, South Shields.

Works additions for George Angus & Co., Ltd., leather manufacturers, Walker Road; Hetherington & Wilson, County Chambers, Newcastle.

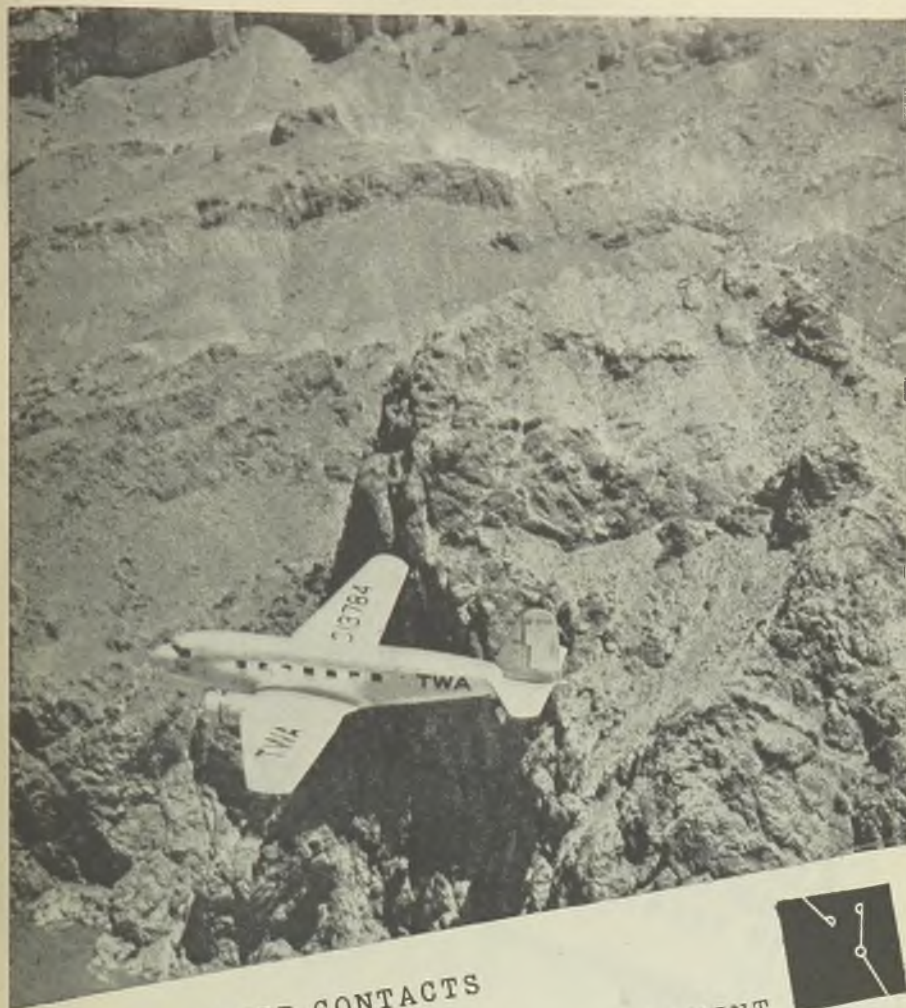
Northamptonshire.—Extensions, Grammar School, Towcester (£2,600); J. Perkins, county architect, County Hall, Northampton.

Silverdale (Staffs).—Extensions, Chapel Street; Silverdale Aerated Water Co., Chapel Street.

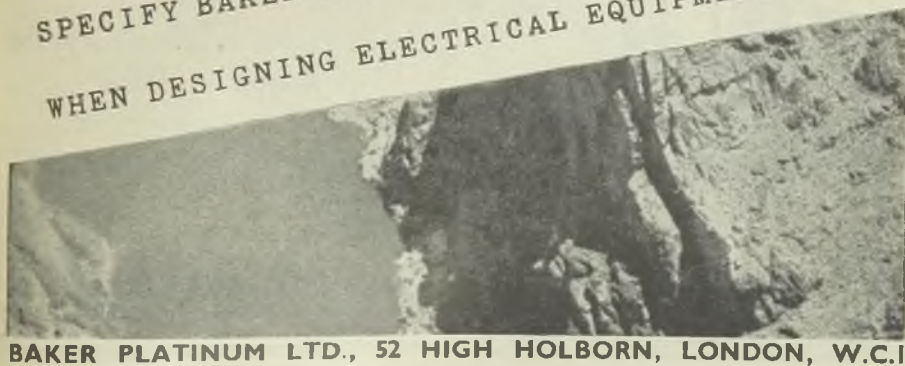
Stockton-on-Tees.—Workshop extensions, Parkfield Works, for Ashmore, Benson Pease & Co., Ltd.

Warwickshire.—Central kitchen, Wilnecote (£4,950); youth centres at Solihull (£1,525) and Castle Bromwich (£1,670); nurses' accommodation, County Hospital, Warwick (£5,500); and extensions to King Edward School, Nuneaton (£5,000); county architect, Warwick.

Wigan.—Senior School, Springfield; Rev. F. Greenhouse, P.P., Church of the Sacred Heart, Throstle Nest Avenue.



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WHEN DESIGNING ELECTRICAL EQUIPMENT



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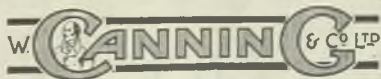
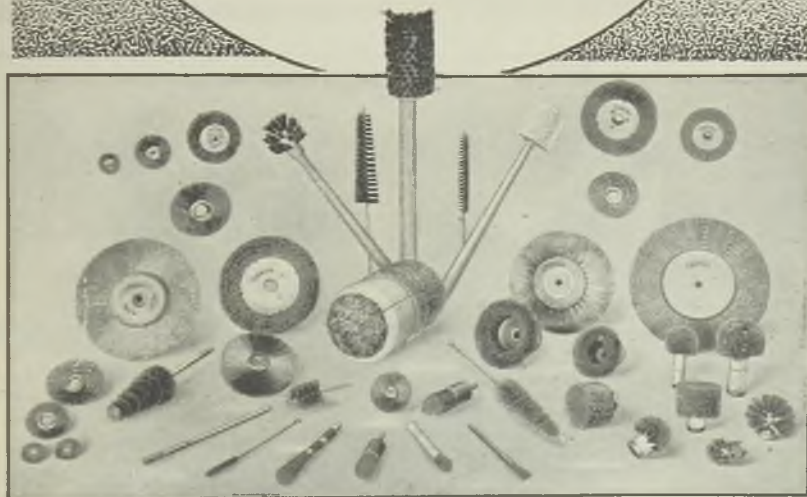
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WIRE WHEELS AND BRUSHES

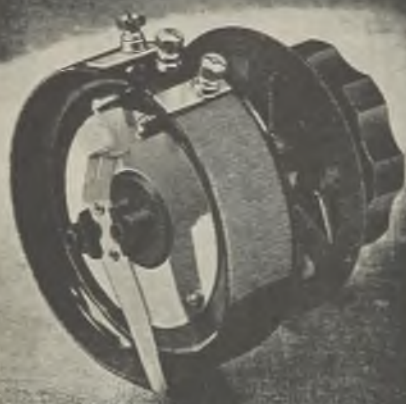
We manufacture a full range of Wire Brushing Wheels and Brushes for Munitions, and have solved many problems in brushing and cleaning shell cases, bomb castings, hand grenades, fuse parts, etc.

● Send your Brushing or Cleaning problems to us for immediate attention



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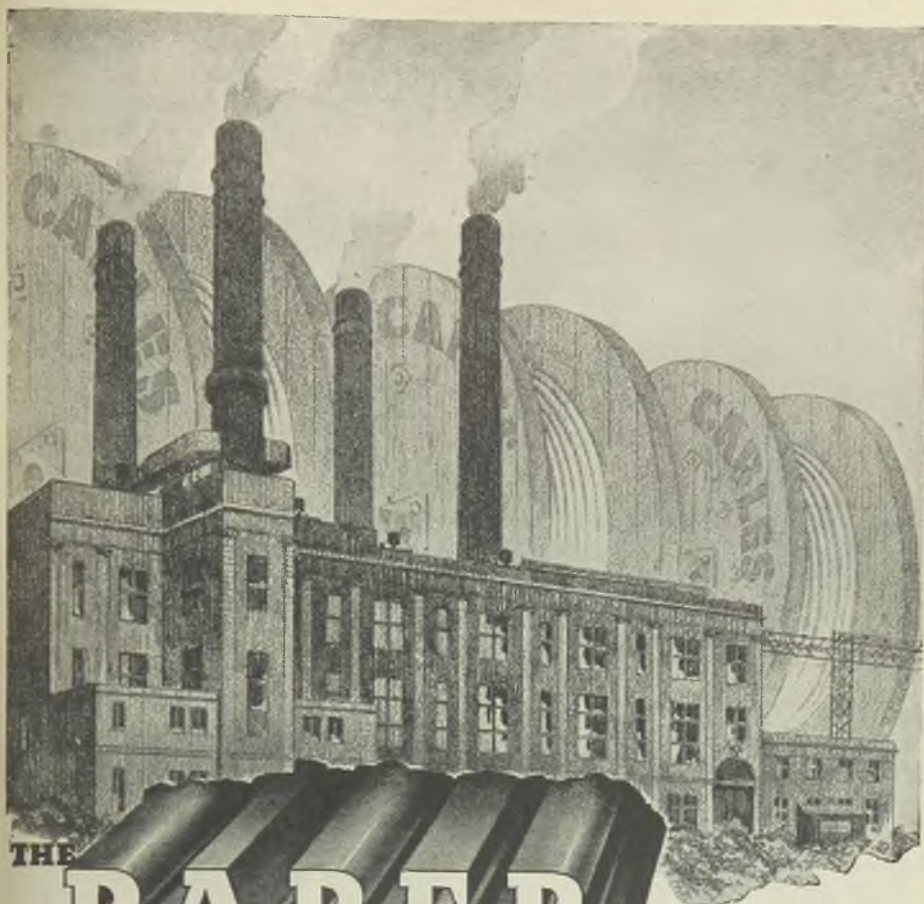
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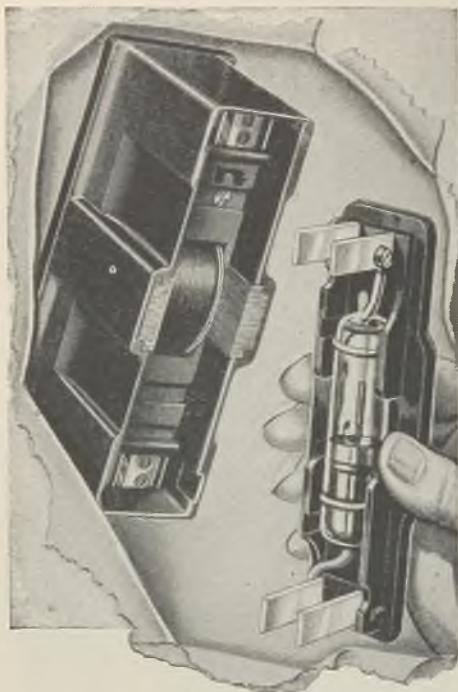
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Something NEW in Switchgear!

Sordoviso produce a new Plug-in Contactor

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(British & Foreign Patents). For full information write:

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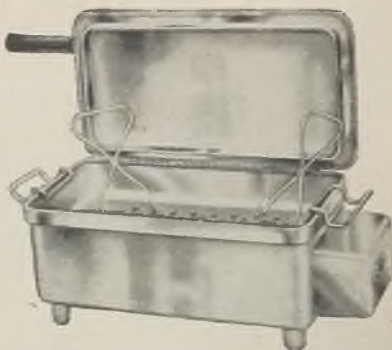
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Contractors to Air Ministry, Ministry of Aircraft Production,
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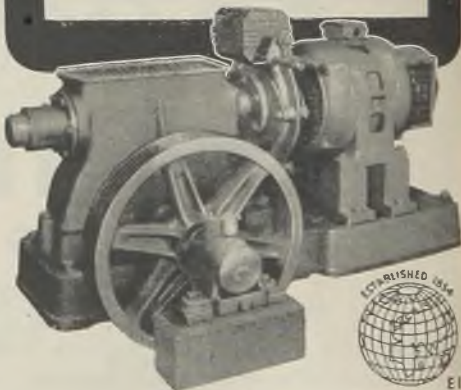
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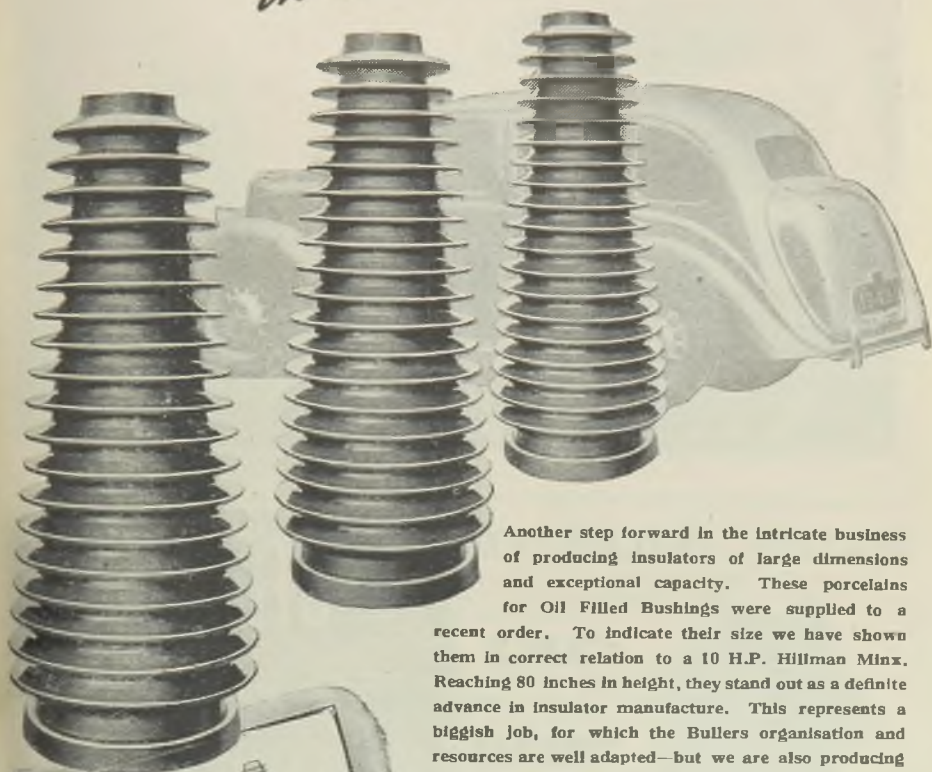
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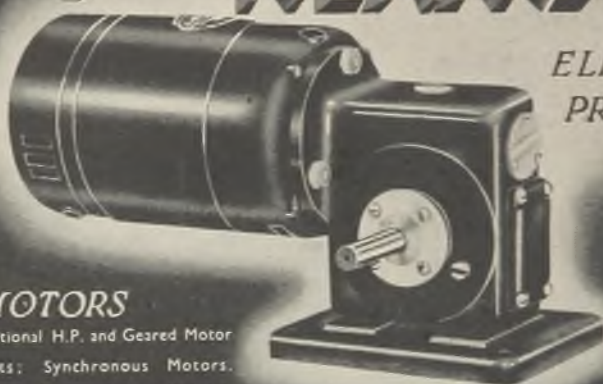
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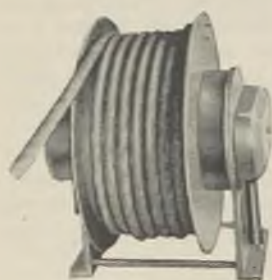
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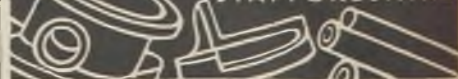
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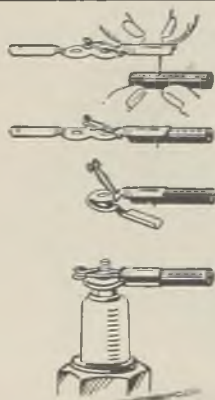
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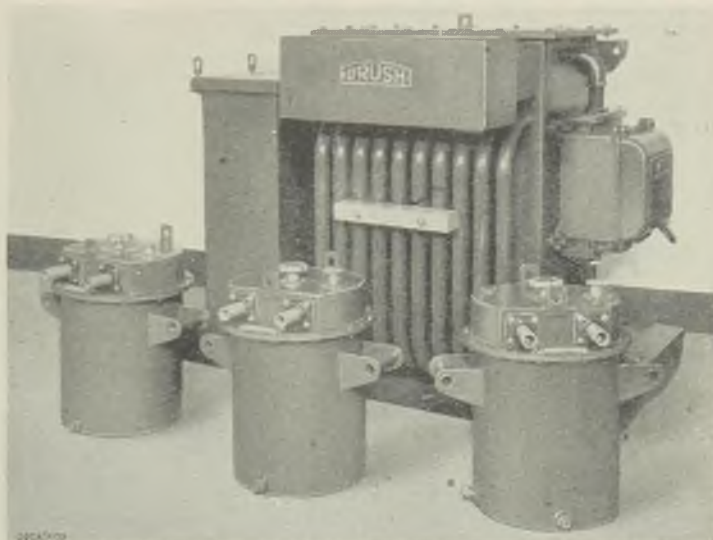
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THIS equipment is constructed for heavy duty to withstand the most arduous service conditions and conform to British Standard Specification 1071-1943.

The illustration shows a Brush 90 kVA Transformer complete with incoming control switch and fuse, and condenser for power factor correction, the whole mounted on skids for ease of movement.

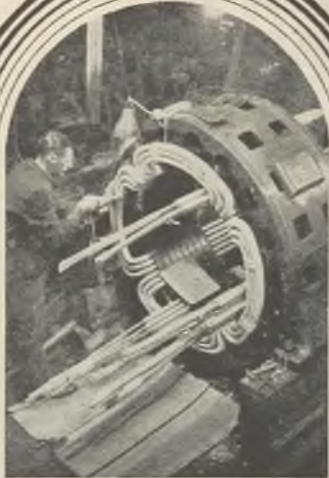
Three of six regulators are shown in the foreground. Each regulator has a capacity of 300 amperes per arc and is fitted with a robustly constructed switch having 36 positions to cover a current range from 35 to 300 amperes. The switch is arranged for positive location in all positions. An indicator plate shows the current ratings.

Brush Welding Equipment is built to cover four standard sizes, details as follows :—

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54	Three at 300 amps per arc
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5-136

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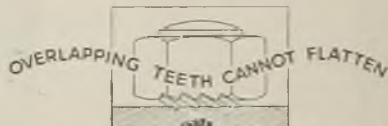
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Overlapping teeth cannot be flattened.
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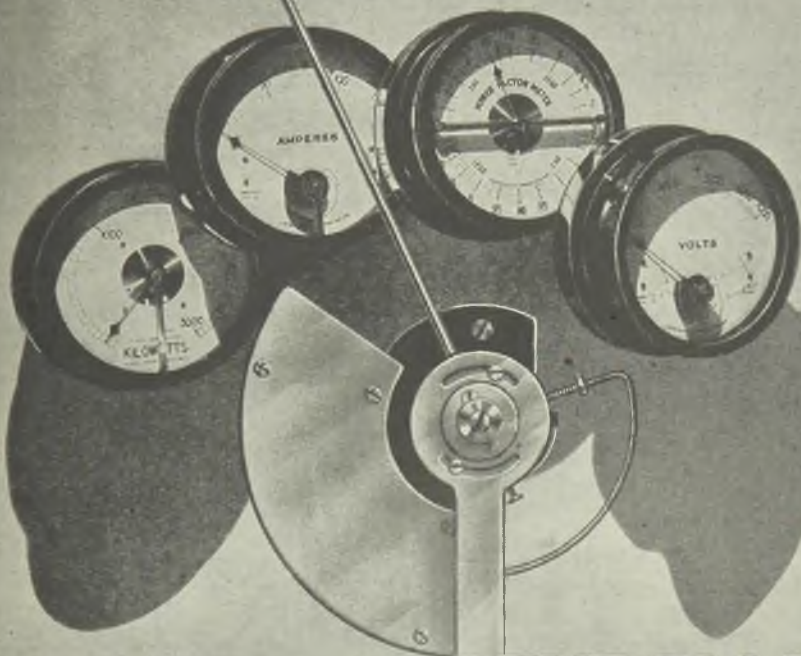
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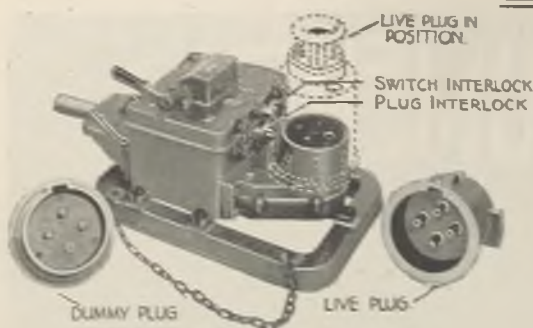
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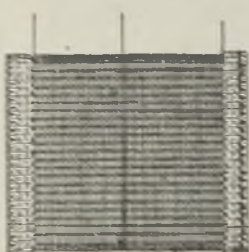
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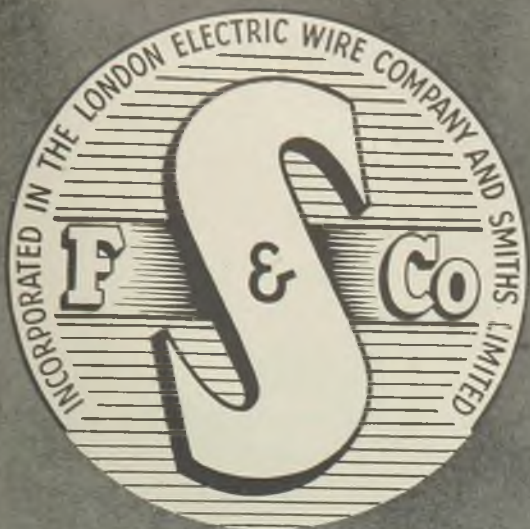
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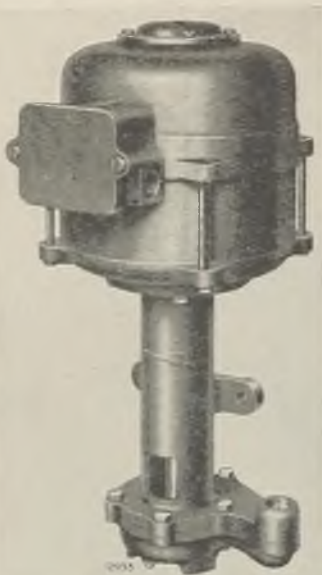
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Gallons per minute, suds	5	13
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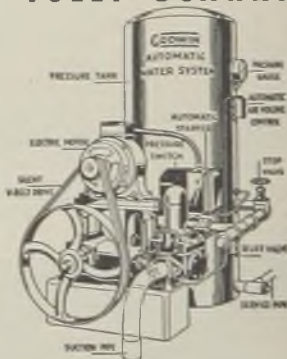
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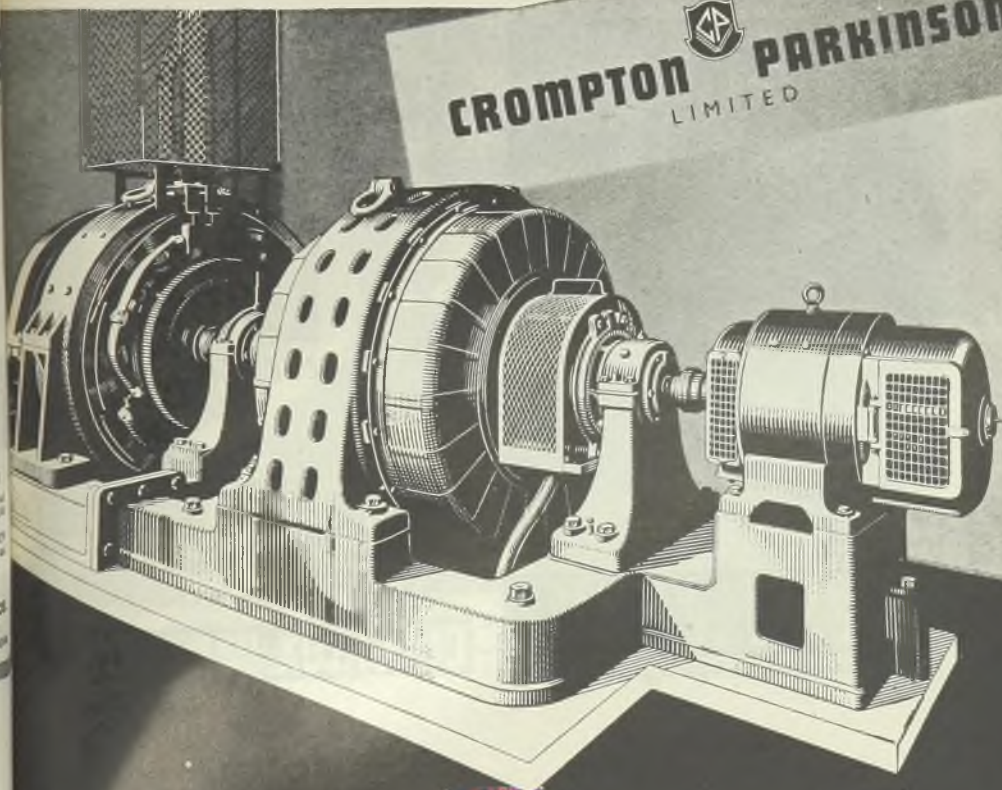
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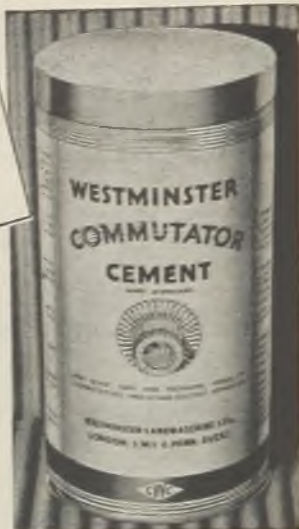


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"ASHTON" WELDING CABLE

300 AMP.
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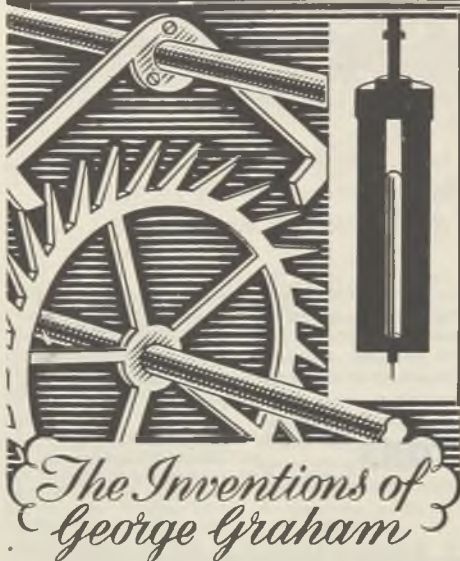
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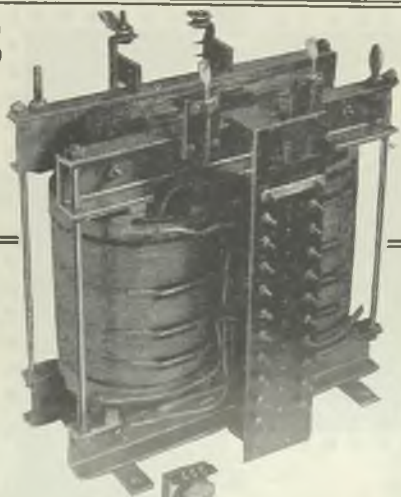
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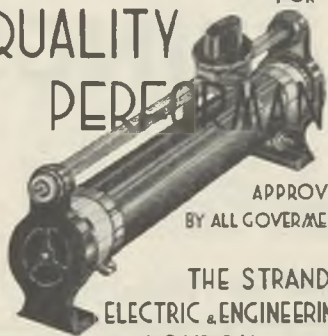
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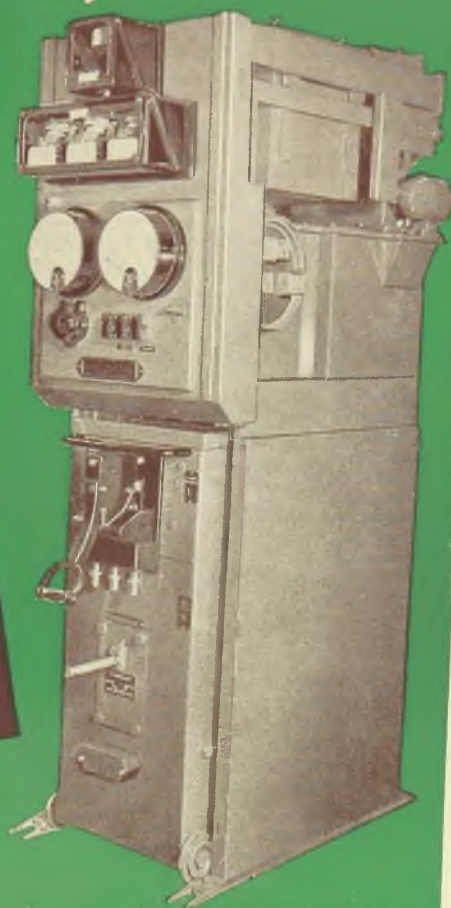
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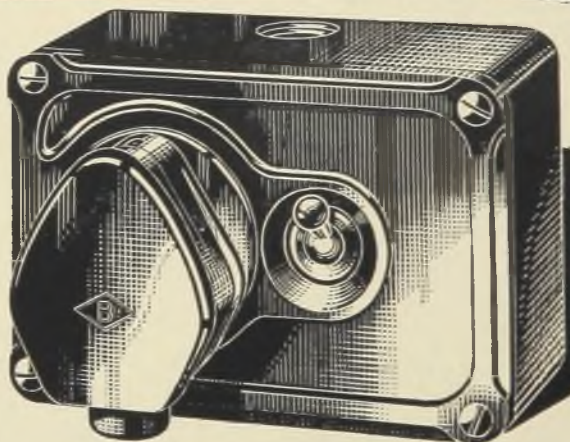


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ELECTRICAL ACCESSORIES FOR ALL WAR-TIME INSTALLATIONS

The Outstanding Quality of "BRITMAC" Ironclad Accessories is well known. The Switchplug illustrated, Catalogue No. P.1402, fully justifies its popularity, resulting in ever-increasing demands which, bearing in mind present day conditions, we are endeavouring to satisfy. May we send you full details of the "BRITMAC" Ironclad Range?



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We also manufacture the following instruments :-

MODEL 200. 2" instrument with either round or square covers.

MODEL 250. $2\frac{1}{2}$ " instrument for flush or projecting mounting.



MODEL 500
5" Instrument



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4" Instrument
MODEL 350
3 1/2" Instrument



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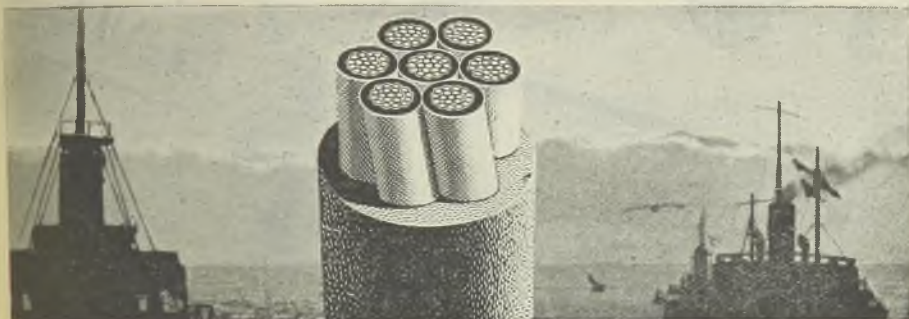
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Illustrated is a seven-cored tough rubber sheathed and waterproof cable that is



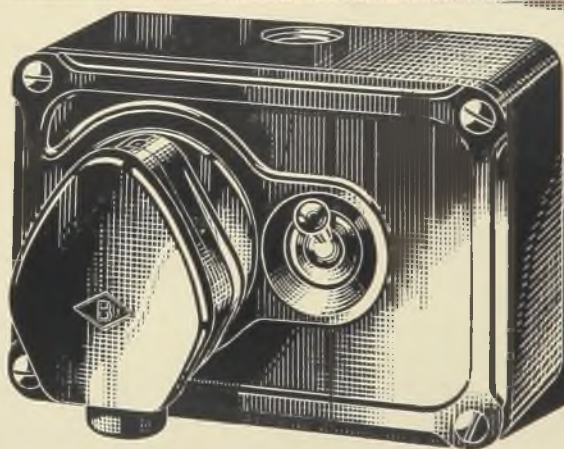
playing its part in helping ships at sea . . . **MERSEY CABLES**



MERSEY CABLES WORKS LTD • LINACRE LANE • BOOTLE • LIVERPOOL. Rubber Insulated Cables in all sizes for all purposes.

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IRONCLAD SWITCH PLUG UNITS



ELECTRICAL ACCESSORIES FOR ALL WAR-TIME INSTALLATIONS

The Outstanding Quality of "BRITMAC" Ironclad Accessories is well known. The Switchplug illustrated, Catalogue No. P.1402, fully justifies its popularity, resulting in ever-increasing demands which, bearing in mind present day conditions, we are endeavouring to satisfy. May we send you full details of the "BRITMAC" Ironclad Range?



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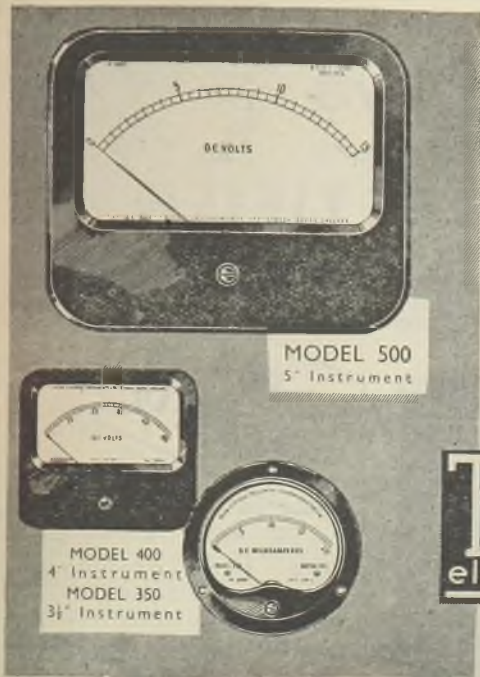
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electrical instruments Ltd.

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Illustrated is a seven-cored tough rubber sheathed and waterproof cable that is



playing its part in helping ships at sea . . . **MERSEY CABLES**



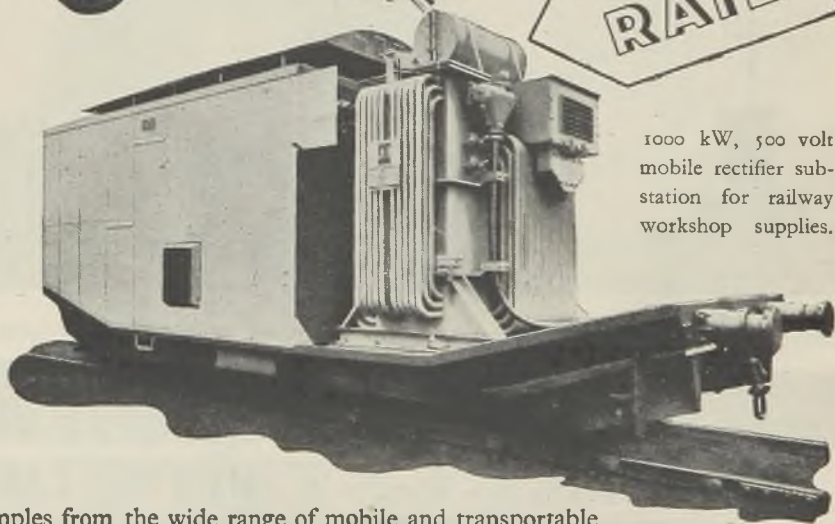
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100 kW mobile unit
giving a 220 volt D.C.
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ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First post on Monday**, at Dorset House, Stamford Street, London, S.E.1. (For *Whitsun* see notice below.)

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

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

Original testimonials should not be sent with applications for employment.

WHITSUN

Classified Advertisements for our issue of June 2 closed for press first post on **FRIDAY, MAY 26**

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.

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Electricity Department

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APLICATIONS are invited for the above at the Council's Generating Station. Salary in accordance with N.J.B. Schedule, Class D, Grade 8, at present £345 per annum.

The position is superannuated and the successful candidate will be required to pass a medical examination and contribute to the superannuation fund.

Applications, giving age, details of training and experience, with copies of recent testimonials, to be delivered to the undersigned not later than Monday, 5th June, 1944.

C. W. JACKSON,
Engineer and Manager.

Electricity Works,
King's Lynn,
15th May, 1944.

151

BOILER HOUSE ENGINEER

BOILER House Shift Engineer required in 94 M.W. Power Station to be responsible to the Charge Engineer for operation of H.P. water tube boilers, including combustion efficiency control. Experience of H.P. boiler control essential. Salary in accordance with N.J.B. Schedule, Class I, Grade 9, at present £372 per annum. Applications, giving details of qualifications and experience, to be addressed to the General Manager, Hull Corporation Electricity Department, Ferensway, Hull, not later than 9th June, 1944.

176

AN excellent opportunity is open in a progressive advertising agency for a first-class man (or woman) experienced in the complete handling of Technical Advertising. Principally the newcomer would be wanted for the origination of schemes and the writing of "copy" and preparation of preliminary visuals. This is a ground-floor chance for the right person. Apply, giving full details of experience, age, wage required, to—Edward Martin Harvey Advertising Agency Ltd., Staple House, 51/52, Chancery Lane, London, W.C.2. 160

CLERK wanted by well-known electric motor repair firm in South London. Good salary and prospects to live and intelligent man.—Box 143, c/o The Electrical Review.

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 disclosed. All replies to Box Numbers will not 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.

CONTRACTS Estimator required by company engaged on complete installation of underground cables (all pressures), erection of overhead lines, etc. Permanent confidence. State age, experience and salary expected to.—Box 183, c/o The Electrical Review.

CONTRACTS Manager required by company engaged on complete installation of underground cables (all pressures), erection of overhead lines, etc. Applicants must have first-class experience, including estimating, and be capable of undertaking complete responsibility. Permanent position. Applications will be treated in the strictest confidence. State age, experience and salary expected to.—Box 184, c/o The Electrical Review.

DESIGNER or Manager with designing experience required for the manufacture of Electric Junction and Pillar Boxes. Excellent opening and permanent position for suitable applicant. Applications will be treated in the strictest confidence. State age, experience and salary expected to.—Box 182, c/o The Electrical Review.

ELECTRICAL Contractors in Leeds require experienced Storekeeper. Must be fully conversant with all types of electrical installation materials and be capable of organising receipt and despatch of such materials for large contracts. Excellent post-war prospects for right man with initiative. Reply, giving full details of age, experience and salary required, to.—Box 142, c/o The Electrical Review.

ELECTRICAL Contractors, with head office in London, opening branch in Glasgow, require Area Manager, with knowledge of all classes of power and lighting installations, preferably with connection in Scotland. Details of experience, age and remuneration, in confidence, to.—Box 117, c/o The Electrical Review.

ELECTRICAL Manufacturers require Lighting Representatives for Scotland, North-East Coast, Yorkshire, West Country, with South Wales, London. Electrical and lighting knowledge desirable. Ex-Servicemen preferred. Age limit 36. Reasonable remuneration with sound post-war prospects. Details of education, areas known, National Service position, and if car driver, to.—Box 4986, c/o The Electrical Review.

ELECTRICAL Wholesalers require a Clerical Assistant, conversant with trade and materials as handled.—Box 24, c/o The Electrical Review.

FEMALE Assistants required for the supervision of interesting statistical and technical work in an Electric Lamp Factory. At least secondary education and fair aptitude for simple calculations and record keeping desirable. Permanent and progressive positions with good post-war prospects are offered, but temporary services of really suitable applicants will be considered. Apply at once for particulars to—Cryselco Limited, Kempston Works, Bedford. Phone, Bedford 3277.

FOREMAN required for a North-East Coast firm manufacturing turbo-type alternators. Applicants should have experience in preparation of windings and assembly of large stators and rotors for this class machinery. Write, giving details of experience, to the Ministry of Labour and National Service, R.O.5A (1) (Reference No. 19), 28, Great North Road, Newcastle-upon-Tyne. 2. 121

OVERSEAS Employment: Armature Winders urgently required for service with the Admiralty, Gibraltar. Rate of pay for week of 47 hours, £4 11s. to £5 3s. plus overtime and allowances. Free furnished quarters. A leaflet containing full details will be furnished to suitable applicants. Written applications (no interviews), giving details of age, National and Armed Forces registration numbers, training, experience and name of present employers, should be sent to—The Secretary, Overseas Manpower Committee (Ref. 1247), Ministry of Labour and National Service, Alexandra House, Kingsway, London, W.C.2. 158

INSPECTOR required to take charge of inspection and quality control in works producing specialised electrical components. Knowledge of electric motor manufacture preferred. Experienced A.I.D. procedure. Permanency to right man. —Box 146, c/o The Electrical Review.

LEADING firm of cable manufacturers require services of a Sales Engineer with live connection among electricity supply undertakings and large buyers in London and the Home Counties. Full details of past experience and salary expected to—Box 159, c/o The Electrical Review.

OVERSEAS Employment: Assistant Mechanical Engineer required for the electrical branch of the Nigerian Government Public Works Department for one tour of 12 to 24 months, with possible permanency. Salary £475, rising to £660 a year. Separation allowance for married men is £98 on salary of £475. Free passages and quarters. Candidates must have served an apprenticeship in a good engineering works and have experience of Babcock boilers, steam turbines, reciprocating internal combustion engines and gas producer plant. They must be competent to take charge of shift and run small power station. Written applications (no interviews), giving details of age, National Service Armed Forces registration numbers, training, experience and name of present employers, should be sent to—The Secretary, Overseas Manpower Committee (Reference 1931), Ministry of Labour and National Service, Alexandra House, Kingsway, London, W.C.2. 154

PRODUCTION Manager required by company engaged in the manufacture of Electrical Equipment. Applicants must have first-class technical education up to degree standard, sound practical training and complete knowledge of modern methods of works production and management. Permanent and progressive position for applicant with sound experience and initiative. Applications will be treated in the strictest confidence. State age, experience and salary expected to—Box 183, c/o The Electrical Review.

RELIEF Switchboard Attendant. Required, for power station in West Country. Switchboard Attendant. N.J.I.C. conditions. Zone "B." Present wage, 27.14d. per hour, rising to 28.09d. in immediate future. Candidate must be accustomed to synchronising and controlling large turbo-alternators and to grid operation. Position is permanent and pensionable to suitable man. Before applying, candidates should ascertain if release from present employment will be agreed to, if appointed.—Box 150, c/o The Electrical Review.

REQUIRED immediately for municipal power station in S.W. area, the following staff: Turbine Drivers, 25.87d. per hour; Assistant Turbine Drivers, 24.34d. per hour; Boiler Firemen, 25.24d. per hour; Assistant Boiler Firemen, 24.01d. per hour; Ash Conveyor Attendants, 23.98d. per hour; Fitters' Mates, 21.42d. per hour. The positions are permanent and pensionable for suitable men. A medical examination is necessary. The first five categories above listed comprise shift workers, and, in the case of the first four, previous similar experience is necessary. In all cases it will be necessary for applicants to ascertain their position regarding release from present employment. In view of the acute housing shortage in the area, successful applicants who are married, or have dependants living with them, will, during the period of hostilities, and whilst awaiting a house, be paid lodging allowances on the Ministry of Labour scale.—Box 177, c/o The Electrical Review.

SALES Correspondent and Estimator to handle enquiries and orders for A.C. Electric Motors. Full particulars of age, education, training, experience and salary required, to—Box No. 226, Reid Walker, Field House, E.C.4. 4985

THE following vacancies exist in the Ministry of Aircraft Production—Technical Officers and Technical Assistants II (Order No. P.P. 229). Requirements, authorship, compilation and editing of technical handbooks or manuals relative to equipment in use by the R.A.F., e.g., airframes, aero engines, marine craft, mechanical transport, balloon barrage equipment, instruments, armament, radio electrical and ground equipment. Salaries, technical officers (male) £275-£580 per annum, (female) £275-£520 per annum; Assistants II (male) £315-£375 per annum, (female) £265-£300 per annum. All salaries carry war bonus. Assistants II receive payment for overtime. Technical Illustrators or Commercial Artists (not necessarily engineering draughtsmen) (Order No. P.P.188). Requirements, illustration of R.A.F. manuals and handbooks dealing with technical equipment in use by R.A.F. and preparation of diagrams for training purposes. Salary from 70s. per week to £327 12s. per annum according to qualifications and experience, plus war bonus. Payment for overtime. 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 appropriate Order No., should be addressed to—The Ministry of Labour and National Service, Appointments Department, Sardinia St., Kingsway, London, W.C.2. 155

SALES Representatives required for Atlas Electric Lamps. Remunerative positions with excellent post-war prospects for keen, energetic men not liable for military service. Connections amongst electrical and hardware trade and large users an advantage. Salary, commission and expenses. Write in confidence, with details of past record, to—Box S.R.12, Thorn Electrical Industries, 105, Judd Street, London, W.C.1. 158

TRAVELLER required for Liverpool and Manchester area, E.L.M.A. manufacturer. State connection, references, salary required.—Box 127, c/o The Electrical Review.

APPOINTMENTS FILLED

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

BOXES 1740 & 4943—Assistant (Male).

SITUATIONS WANTED

COMMERCIAL Engineer and Sales Manager, with 25 years' administrative experience, wishes to contact live concern interested in post-war sales expansion, home and export. Salary £1,500 or equivalent.—Box 5911, c/o The Electrical Review.

COMMERCIAL or technical position required by young Radio/Electrical Engineer, exempt, best education, technical training of degree standard, several years' practical and trade experience, linguist, used commercial correspondence.—Box 5908, c/o The Electrical Review.

ELECTRIC lamps, associated products and components. Production specialist with wide experience desires post in managerial or consulting capacity.—Box 5912, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer (33), apprentice ship, sound experience electrical machinery, including design, production, repair and sales, seeks post with good firm, A.M.I.E.E.—Box 5892, c/o The Electrical Review.

ELECTRICAL and Refrigeration Engineer, A.M.I.E.A., M.R.S.E.S., at liberty to take post as business manager or partner for immediate activity.—Box 5906, c/o The Electrical Review.

ELECTRICAL Engineer (29), specialising in the design and manufacture of electrical measuring instruments and allied equipment, seeks to contact company who can offer a suitable field of activity; post-war, or possibly in the near future.—Box 5907, c/o The Electrical Review.

ELECTRICAL Engineer (49) desires position as representative or agent in London and Southern Counties, connection with Government departments, supply authorities and trade.—Box 5887, c/o The Electrical Review.

ELECTRICAL Supervising Engineer seeks position electrical contractors, 25 years' experience in control of contracts, office routine, labour, store control. Free.—Box 5863, c/o The Electrical Review.

ENGINEER (40), discharged R.N., regular electrical experience, proven record of co-ordination and co-operation, available short notice, seeks contact with established concern, London, Home Counties, S. or S.W. Midlands, with view to permanency. Negotiations, plans and estimates, technical literature, purchase and sales, contract and office staffs, plant and maintenance. Some experience mechanical assembly and building construction.—Box 5905, 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.

WATER TUBE BOILERS IN STOCK

Three 12,000 lbs. evaporation, 200 lbs. W.P.			
One 12,000	160
One 4,000	160

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.

SHEFFIELD CORPORATION ELECTRICITY DEPT.

Sale of Redundant and Scrap Plant

Neepsend Generating Station

THE Electricity Committee invite Tenders for the purchase and removal of the following equipment from the Neepsend Generating Station, Club Mill Lane, Sheffield.

- Two Stirling Water Tube Boilers with economisers and ancillary plant, original capacity 30,000 lbs. per hour.
- Two Steel Feed Water Tanks.
- Four Steam Feed Pumps, original capacity 10,000 galls. per hour.
- Four Electric Feed Pumps, original capacity 20,000 galls. per hour.
- Five Keith Blackman Fans and Motors.
- One 2-ton Jib Travelling Steam Crane by Messrs. Coles Ltd., Derby.
- Eleven 2-phase Electric Motors of varying sizes.

Also

- One English Electric Co. 10,000-kW Alternator in a damaged condition, lying at the English Electric Co.'s yard at Stafford.

A schedule and specification of the plant for disposal will be available on and after 27th May, 1944, on application to the undersigned, and the plant may be inspected by appointment.

In the execution of the work of removal the successful Tenderer will be required to comply with the Standing Orders of the City Council relating to standard rates of wages and conditions of labour.

The Corporation reserves the right to accept Tenders for the whole or part of the plant referred to.

Tenders to be forwarded to the Town Clerk, Town Hall, Sheffield, 1, enclosed in the official envelope provided, which must be sealed and bear no name or mark indicating the sender, and received by him not later than first post on Monday, the 16th June, 1944.

Tenders received after the time stipulated herein will not be considered.

JOHN R. STRUTHERS,

Commercial Street,

Sheffield, 1.

May, 1944.

General Manager.

181

ELECTRIC MOTORS & 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.,

22-23 BRITANNIA STREET,

CITY ROAD, LONDON, N.1.

Telephone: 5512-3 Clerkenwell.

13

ECONOMISERS IN STOCK

TWO Green's Economisers, 208 tubes, 250 lbs. W.P.
ONE Green's Economiser, 128 Tubes, 185 lbs. W.P.

All 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

MODINSTAL ELECTRIC COMPANY, LIMITED

INDUSTRIAL INFRA-RED APPARATUS FOR

PAINT DRYING

COMPLETE EQUIPMENTS OR SINGLE UNITS

PROVIDED.

GUARANTEED HEAT GENERATORS.

OLDHAM WORKS, OLDHAM TERRACE,

ACTON, W.3, LONDON.

Telephone: Acorn 3504/5.

M.E.C. APPARATUS, DULL EMITTER SYSTEM.

46

STIRLING CORPORATION

Electricity Undertaking

Power Station Plant for Sale

OFFERS are invited for the whole or part of the following plant, all of which is in first-class working order:

(1) 4 LANCASHIRE BOILERS, each 8 ft. x 28 ft., working pressure 160 lbs. per sq. in. Safety valves, stop valves and water gauge fittings of Hopkinson's Ltd. manufacture. All eight furnaces fitted with Neils Patent Rocker Furnace Bars.

(2) 2 WEIR BOILER FEED PUMPS, each of a capacity of 4,000 gallons per hour. Pump 7" in diameter, cylinder 9 1/2" in diameter, stroke 21". Both pumps fitted with mechanical lubricators. Steam ends fitted with U.S. packing, all complete with spares.

(3) 224-TUBE GREENS ECONOMISER, complete with scrappers and gear.

(4) 300-kW GENERATING SET, Belliss & Morcom triple expansion engine, having cylinders 12", 17" and 26" x 12" stroke, speed 375 r.p.m., 430 b.h.p., direct coupled to Dick Kerr 6-pole D.C. generator, 480/500 volts, 625/600 amps. (shunt wound), 375 r.p.m.

(5) 220-kW GENERATING SET, Allen 3-cylinder compound engine, having cylinders 14", 18" and 18" x 10" stroke, speed 375 r.p.m., 425 b.h.p., direct coupled to Siemens 6-pole compound D.C. Generator, 500/550 volts, 440 amps., 375 r.p.m.

Also quantity of 6" and 4 1/2" M.S. and Copper Steam Piping and Hopkinson's and Ferranti Main Stop Valves. Can be seen by appointment. 171

ENGINES

45 b.h.p. vertical single-cylinder PETTER Atomic Diesel Engine, new 1932, 375 r.p.m., cold start, complete with accessories.

37 1/2 b.h.p. vertical single-cylinder CROSSLEY enclosed Diesel Engine, No. 103235, new 1935, 500 r.p.m., cold start, complete with accessories.

43/49-h.p. CROSSLEY horizontal single-cylinder solid injection cold start Diesel Engine, No. 91399 (1925), 250 r.p.m., complete with accessories.

27/30 h.p. NATIONAL vertical 3-cylinder high-speed Diesel Engine, type "3D", No. 42710, new 1939, 1,000 r.p.m., hand or compressed air starting, complete with accessories.

26-h.p. CROSSLEY horizontal single-cylinder Diesel Engine, type H.D.E.8, No. 118040, new 1935, 340 r.p.m., cold starting, complete with accessories.

We can offer generators with any of the above.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL

4996

FOR SALE

20-kW Diesel Generating Set, comprised of 28-b.h.p. NATIONAL vertical 3-cylinder water-cooled Diesel engine, 1,000-r.p.m., No. 42710, new 1939, direct coupled to 20-kW, 230-volt D.C. compound Generator, complete with engine accessories and shunt regulator.

23-kW Diesel Generating Set, comprised of 45-b.h.p. PETTER vertical single-cylinder Atomic Diesel engine, No. 220399, 375 r.p.m., direct coupled to 460-volt D.C. compound Generator, 375 r.p.m., with shunt regulator and accessories.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL

173

ARC WELDING MACHINES FROM STOCK

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

MAX-ARC WELDERS LTD.,

190, THORNTON ROAD, CROYDON.

THORNTON Heath 4276-8.

35

GEORGE COHEN, SONS & CO., LTD.

SUPPLIERS OF SECONDHAND
GUARANTEED ELECTRICAL
PLANT.

SHOWROOMS AT: WOOD LANE,
LONDON, W.12.

Telephone: Shepherds Bush 2070.

STANNINGLEY, NEAR LEEDS.

Telephone: Pudsey 2241.

27

FOR SALE

150-kW Generating Set, comprising **BELLISS & MORCOM** 215-h.p. compound engine, steam 150 lbs., speed 450 r.p.m., direct coupled to 230-volt D.C. Generator by **MATHER & PLATT**, with control panel.

DITTO PLANT.
100-kW Generating Set, comprising vertical compound engine by **HOWDEN**, steam 150/160 lbs., speed 450 r.p.m., direct coupled to 500-volt D.C. Generator by **DICK KERR**.

75-kW Generating Set, comprising vertical compound engine by **BELLISS & MORCOM**, steam 120 lbs., speed 525 r.p.m., direct coupled to 220-volt D.C. Generator by **ELECTROMOTORS**.

49-kW Generating Set, comprising twin-cylinder vertical engine, steam 70/90 lbs. pressure, speed 400 r.p.m., direct coupled to 100/140-volt D.C. Generator by **MAVOR & COULSON**.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL

174

REBUILT MOTORS AND GENERATORS

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

SEND US YOUR ENQUIRIES.

OVER 1,000 RATINGS ACTUALLY IN STOCK HERE.

DYNAMO & MOTOR REPAIRS LTD.,

Wembley Park, Middlesex.

Telephone: Wembley 3121 (4 lines).

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

Telephone: Northern 0898.

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B.A. BRASS & STEEL SCREWS, NUTS, WASHERS, STUDDING, SPRING WASHERS, ETC.

London Stocks. Enquiries Welcomed.
Small or Large Quantities Supplied.

APEX SALES,

6. LEASIDE ROAD, LONDON, E.5.
STA. 7131.

5859

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

A number of modern first-class Ruston Hornsby horiz. cold start Diesel Engines, 10-60 h.p., available for quick delivery.—J. Gerber & Co. Ltd., Wembley, Mdx. 164

SPECIAL OFFER

JOHN THOMPSON SELF-CONTAINED SUPER ECONOMIC BOILER, new 1940 (worked for 18 months only), 8½ ft. dia. x 14 ft. long, 8,000 lbs. per hour evaporation, 180 lbs. pressure. Complete with triumph stokers, induced draught fan, coal elevator and motors. Inspection near London.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL
4998

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). 5881

A.C. Motors, 1/50th h.p. to 2 h.p., from stock, for essential work only.—Johnson Engineering, 86, Great Portland Street, W.1. Tel. Museum 6373. 15

A.C. Welder, petrol driven, 12 kW, 230/1/50, self-contained, semi-portable, as new.—J. Gerber & Co. Ltd., Wembley, Middx. 166

AERIAL Cables, all sizes quoted for; good deliveries against Government contract numbers.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5815

ALTERNATING Diesel Set, 31 kVA, 400/3/50, 1,000 r.p.m., coupled to 4-cyl. vert. coil start Ruston engine.—J. Gerber & Co. Ltd., Wembley, Middx. 163

ALTERNATING Petrol Set, 60 kVA, 400/3/50, self-contained, rad. cooled, semi-portable, as new.—J. Gerber & Co. Ltd., Wembley, Middlesex. 165

ALTERNATOR, 35 kVA, 400-440 v., 50 cycles, 3-phase, 750 r.p.m., exciter mounted on shaft extension.—Box 5893, c/o The Electrical Review.

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

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

BEST English Cables, 1/044 up to 127/103, deliveries against M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5916

CARBONS, large stocks assorted sizes, solid and cored.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5917

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

FOR sale, 200-kW Alternator by E.C.C., for 415 volts, 3-phase, 50 cycles, star connected, 750 r.p.m., mounted on extended baseplate with long shaft extension for pulley drive, supported by outer pedestal bearings, complete with switchboard and Isenthal automatic voltage regulator, new 1935.—George Cohen, Sons & Co. Ltd., Wood Lane, London, W.12. Tel.: Shepherds Bush 2070. 168

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

GENERATING Sets for sale, petrol and crude oil, A.C. and D.C., including 10-kW, 400/3/50 and 2½-kW, 230/1/50 petrol sets.—Fyfe, Wilson & Co., Ltd., Station Works, Bishop's Stortford. 178

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

LEAD-covered and Armoured Cables, P.I. and V.I.R., various special lines at low prices.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5918

LONDON Power Company. Offers are invited for a quantity of unused Cast Iron Spare Parts for Underfeed "E" Type Stokers, detailed list of which is available, and which may be inspected at Grove Road Generating Station, St. John's Wood, N.W.8. 152

MICROAMMETER (0-6uA) Cambridge Pointer, 41821, good condition. Also Cambridge Vacuo Thermal Junction.—B.M./Z.L.M.E., W.C.1. 5909

MODERN 48-kW Diesel Alternator Set, comprising 80-h.p. Fielding coil start Heavy Oil Engine, "V" belt, driving a 48-kW Verity Alternator, 400/250 volts, 3-phase, 50 cycles, with all accessories, as installed and running, new 1936. Overhauled by makers recently. Inspection Birmingham.—Abelson & Co. (Engs.) Ltd. 2297, Coventry Road, Sheldon, Birmingham. Tel. Sheldon 2424. 170

MOTORISED 4" Bench Drilling Machine, 13 speeds, £11 11s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 51

MONOMARK. Permanent London address. Letters re-directed. 5s. p.a. Write—BM/MONO53, W.C.1. 44
MOTOR Generator Sets and Convertors, all sizes and voltages from ½ kW up to 500 kW in stock.—
Britannia Manufacturing Co., Ltd., 22/26, Britannia Walk, City Road, London, N.1. Telephone, Clerkenwell 5512, 5513 & 5514. 12

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

PHONE 98 Staines. 250 kW Browett Steam Set, 220 v. D.C.; 60-kW Allen Crane Oil Set, 220 v. D.C.; Weir Feed Pump, 9½" x 7" x 21"; 18-h.p. Electromotor Motor, 415/3/50; 35-kW Tangye Crude Oil Engine and 220-v. Dynamo; 4" Turbine Pump, 450" head.—Harry H. Gardam & Co. Ltd., Staines. 30

PORCELAIN Cleats, 2 and 3 groove, various sizes ex stock, price list.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5919

PORCELAIN Insulators and Spindles, also Cleats, cheap.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5920

ROTARY Converter, "Bull." input D.C. 220 v., output 220/230 v., 1-ph., 50-per.; 1 kVA, perfect.—Southern Ignition Co., Ltd., 190, Thornton Road, Croydon. 76

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

RUSTON-Hornsby Generating Plant, 15 h.p., 100/50 v., 80/105 amp., complete with 1,000 amp-hour battery, in excellent condition, £200. Would separate.—Wicksteed, Royston. 162

SELF-Priming Electric Pumps, 300 g.p.h., £11 11s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 53

SINGLE-core V.I.R., Braided Flexible, heavy insulation, carry 24 amps., cheap.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5921

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

SWITCH and Fuse Units, Conduits and fittings, works requirements stocked.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5922

TEN modern 8-h.p., 720-r.p.m., 400-volt, 3-phase, 50-cycles, ball-bearing, squirrel cage Motors, by "Brook," each with rails and "E.A.C." oil-immersed star/delta starter. Three new "NECO" geared Motors for 400-volt, 3-phase, 50 cycles, 1,450/26 r.p.m., two 1 h.p. and one ½ h.p. Apply—Newman Industries Limited, Yate, Bristol. 144

T.R.S. Cables and Flexibles supplied to M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5923

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36 25-watt R.C. Pearl Lamps, Mazda; 59 25-v., 25-watt ditto, Mazda; 102 25-v., 25-watt ditto, Osram; 107 25-v., 25-watt ditto, Cryselco. All are new and unused, £30 the lot.—Green's, 20, Welford Road, Leicester. 5913

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75-kW Motor Generating Set, input 400/3/50, output 205 volt D.C., and switchboard; 150-kW Motor Generating Set, input 400/3/50, output 220 volt D.C., complete with control gear; one 50-kW Motor Generating Set, input 400/3/50, output 110 volt D.C., complete with control gear.—Stewart Thomson & Sons, Fort Road, Seaford, Liverpool, 21. 61

80-kW Motor Generating Set, input 400/3/50, shirping motor, output 80 kW, 220 volt D.C., comp. int. on combination baseplate.—Electric Machinery Co. (M/cr.) Ltd., New Union Works, New Islington, Ancoats, Manchester. 4922

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WANTED. Rotary Converters, any size.—Universal, 221, City Road, London, E.C.1. 22

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BRITISH Patent 509993: Method of electrically welding the links of metal chains. Patentees desire to meet all demands for the practical development of this invention and invite enquiries from parties competent to take up the commercial exploitation of this patent. Address in first instance—Messrs. Dickler, Pollak, Mercer, Tench & Meyer, Chartered Patent Agents, 20-23, Holborn, London, E.C.1.

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THE patentee of Patent No. 901/39, relating to "Disinfection and drying by electrical means," wishes to enter into arrangements by licence or otherwise, on reasonable terms, for the purpose of exploiting and developing the apparatus, which has great post-war potentialities.—Box 5904, c/o The Electrical Review.

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COMPANY MEETINGS

BRUSH ELECTRICAL ENGINEERING

Further Increase in Trading Profit

Plea for Private Enterprise

Views of Sir Ronald Matthews

THE Fifty-fifth General Meeting of the Brush Electrical Engineering Company, Ltd., was held on Tuesday, May 16th, at the registered office, Falcon Works, Loughborough, Sir Ronald W. Matthews (the chairman) presiding.

The Chairman said: Gentlemen.—As the report and accounts have been circulated to you, I will, with your consent, take them as read. (Agreed.)

You will see that the accounts show that the progress which has been made by this company in recent years is being maintained. The trading profit amounts to £261,836, against £214,336 for the previous year. After providing reserves for depreciation and renewal of plant and buildings and charging bank and loan interest, war risk insurance and other sundry charges in the profit and loss account and taking credit for sundry dividends and interest, fees and repayments, the profit carried to the appropriation account is £175,002, against £118,130 for the previous year. With the balance of £10,271 carried forward from the previous year there is an amount of £185,273 taken to the appropriation account. Your directors recommend that this should be dealt with as set out in the directors' report.

The main appropriations are £93,000 as a provision for taxation, £25,654 as a transfer to general reserve, and £32,567 as a provision for Ordinary dividend for the year to 31st December, 1943—this is the amount to provide a dividend of 9 per cent, less income-tax, which is the rate your directors recommend.

Balance Sheet Changes

There are certain changes in the balance sheet as compared with last year which I will explain. In the balance sheet as at 31st December, 1942, there were 129,005 Ordinary shares of £1 each held under option. During 1943 options amounting to 123,210 were exercised and Ordinary shares to this amount were issued in exchange and converted, on issue, to Ordinary stock. The balance of 5,795 Ordinary shares of £1 each were issued at a premium, and on issue were also converted to Ordinary stock. Thus the issued capital of your company now consists of £391,489 Five-and-a-Half per cent. Cumulative Preference stock and £723,722 Ordinary stock, a total of £1,115,211.

Your directors have revalued the company's plant and machinery, loose tools, office equipment and motor vehicles as at 31st December, 1943, and have entered these assets in the balance sheet at the revised value which is equivalent to the value ascertained for Inland Revenue purposes—that is, the original cost of the assets, less wear and tear allowances as computed by the Inland Revenue. In order to reduce the gross value of the assets to the revised figure it has been necessary to transfer £40,000 from reserve for depreciation and renewal of plant. The balance of this reserve which it is no longer necessary to allocate specifically has been transferred to reserve for obsolescence and renewal of plant.

It is your directors' intention in future to write off for depreciation from the plant and machinery, loose tools, office equipment and motor vehicles, a sum equivalent to the wear and tear allowed by the Inland Revenue, and in addition to make periodical allocations from profits to the reserve for obsolescence and renewal of plant.

The reserve for depreciation of buildings which has been built up over the last few years has now been applied in writing down the value at which these assets stand in the balance sheet, and in future years it is proposed to depreciate buildings annually. It must be stressed that in addition to providing depreciation, the company is maintaining its buildings in good condition.

As a result of the transfer of £25,654 from the profit and loss account and the transfer of a premium of £4,346 on the issue of Ordinary shares, as referred to above, the general reserve now stands at a total of £130,000, which, with the balance remaining on reserve for obsolescence and renewal of plant—£120,000—puts the company in possession of total reserves amounting to a quarter of a million pounds.

Strong Position

Last year I drew your attention to the strong position disclosed by the consolidated balance sheet, when I pointed out that the surplus of current assets over current liabilities amounted to £680,220. This year the excess is no less than £709,123, while the figure for fixed assets, after applying against it the whole of the reserves, is only £417,853.

Your company's two main subsidiaries, Petters, Ltd., and Brush Coachwork, Ltd., made valuable contributions towards the increased turnover of the parent company.

During the year your company and Metropolitan-Vickers Electrical Company, Ltd., fused their interests in the battery electric vehicle industry. Before this fusion of interests your company had produced an electric truck. They have now extended their interest in the battery electric field by acquiring the goodwill and battery vehicle designs and stocks of the Metropolitan-Vickers Company, and while the latter will continue to manufacture the motors and controllers the vehicle will be built and sold as the "Brush" Electric Vehicle.

Since the close of the year a new company, Brush (S.A.) (Pty.), Ltd., in which your company has a majority holding, has been incorporated in Johannesburg, and while initially this company will concentrate on the manufacture of the other products manufactured by your company and its subsidiaries.

Craft Selection School

The importance of craftsmanship in the engineering industry is fully appreciated by your directors, and the trade apprenticeship courses of this company are among the most comprehensive in the country. Your directors, however, appreciate that training must be allied to an aptitude in every case for a specific craft. They have accordingly opened a craft selection school in the vicinity of the works, through which all youths pass and are graded into a trade before being indentured as trade apprentices. There is no doubt that the results will be of inestimable value to your company in future years, and the thanks of all concerned are due to Mr. Hoesason, who has given an immense amount of time and thought to the whole question.

In addition, immediate effect has been given to the proposals outlined in the recent White Paper for continuous education for young persons in industry, without waiting for the Bill to become law in the post-war period. A comprehensive programme has been worked out in collaboration with Loughborough College, and by means of courses in the works school and at the college continuous education, amounting to approximately one day per week, is being introduced for all boys and girls below the age of 18.

Post-War Trade Development

Though the energies of all connected with the company are being increasingly directed to making the maximum contribution to the winning of the war, you may rest assured that your directors are not unmindful of their responsibilities in regard to the development of the country's trade when the world is once more at peace. I am certainly no pessimist as regards the future of Britain in general and of this company in particular—but equally I regard with suspicion and apprehension the views of those super-optimists who look forward to orgies of unlimited spending without any very clear idea of where the money is coming from. These are the people who blissfully believe, or appear to believe, that the State is in possession of some unlimited fund which it can draw on ad lib for the carrying out of any schemes which seem desirable to the Government of the day. There is, I need hardly remind you, no such fund, and the expenditure of the State can be met only by taxation and by borrowing. The great bulk of revenue comes from the taxation of industrial profits, and it is consequently essential, if we are to do all the things we want to do as a nation after the war, that industry should be freed as soon as is reasonably possible from all hampering restrictions and controls, and that initiative, enterprise and adventure should be given full scope. Business can never be secured by rule-of-thumb methods in a Whitehall office; it has got to be pursued with energy and courage by those who understand the needs of markets and the vagaries of customers, and backed by conscientious workmanship in the shops.

Tribute to Management and Staff

I cannot conclude my remarks without expressing what I know is in the minds of all our shareholders—our grateful thanks to our managing director, Mr. Good, and his colleagues for their admirable work during the twelve months under review. Mr. Good has again led his team with the sure touch of the born captain, and has been loyally supported in board room and office and throughout the works.

The company has made notable contributions in many directions to the war effort, and on behalf of the shareholders I congratulate most warmly all concerned.

The report and accounts were unanimously adopted, and the dividends and other appropriations as recommended were approved.

The retiring directors (Mr. Alan P. Good, Mr. Allan Miller and Mr. M. A. Pienas) were re-elected, and Messrs. Cooper Brothers & Co. and Messrs. Lawrence Brothers & Co. having been appointed joint auditors, the proceedings then terminated.



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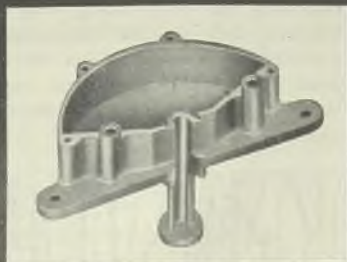
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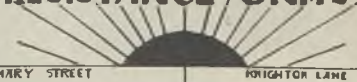


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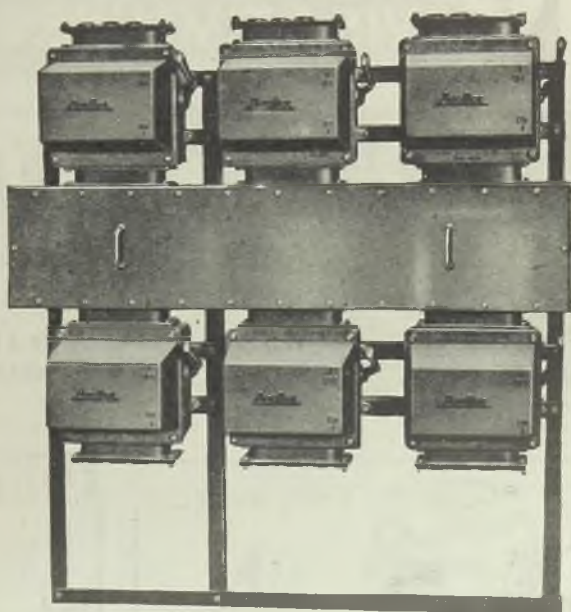
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