

ELECTRICAL REVIEW

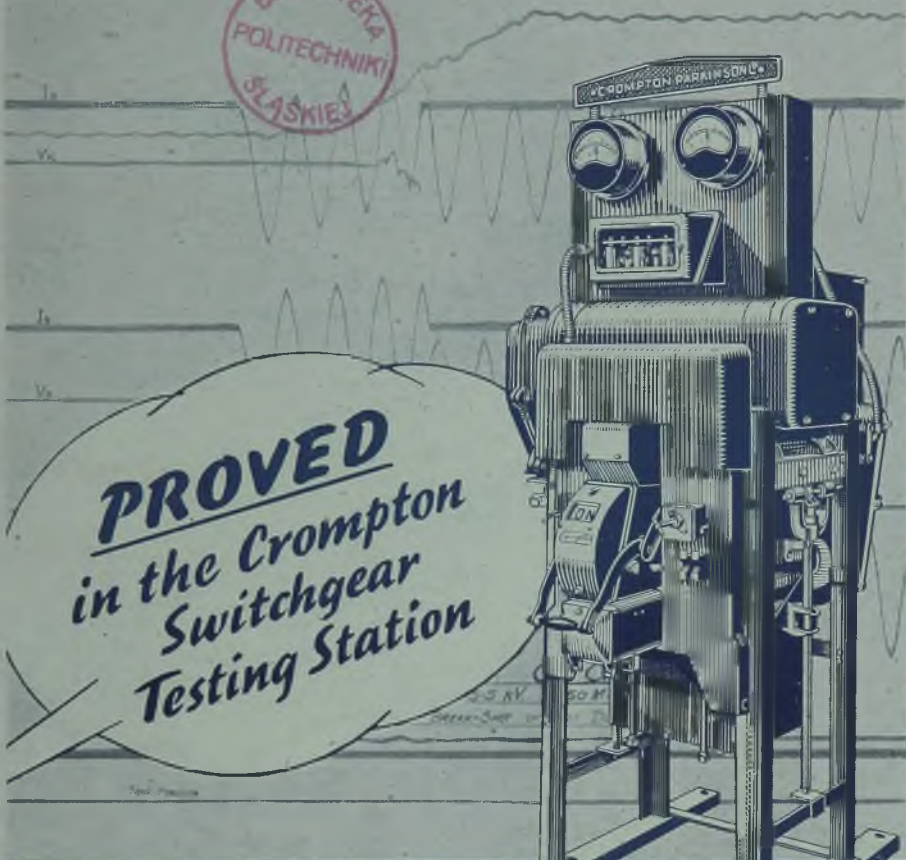
FOUNDED
1872

Vol. CXXXIV. No. 3467

MAY 5, 1944

9d. WEEKLY

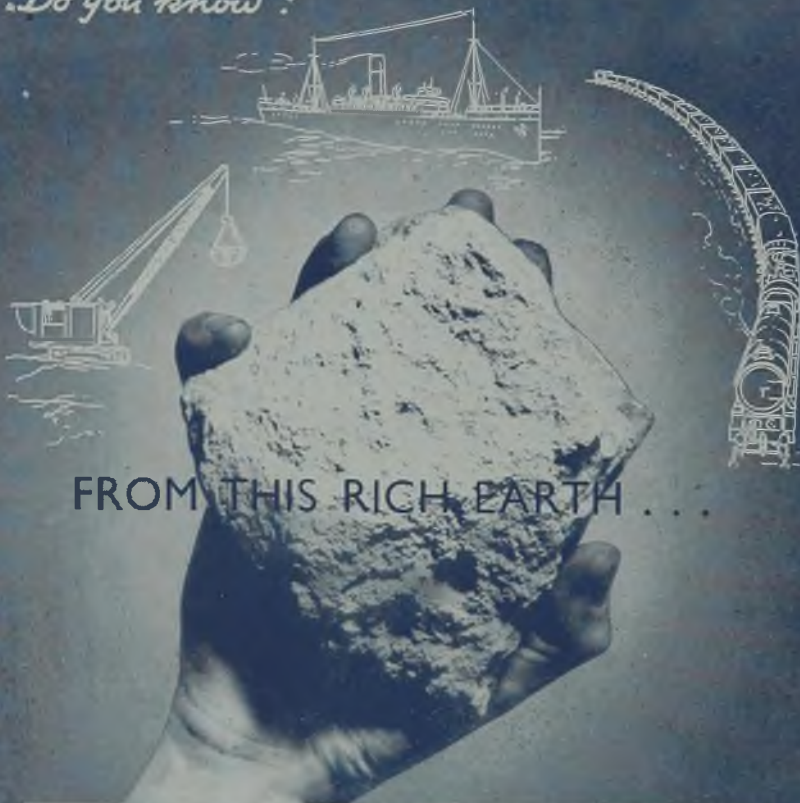
Series No. 1028
Catalogram No. 1348



PROVED
in the Crompton
Switchgear
Testing Station

CROMPTON  **PARKINSON**
LIMITED

Do you know?



FROM THIS RICH EARTH . . .

. . . comes BAUXITE which is named after the village of Les Baux in Southern France, where it was first found.

Next to silicon, aluminium is the most plentiful metal on earth. It is the basis of most rocks and clays, but the aluminium you use in your cooking utensils is not found in nature.

The industrially important ore is BAUXITE, found in fairly well defined belts around the globe, usually in a hot country with a high rainfall, in a district where surface water cannot run off rapidly and carry the slowly concentrating bauxite away. Given those conditions and vast periods of time, the basalts and granites are slowly relieved of more soluble oxides such as silica, leaving the more adamant elements, aluminium, iron, titanium.

The bauxite now being used to produce British aluminium probably started on its career thirty-three million years ago, and it takes four tons of that long prepared wealth to produce one ton of ALUMINIUM.

THE **British Aluminium**

Temporary Head Office -
SALISBURY HOUSE, LONDON WALL, LONDON, E.C.2
Telephone: CLERkenwell 3494

CO. LTD

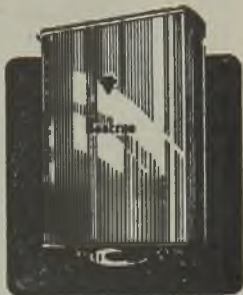
Telegrams: Cryolite, Avo, London



The Art of Knowing How



An Aborigine can throw a boomerang most expertly, but he could never design or make a "Heatrae." In converse manner, we could never throw a boomerang—except of course with years of practice. So we are not jealous of his prowess and we are certain he does not envy ours in the art of knowing how to do our particular job.



**LEADERS IN
ELECTRIC
WATER HEATING**

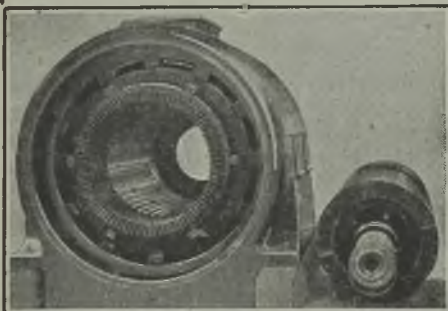
HEATRAE LTD., NORWICH

PHONE : NORWICH 25131

GRAMS : HEATRAE, NORWICH

REPAIRS

THE WESTMINSTER ENG. Co. Ltd.
Victoria Road, Willesden Junction, N.W.10



1500 kVA Turbo Generator Stator and Rotor
Entirely Rewound

Makers of Electric Welding Machines,
Photo Printing and Process Arc Lamps.
"Partridge" Pressure Detectors

Telephone:
Willesden 1700-1

Telegrams:
"Regency, Phone, London."

SOUND TERMINAL WITHOUT SOLDER



Suitable for Telephone Lines

FOR CABLES
AND WIRES
OF ALL KINDS



SIZES FROM
 $\frac{1}{8}$ " to $\frac{1}{2}$ "
HOLE

ROSS COURTNEY & Co. Ltd.
ASHBROOK ROAD, LONDON, N.19

POWER JETS



To the specific requirements of our customers

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



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

Come to the point!

It's hot—all the time! That's because the heating element is housed **inside the bit** in the Solon Electric Soldering Iron. Soldering is easier; you get a neater, cleaner job in less time. All internal connections are housed at end of handle, away from heat. A robust cord grip prevents sharp bending of the flexible lead.



Complete with 6 ft. Henley 3-core flexible, Solon Irons are made for the following standard voltages—100/110, 200/220, 230, 250. Illustration shows a 125 watt standard model.



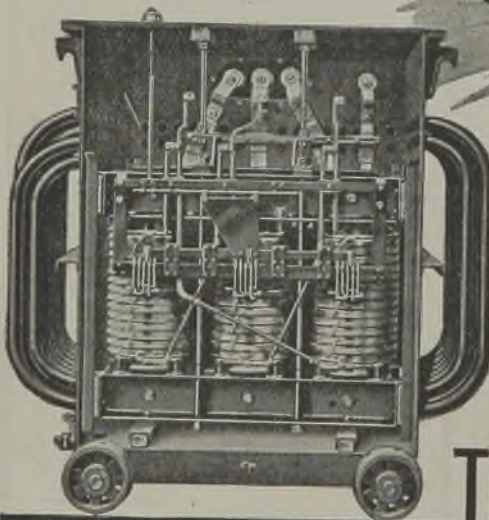
Supplies are, of course, only available for essential war work. Early orders are advisable as demands are heavy.



Made in England

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., Engineering Dept.
Milton Court, Westcott, Dorking, Surrey

Inside - Information



Outwardly one transformer looks very much like another. It's the unit inside the tank—the nerve centre—upon which real performance must be judged. The picture tells the discerning engineer just what he wants to know and shows how reliability is built into



TRANSFORMERS

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, SW1

BIRCHFIELDS - 5011 (4 LINES)

BILL SWITCHGEAR LTD
BIRMINGHAM-20

MANCHESTER - GLASGOW -
BELFAST - BURTON - OXFORD - TRENT
EXETER - SOUTHAMPTON

"BILSWITCH" BIRMINGHAM

**Make light of
Fuel Economy with**

SIEMENS

Lamps

BRITISH MADE

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

Remember, selling Siemens Lamps enhances
your goodwill — and, they help to save the
Nation's fuel.

Plastic Mouldings *for* Electrical Insulation, etc.

TEL-ENDURON composition material for telephone and telegraph insulators and other line equipment



Meter boxes in plastics give perfect insulation together with good appearance and durability

Plastic telephone instruments are moulded in light-fast colours and black

De La Rue Plastics
LIMITED.

Sales Office: IMPERIAL HOUSE · 84/86 REGENT STREET · LONDON · W1

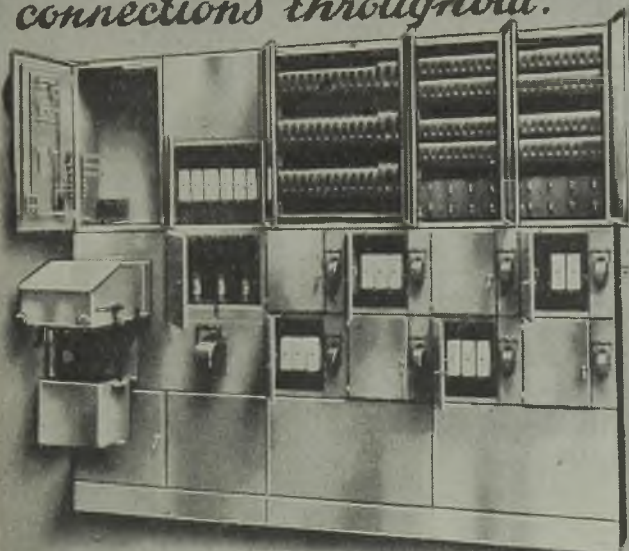
Telephone: REGent 4901

INDUSTRIAL SWITCHGEAR

and TRUNKING SYSTEMS



Labour costs on site are saved by using solid copper connections throughout.



ALSO
MAKERS
OF THE

Bus Bar Tee

OVERHEAD
DISTRIBUTION
SYSTEMS



DRAKE & GORHAM LTD

STANDARD RD. · NORTH ACTON · N.W.10

Telephones: Willesden 6601-2 Telegrams: Tincomar "Harles London."



BRUSH
SWITCHGEAR

The BRUSH ELECTRICAL ENGINEERING CO. LTD.
LOUGHBOROUGH - ENGLAND



FUSEGEAR

*Specify
'English Electric'*



and be Safe

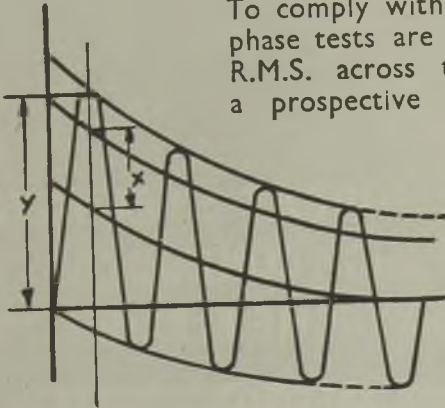
Illustration shows a 20-amp Type 'NS' Cartridge-fuse Link, (actual size $\frac{3}{8}$ " dia.) Type 'T' range available up to 800 amps

**'ENGLISH ELECTRIC'
TYPES 'NS' and 'T'**

**INDICATING
CARTRIDGE-FUSE LINKS**

possess a rupturing capacity of 25,000 kVA at 440 volts 3-phase, i.e. they comply with BSS88/1939 category of duty 440AC4 (A.S.T.A. certified)

To comply with category 440AC4 three single-phase tests are required each with 440 volts R.M.S. across the fuse terminals and with a prospective current of 33,000 amps



It should be particularly noted that the 33,000 amps specified is the R.M.S. symmetrical prospective current (X) not the peak asymmetrical prospective current (Y)

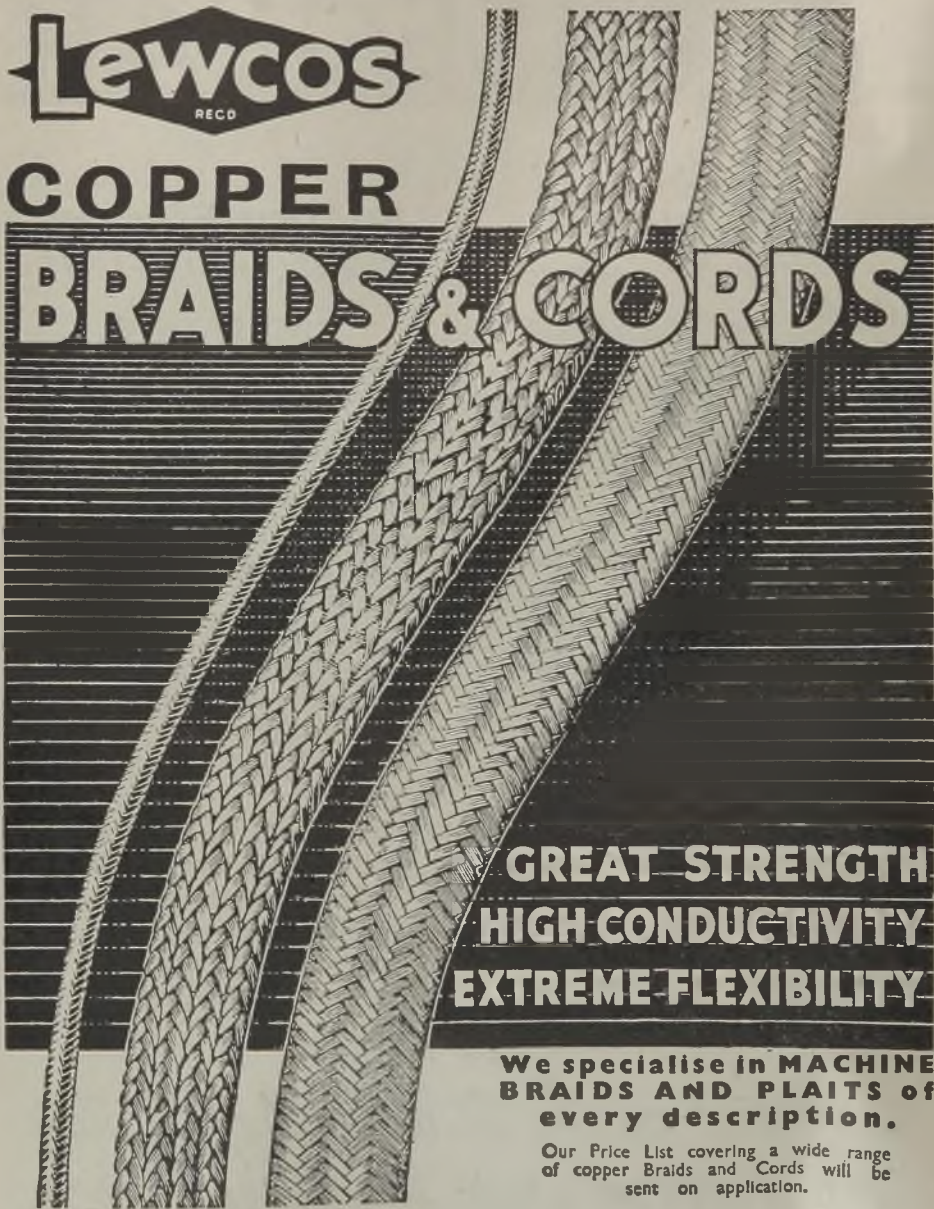
*Accepted as the Standard of Quality
and Performance the World Over*

THE ENGLISH ELECTRIC COMPANY LTD.
— STAFFORD —



COPPER

BRAIDS & CORDS



**GREAT STRENGTH
HIGH CONDUCTIVITY
EXTREME FLEXIBILITY**

**We specialise in MACHINE
BRAIDS AND PLAITS of
every description.**

Our Price List covering a wide range
of copper Braids and Cords will be
sent on application.

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED
CHURCH ROAD . LEYTON . LONDON, E.10

★ Cosmology

Number Eleven

THE SATELLITES OF THE PLANETS

★ The Science of the Universe as a whole.

MOST of the planets are accompanied by retinues of satellites, or moons, proportional in number to the size and dignity of the planet. The two largest planets, Jupiter and Saturn, each have nine; Uranus, which comes next in size, has four, while the still smaller planets have two, one, or even none at all. We believe the satellites to be fragments which were torn out of the planets,

just as the planets are fragments torn out of the sun, and by much the same sequence of events.

For mathematical theory shews that there is what may be a danger-zone surrounding every big body in space. We believe that, long ago, in its blind wanderings through space, the sun entered the danger-zone of a bigger and more massive star, and paid the usual penalty of being broken up. Matter was torn out of it, forming a cigar-shaped filament, out of which the planets were born. These planets would not at first describe the regular circular orbits in which they now move; their motions would be far more erratic, and might take them into the danger-zone surrounding the sun, in which case they would be broken up much as their parent, the sun, had been broken up before them. It seems most likely that the satellites of the planets were born in this way. Indeed, the satellite systems are so much like tiny replicas of the main solar system that we are almost compelled to suppose that they were produced by the same process as the main system. If so, the sun is the parent of the planets, and the grandparent of their satellites.

Saturn is in many ways the most interesting of all the planets, and is certainly the most sensational in appearance. It not only has nine moons, but also is surrounded by three flat circular rings, which form a sort of frill or collar round its middle (see

illustration). Galileo first discovered these in 1610, and many speculations were made as to their true nature.

Nowhere in the solar system do we find a satellite of reasonable size revolving inside the danger-zone of its planet. Jupiter's innermost satellite comes nearest, being very near indeed to the danger-zone of Jupiter. It seems likely that in course of time this satellite must draw ever closer in towards Jupiter, and that sometime in the not very remote future it must enter the danger-zone of the great planet and be broken up. Jupiter will then be surrounded by rings as Saturn now is.

In the same way, although only in the very far future, our own moon must inevitably be drawn in closer and closer to the earth, until finally it approaches too near for safety and meets the same fate. After this the earth will have no moon, but will be surrounded by a frill of rings like Saturn. These rings will not only reflect far more of the sun's light than our present moon does, but there will be full moonlight all night long. While this will no doubt add to the amenities of life, things will, in some respects, be less comfortable than now. For at frequent intervals, moons must crash into one another and their broken fragments fall onto the earth like huge rocks falling from the sky.

*From "The Stars in their Courses,"
by Sir James Jeans. By
permission of the Cambridge
University Press*



1915

1921

1909

1912

After a photograph by Lowell Observatory.



COSMOS & METROVICK LAMPS

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

ERM

High Speed

**machining
copper**

offers a remarkable combination of qualities never before associated with H.C. Copper.

For example :

Electrical Conductivity 98% I.A.C.S.

Softening Temperature 400° C.

Machinability — equal to free turning Brass.

Where this alloy is used, machining costs are but a fraction of those for ordinary H.C. copper ; those tricky jobs, once avoided at all costs, can now be done on automatics without trouble.

We are proud of this copper ; during the past three years it has brought about many striking changes in machine-shop practice and electrical design. We can supply it as Extruded or Drawn Rods and Sections, as Forgings or Castings, or as finished machined parts. Our engineers are at your service.

Enfield Rolling Mills Ltd

BRIMSDOWN

MIDDLESEX

Telephone

Howard 1255

IMPORTANT TO DEALERS

TELEGRAMS:
FERRANTI MANCHESTER
TELEPHONE:
FAIRSWORTH 2271
100MATE BRANCH (EXCHANGE)
TELEX:
FAIRSWORTH TELEX 2000

FERRANTI LTD
ELECTRICAL & GENERAL ENGINEERS
MOSTON
MANCHESTER. 10

LONDON OFFICE:
KELVIN HOUSE,
36 KINGSWAY, W.C.2
TELEGRAMS:
FERRANTI WESTCENT,
LONDON.
TELEPHONE:
TEMPLE BAR 6666
REGISTERED OFFICE
HOLLWOOD, LAMOS

Your Ref

Our Ref **FF293/3.**

Dear Sir,

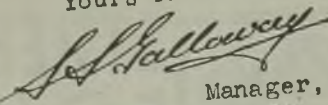
THE ROAD BACK.

Everybody seems to be making Peace-time plans to build a new and better world --- particularly for the housewife. Ferranti Engineers will not lag in this, but we are far too practical-minded to think women are going to accept every untried innovation put before them --- or wait for us to produce "revolutionary" new types of Radiant Electric Fires.

There will be a big demand for Electric Fires quickly --- for new homes as well as for replacements. We plan to help Dealers to profit from this immediately war-time restrictions are relaxed --- with early deliveries of the best of our pre-war designs.

Improvements and innovations will follow --- but not until they have been tested and proved by the sound judgment which put Ferranti Fires in the forefront and will do so again.

Yours faithfully,



Manager,
Domestic Appliance
Sales Department..





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



REVO *will be there!*

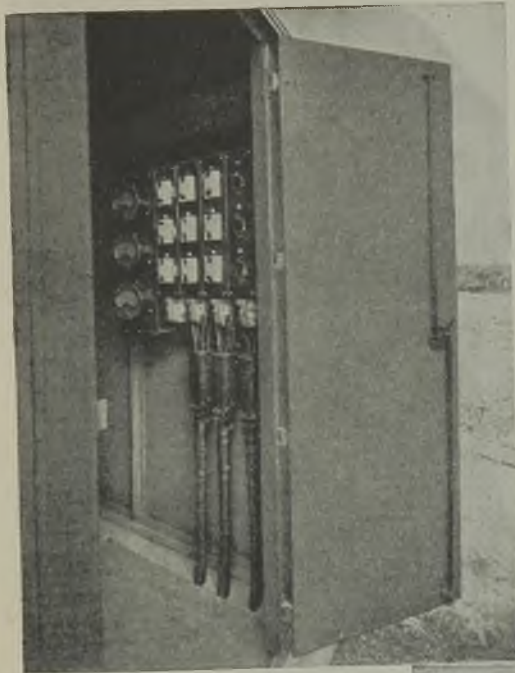
WHEN the time comes, and the Prime Minister calls "SWITCH ON," millions of people will revel in the luxury of safely lighted streets — streets lighted by REVO Street Lighting equipment, of which, in this country alone, there are many thousands. Others unfortunately, will have no lighted streets until 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.

DISTRIBUTION PILLARS & PANELS for all purposes

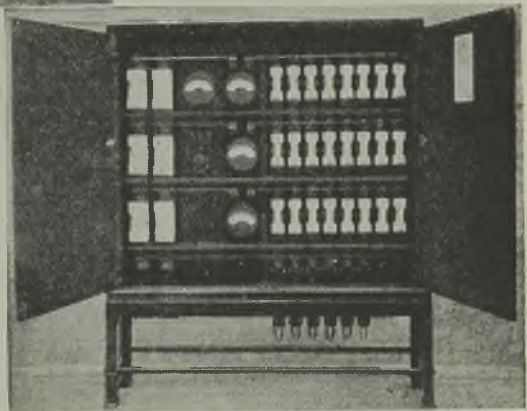


In addition to standard ranges of Henley Distribution Pillars and Panels, we can arrange for special assemblies to meet customers particular requirements. The Henley unit type construction is exceedingly flexible and by mounting meters, instrument panels, etc., on the same framework as the units themselves, space is saved and a neat layout is obtained.

On Left: A small substation panel fitted with bakelite shields and incorporating a meter panel. The units are of the HENLEY Dwarf type.

Below: A pillar assembly including two 500 amp. feeder units and eight 150 amp. distributor units, direct connected ammeter on each phase and voltmeter with selector switch for reading voltage on each phase.

HENLEY
 UNIT TYPE
**DISTRIBUTION
 PILLARS &
 PANELS**



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

PHONE: DORKING 3241 (10 LINES)
 TELEGRAMS: HENLETCL, DORKING

MEADOWS

ENGINES
AND
GEARBOXES



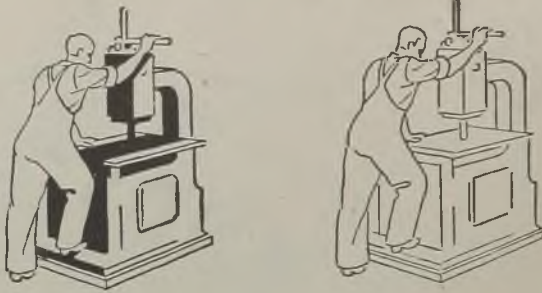
HENRY MEADOWS LTD. FALLINGS PARK ENGINE WORKS - WILVERHAMPTON
Telegrams: "Output," Wilverhampton. Telephone: Fallings Park 2104 & 2101

ALL'S WELL
THAT ENDS -
ON A DRUM OF
**St. HELENS
CABLE**

The advertisement features a large spool of cable on the left, with the words "St. HELENS CABLE" printed on its side. A wire loops through the top of the frame, forming a shape that encloses the text "ALL'S WELL THAT ENDS -". Below this, the text "ON A DRUM OF" is written in a smaller font, leading to the large, bold text "St. HELENS CABLE".

ST. HELENS CABLE & RUBBER CO. LTD., SLOUGH

SLOUGH 20333



minus shadow = plus production

HOURS OF PRECIOUS time are lost in that patch of cast shadow. Errors flourish there, and inaccuracies multiply. No wonder industrialists working under the high pressure of war were glad to find a way to cut the shadow out! OSRAM Fluorescent Tubes—next best thing to daylight—provide a steady, even radiance with no hard shadows. Economical, too! An 80-watt OSRAM Fluorescent Tube gives almost as much light as a 200-watt tungsten lamp. OSRAM Fluorescent Tubes do not destroy colour-values and they radiate next to no heat. This is the logical lighting for industry!

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

Osram

FLUORESCENT
TUBES



You can use Laminated Plastic!



YOU will be interested to learn more about "DELARON"—a high-grade material with excellent stamping, machining and insulating properties. "DELARON" is made in many grades and thicknesses in bases of Paper and Fabric to Ministry and British Standard Specifications. The co-operation and advice of our Technical Department are freely at your disposal in the effective application of "DELARON," and samples and prices will gladly be sent on request.

DELARON LAMINATED PLASTIC

Sheets - Panels & Strips - Fabricated



DELARON
LAMINATED
PLASTIC

HAMOLAC
INSULATING
SLEEVING

HAMOFIL
CONNECTING
WIRES

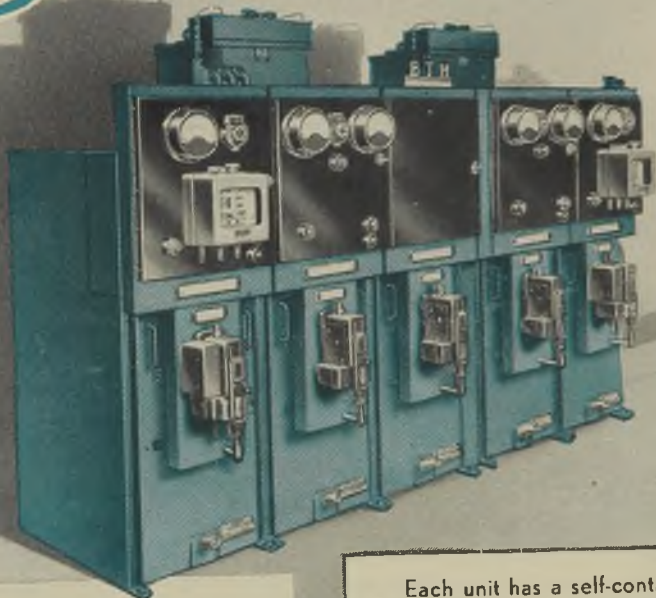
De La Rue Insulation Limited

BRIGHTON ROAD • SUTTON • SURREY
TELEPHONE : VIGILANT 0033



SWITCHGEAR

OIL-BREAK • AIR-BREAK • AIR-BLAST



Each unit has a self-contained circuit-breaker carriage and tank lift.

CLASS QA

(Metal-enclosed)

UP TO 11 kv., 150 MVA.,

incorporating

VERTICAL-PLUGGING
OIL CIRCUIT-BREAKERS

FULLY TESTED FOR
SHORT-CIRCUIT DUTY

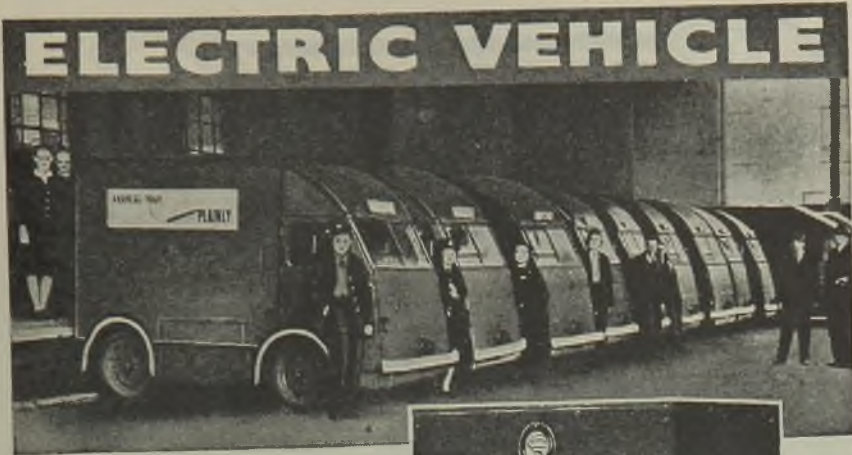


BTH

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

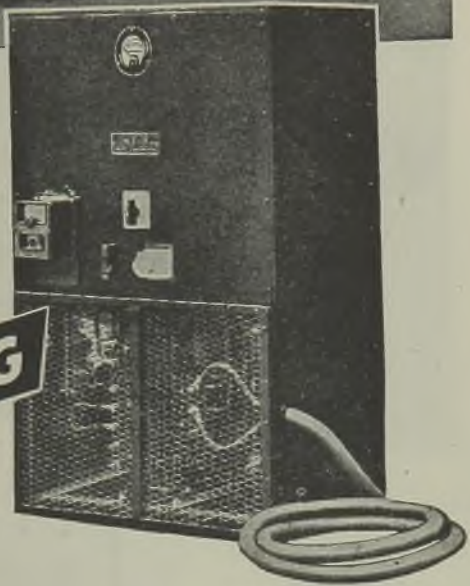
A1431/2C





Photographs show group of Metrovick electrics for Postal Services (published by courtesy of H.M. Postmaster General), and Westinghouse Vehicle Charger, type VR.30/45 fitted with M.J.V battery charge timing relay.

**BATTERY
CHARGING**



It is significant that Government Departments, who consider reliability above all else, already have in service thousands of



RECTIFIERS

some of which have been in use for over 17 years

WESTINGHOUSE BRAKE & SIGNAL CO. LTD.
PEW HILL HOUSE, CHIPPENHAM, WILTS.



CO., LTD.
A.H.E.

CANNING



ELECTRO TINNING

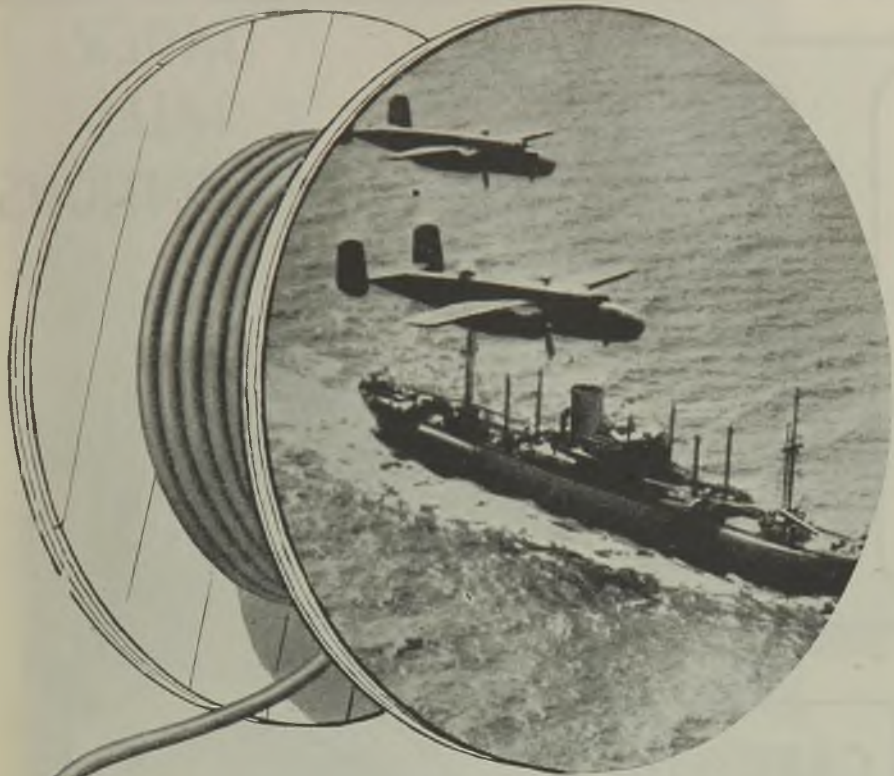
The Modern Process, using Stannate Tin Solution, produces strictly controlled coatings, predetermined and uniform in thickness, even on articles of irregular shape.

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

The solution also permits of a faster speed of deposition.

W. **CANNING** & CO. LTD.

**GREAT HAMPTON STREET
BIRMINGHAM 18**



PROTECTIVE COVER

Crompton Ship Wiring Cables are notable for their thorough mechanical and electrical protection. Crompton Cables have a reputation for that little extra care in the choice and laying of protective materials which makes all the difference. In this 250-volt single-core ship wiring cable the covering of varnished cambric, insulating the stranded core from the lead alloy final covering, is of the highest quality and is noticeably well laid. The outer varnished cambric tape is numbered. For reliable ship wiring specify Crompton Cables.

CROMPTON SHIP WIRING 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.



**UNDER
ALL
CONDITIONS!**



**PIRELLI-GENERAL
CABLES**

**CARRY THE
CURRENT**

WITH

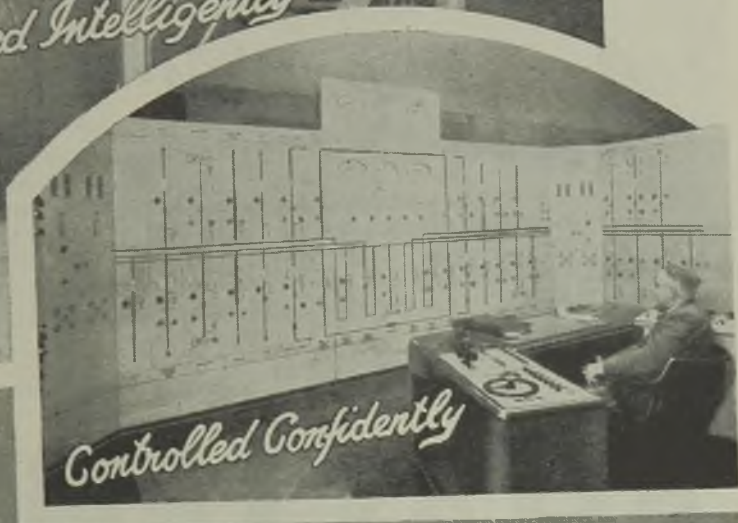
**UNFAILING
RELIABILITY.**



PIRELLI-GENERAL
CABLE WORKS, Ltd., SOUTHAMPTON.

SWITCHGEAR by SPECIALISTS

Installed Intelligently



Controlled Confidently

REYROLLE

HEBBURN-ON-TYNE

ENGLAND

SEE WHERE YOU ARE WITH
ATLAS LAMPS

CANTEN & REST ROOM
FOR H.M. FORCES
& MERCHANT NAVY

THORN
ELECTRICAL INDUSTRIES LTD.

It's that Man again!

He certainly gets around . . . that little man . . . calling attention to Atlas Lamps from commanding positions in all the big railway stations, in the streets and in the pages of the national press. Atlas Lamps are readily acceptable in YOUR district to-day . . . folks know they're worth a lot more and cost a little less. Be prepared to supply this demand and enjoy the better discount and more generous rebate that Atlas Lamps offer you.

Sell Atlas for profit.

Contact us for terms to-day

ATLAS LAMPS

THORN ELECTRICAL INDUSTRIES LTD., JUDD STREET, LONDON, W.C.1. 'Phone: Euston 1183
Northern Branch: 55 Blossom Street, Manchester. 'Phone: Central 7461
N.E. Depot: 46 Sandhill, Newcastle-on-Tyne, 1. 'Phone: Newcastle 24068

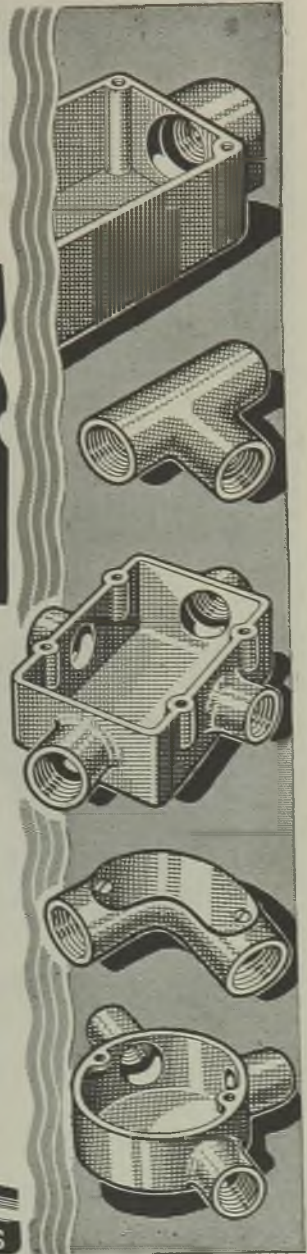
IMPROVED COMMUNICATIONS



To those who once endured the slowness and discomfort of the old horse-drawn buses — the smoothness and speed of the London Tube System would seem a miracle.

It is all a matter of comparison. For instance — in the "WALSALL" "Tube" System, cables can glide safely through absolutely smooth inner walls — without risk of abrasion — as also through WALSALL "Junctions" with their bushed entries.

Smooth travel and protection for cables — due to attention to small details in finish. Well worth it? Decidedly.



WALSALL CONDUITS LTD - WEST BROMWICH - STAFFS

PS
 e. Custor
 Central T
 castle 240

After the necessary break to announce the introduction of our Porcelain Watertight fitting, we now resume the reproduction of our popular series of "foreign" advertisements with the English translation added in response to many requests from all quarters.

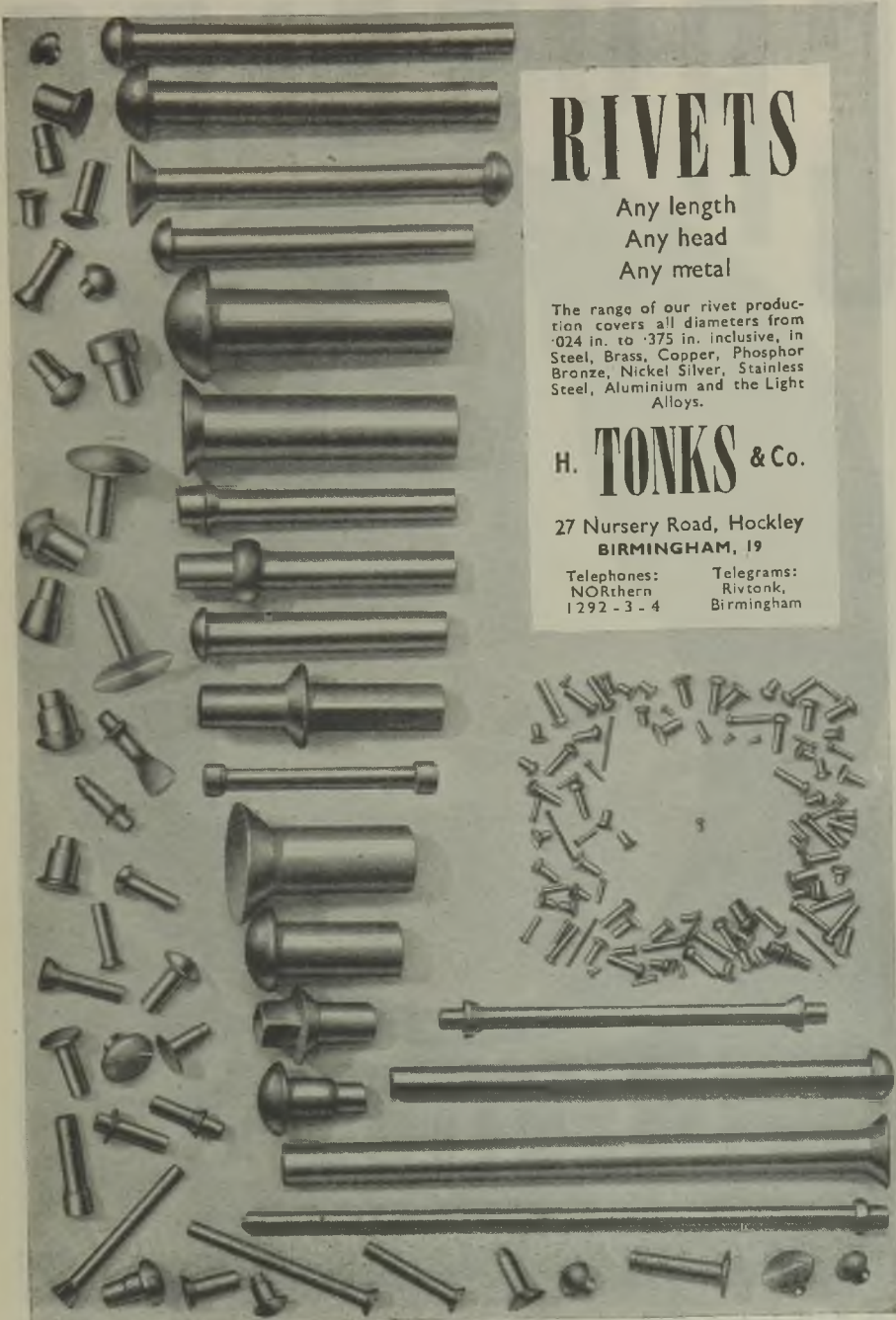
WARSAWA — kiedy było to
miasto światła i rozrywki i kochanków
i miłośników muzyki.
— dzisiaj jest miastem, które
nie ma światła, muzyki ani kochanków. Ci
którzy nie wierzą — REALUMINATION!

R · E · A · L

WARSAW—

once a city of twinkling lights,
and sparkling gaiety, but now
merely a heap of ruin and misery.

Be patient! yet for a little longer,
Warsaw—the day of your libera-
tion rapidly draws nigh, and then
we shall see you once more
ablaze with light—illumination—
REALUMINATION!



RIVETS

Any length
Any head
Any metal

The range of our rivet production covers all diameters from .024 in. to .375 in. inclusive, in Steel, Brass, Copper, Phosphor Bronze, Nickel Silver, Stainless Steel, Aluminium and the Light Alloys.

H. TONKS & Co.

27 Nursery Road, Hockley
BIRMINGHAM, 19

Telephones:
NORthern
1292 - 3 - 4

Telegrams:
Rivtonk,
Birmingham

ing light
but, now
and many
the large
type they
it, and the
more not
mination-

CRYSELCO



LAMPS

Use good lamps and use them sparingly

· C R Y S E L C O · L I M I T E D · B E D F O R D ·

SIMPLICITY WITHOUT SACRIFICE..



The M.E.M. "Startet" does all that a small motor starter should do, yet it is simple and compact. Adjustable, self-resetting, overload trips give full protection. The push-button control gives positive action. The motor is completely isolated when starter is off. Like all M.E.M. designs the "Startet" is worked out to the ultimate simplicity of functional perfection. That, and that alone, is why it is low priced. For a reliable protective, ironclad starter for motors up to $\frac{1}{2}$ h.p. specify the M.E.M. "Startet."



SWITCH, FUSE AND MOTOR CONTROL GEAR

AND LOCALISED LIGHTING EQUIPMENT

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

London Showrooms and Stores: | Manchester Showrooms and Stores:
 21-22 Rathbone Place, London, W.1 | 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



A Peep at the Tomorrow of Peace-Time

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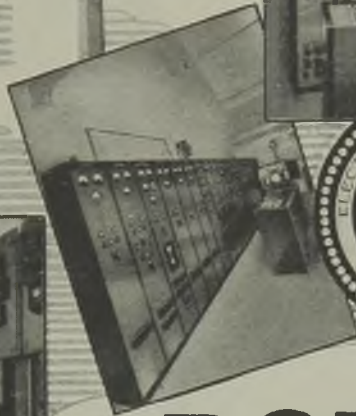
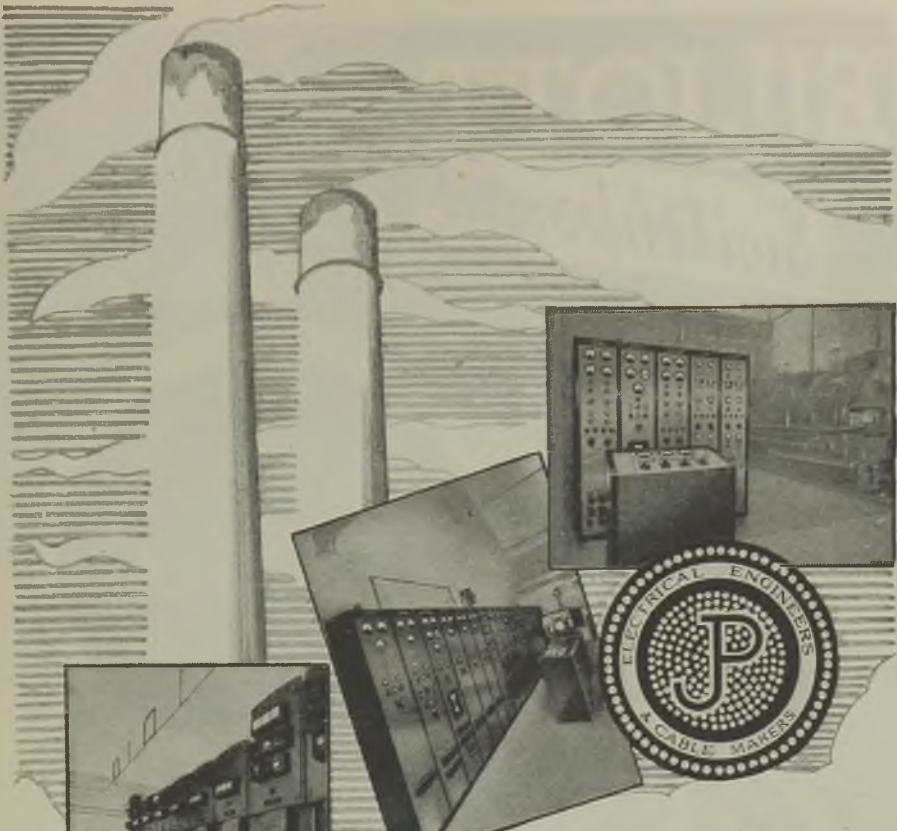
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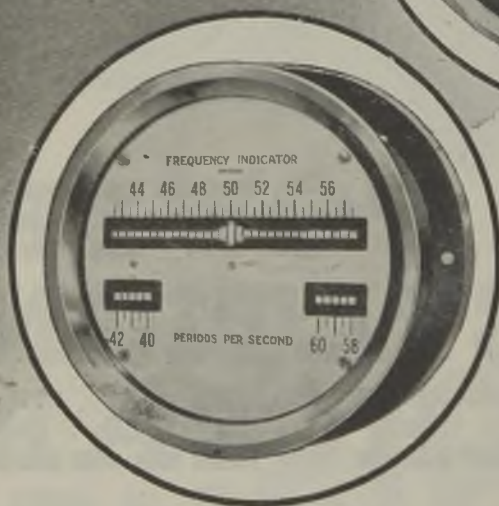
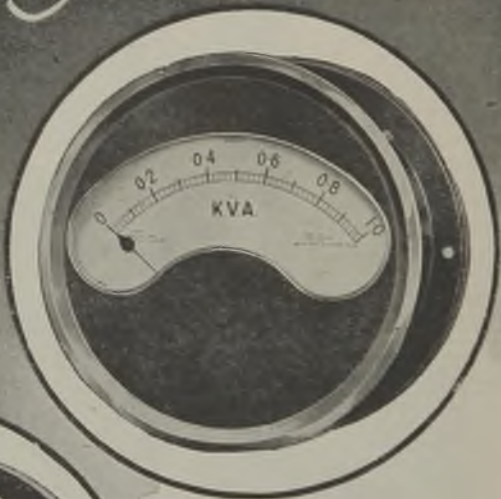
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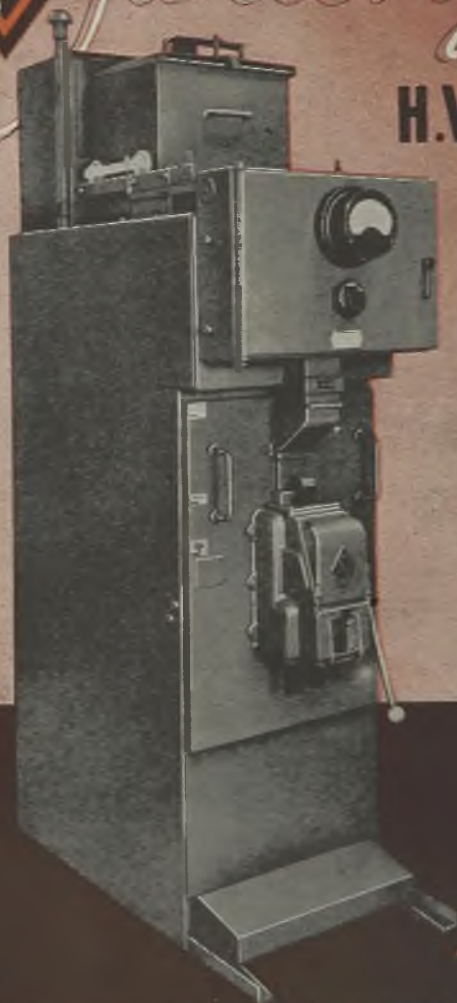


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ELECTRICAL REVIEW

May 5, 1944

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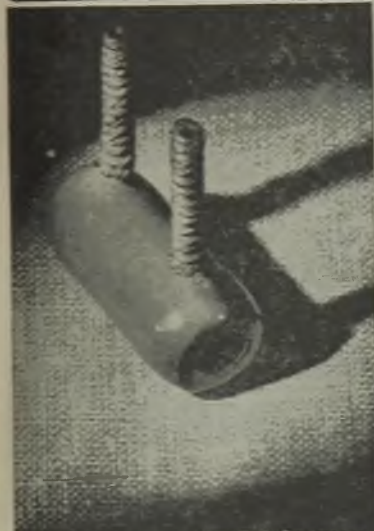
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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIV. No. 3467.

MAY 5, 1944

9d. WEEKLY

Aid to Russia

British Electrical Manufacturers' Contribution

DURING several months past we have been privileged to see in the factories of the electrical and allied industries throughout this country, in various stages of production from the drawing board to the test bed, much of the electrical equipment which is being produced and dispatched to our Russian allies as part of our national aid to the U.S.S.R. The equipment varies from small standard industrial motors to complete power station plants, and its aggregate value must run into many millions of pounds.

To undertake the production of such a vast amount of equipment in addition to the "all-out" effort which our manufacturers are making as their direct contribution to this country's own war needs is a remarkable achievement which must have very far-reaching results internationally. Many barriers which have existed between our engineers and those of our allies have been broken down by personal contact in spite of language difficulties.

A Superimposed Load

These difficulties have been engendered largely by big changes in the Russian vocabulary in the 25 years or so since the Revolution, and partly by the scant supply of modern Russian interpreters in this country. We may be excused for citing the following example of the language "snags" on the score of its illustration of how two-sided goodwill and good humour can heighten the pace of progress. Russian wording engraved on a control panel read, in the eyes of a not-too-technical

interpreter, "emergency push button," but on inspection by a Russian engineering authority the wording was found actually to read, "to create an emergency push."

Within the narrower limits of engineering technique there are many other aspects on which our manufacturing engineers are to be congratulated, and which we will unfold from time to time in articles describing the various types of equipment and installations under consideration; the first of these articles appears in this issue. Many of these features relate to the unusual and severe conditions under which the plant will have to operate, and in this connection we may refer particularly to the maintenance and operation of, say, coal-handling and circulating-water systems in temperatures so low that the uninitiated English engineer finds it difficult to appreciate the working conditions.

Facilitating Installation

Then there are the measures which have been taken to enable the Russian engineers to get plant into commission in the absolute minimum of time on delivery, and these involve special constructions to permit the bulk transportation of large transformers and sizeable boilers, turbo-alternators, etc. The preparation of specifications and drawings without what would be normally regarded as adequate information, in consequence of to-day's emergency conditions, is no mean achievement, and to this we must add a word of praise of the Russian engineers who are grappling under similar difficulties at the other end with the preparation of founda-

tions and buildings for the reception of the plant. The radio transmission of drawings may not be a new thing, certainly not in principle, but its large-scale use in passing technical information and instructions between two points on the globe so far apart is a most important engineering development which augurs well for future international industrial collaboration.

Power Station Ownership

ATTENTION seems lately to have been switched from the reorganisation of distribution to that of generation. Proposals that have been mooted for the acquisition of power stations by the Central Electricity Board are no doubt in some instances coloured by political predilections, but this possibility should not be allowed to obscure the strictly engineering aspects with which Mr. J. A. Sumner deals in this issue. These aspects go beyond the Gilbertian situation created by the dropping of the time limit to the operation of Section 13 of the 1926 Act, which was provided for in the original Bill. There are, of course, arguments for another point of view, but so far they have lacked similar definition and cogency.

It is not easy to understand how the I.M.E.A. adopted the Joint Memorandum upon electricity distribution by what we are told was an "overwhelming majority" upon a "second reading." An earlier meeting had referred the memorandum back to its authors with a proposal that the section dealing with reorganisation should be replaced by a recommendation that the Minister of Fuel and Power should seek the independent views of the associations concerned on ownership and a national bulk supply tariff. All that was altered in the Memorandum were the clauses relating to system standardisation and representation upon the proposed Area Committees. Probably reflection and discussions after the first meeting led to a realisation that this document, though imperfect, represented after all *some* measure of agreement between the sections, which claim to represent 90 per cent. of the distribution side of the industry. While the largely-political question of ownership is very tactfully treated the memorandum does at least make many useful recommendations

for improving electrical services and this ostensibly is the aim of all of the plans which have been put forward.

Labour's Electrical Policy

AIRILY referring to "the chaos which prevails in the industry," the Labour Party has produced recommendations which it considers will put electricity supply in order. Not only does it recommend a Gas and Electricity Board but also a National Electricity Board whose relationships do not appear to be defined. A division of the country into regions and districts is envisaged in a vaguely outlined organisation; the keynote, of course, is nationalisation. Although we have given a little space to the report in this issue we cannot regard it as a serious contribution to the current discussions on reorganisation.

Compulsory Registration

THE scheme drawn up by the National Committee on Statutory Wiring Regulations and Registration, which we briefly mentioned last week, provides for six forms of licence for those carrying out electrical installation work; they are for the contractor, supervisor, journeyman, young journeyman, apprentice, and maintenance man. Observance is required from all licensed contractors and operatives of the Electricity Commissioners' Regulations and "any existing or new rules, regulations or codes issued under statutory and national authority."

Necessary or Not?

A LARGE body of opinion is in favour of the rigid control of the installation industry, including the official organisations of the contractors and operatives themselves. It is true, of course, that they would be compensated for their submission to control by the closing of the industry to incompetent masters and men. The electricity supply industry is represented on the Committee by the I.M.E.A. and the Conference of J.E.A.'s; B.E.A.M.A. was originally represented but subsequently withdrew. Although the I.E.E. is not a party to the Committee it has been kept in touch with the Committee's work; it has, however, expressed the view, through its sub-committee on Electricity Supply, Distribution and Installation, that "an appraisal 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."

Suggested Alternative THE I.E.E. Sub-Committee considered that a reduction in the small accident and fire rate could

be achieved through, *inter alia*, the inspection by supply authorities for compliance with Electricity Supply Regulation No. 27 (1937) and the encouragement by supply undertakings of the observance of the I.E.E. Wiring Regulations and the use of the existing voluntary system of registration. But even if this were certain, which is by no means the case, accident and fire prevention is not the sole consideration. Installations can be safe but still fall short in other directions. The public wants good as well as safe installations and if compulsory rules and registration are likely to raise the standard there is a good case for them. It may be mentioned, incidentally, that the National Register of Electrical Installation Contractors is calling a meeting to consider the subject of compulsory registration.

On From Ewing ALTHOUGH Prof. E. C. Stoner included only one formula in this year's Kelvin Lecture, he left his

audience in no doubt about the extent to which the theory of ferro-magnetism has increased in complexity during the past twenty years or so. Ewing's relatively simple concept of molecules as themselves small magnets which might, if suitably arranged, cause the whole metal to become a magnet is not enough to explain many of the phenomena later observed. The discovery of the electron, which in spinning round the nucleus of the atom possesses a magnetic field, opened up new vistas for exploration. In its presentation of the most recent developments in this fundamental subject, the Lecture provides a valuable common data source for collaboration between electrical engineer, physicist, mathematician and metallurgist.

Theory and Practice SOME of Prof. Stoner's remarks are of general application. A theory is

in the first place an attempt to explain phenomena. But it is something more—a guide to practice. The absence of

any clear line of demarcation between theory and practice is fortunate in that it facilitates understanding by scientists of the work of men who are concerned with results. Dr. Stoner is to be numbered among those who, speaking from experience, advocate that men on the industrial side should be encouraged to carry out special research programmes in the universities.

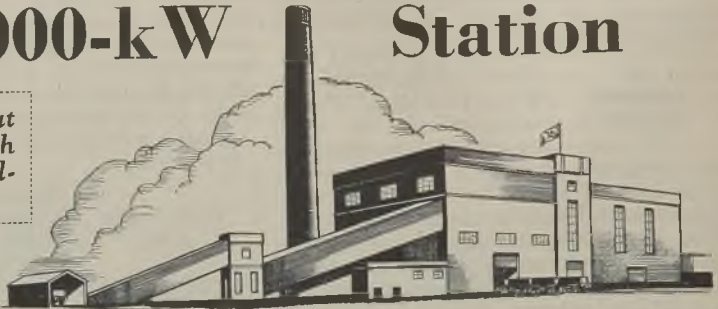
Wash Boiler Uses JUDGING from its refusal to grant permission to the Carlisle Corporation to install wash boilers in new agricultural cottages, the Board of Trade has some false ideas as to the use of these appliances. The reason given for its decision is that, as an alternative method is provided for heating water in bulk by means of coal fires, there is no need for wash boilers. Wash boilers are normally not a means recommended for the heating of water, but only for actually boiling water already heated, and we have yet to see the domestic hot water system designed to boil water and keep it boiling. Of course, as their wartime versatility has shown, wash boilers can be utilised for heating not only water but other liquids as well, but with other more economical facilities available it is most improbable that they would be.

Post-War Appliances CAREFUL consideration should be given to a statement issued by B.E.A.M.A. upon the subject of post-war electrical appliances. At first reading this seems to be a somewhat pessimistic document, but a little thought reveals how justifiable are the sentiments expressed. Moreover, the fact that B.E.A.M.A. is actively engaged in evolving new designs of appliances is an assurance that the manufacturers are not intending to stereotype existing models for many years to come. There must be a period during which preparations for the production of entirely new models must proceed at the same time as the manufacture of appliances for immediate needs. This, it would seem, might narrow the market for the new models very considerably, but the fact seems to be that these will go into the houses which are to be built—they will be designed with this in view—and will probably be available as soon as the houses are ready to receive them.

British Plant for Russia—I

12,000-kW Station

Double-pass-out turbine with pulverised fuel-fired boilers



ONE of the almost complete power station plants being produced in this country for the U.S.S.R. was designed for an initial capacity of 12,000 kW, the main equipment comprising a turbo-alternator set manufactured by the General Electric Co., Ltd., who also provided the auxiliary switchgear and motors, and two water-tube boilers manufactured by Babcock & Wilcox, Ltd., each for a maximum continuous evaporation of 165,000 lb. per hour.

All the buildings and foundations are being supplied by the Russians, who are also undertaking the erection of the equipment on site. The power plant is complete in all respects, the equipment being supplied ranging from the hoppers receiving the coal delivered to the station by rail to the distribution switchgear. To facilitate a description of the plant, it is proposed to make an inspection of the station as though it were in operation.

The raw coal is delivered by rail to the station in side-opening wagons, the coal being discharged from these into storage bunkers at ground level. These bunkers are arranged with a number of outlets from which, by means of a travelling jigger feeder, the coal can be fed on to a series of belt conveyors leading to bunkers in the boiler house. In its passage to the boiler house the coal passes first over a magnetic separator for the removal of tramp iron. It then passes through a hammer-type crusher which reduces the sizing from normal run-of-mine variety to a $\frac{3}{4}$ -in. mesh screen, and finally over a belt-type weighing machine.

The belt conveyor serving the boiler house bunkers is fitted with a travelling tripper, so that the coal can be fed into the bunkers from any selected point. The capacity of the conveyor system is 60 tons per hour and the motive power is provided

by squirrel-cage motors throughout. The crusher also has a similar capacity but, due to the nature of the load, is driven by a slipping motor of 50 HP through the medium of Texropes.

On account of climatic conditions the Russian authorities are arranging for the coal-handling equipment to be enclosed with appropriate heating equipment. In view of the possibility of ice and snow being admitted to the system with the coal, and of being thawed out in the heated buildings, the bunkers are provided with water-collecting gates, and the conveyor pit with a sump pump.

The bunkers form an integral part of the boiler house structure and are of reinforced concrete. The outlets of the raw-coal

bunkers in the boiler house are fitted with water-collecting gates, for the draining-off of any free surface moisture, minimising the interference with pulveriser operation.

The boilers are fired with pulverised coal, the coal being of a highly bituminous nature with high sulphur content and proneness to slagging. The pulverising equipment is arranged on the storage system, the storage bunker for each boiler being sandwiched between a pair of raw-coal bunkers. The pulverising plant for each boiler comprises two tube-and-ball-type pulverisers, each having a nominal output of six tons per hour.

The raw coal is fed to the pulverisers through disc-type feeders driven at constant speed by $1\frac{1}{2}$ -HP squirrel-cage motors. Each pulveriser has a rotating horizontal drum, 6 ft. 6 in. in diameter and 9 ft. long, which contains a free pulverising charge formed by forged-steel balls of various sizes up to $2\frac{1}{2}$ in. diameter; it is driven by a 130-HP motor through a speed reduction unit and spur gearing on to the pulveriser drum. The pulverisers are air-swept, the pulverised

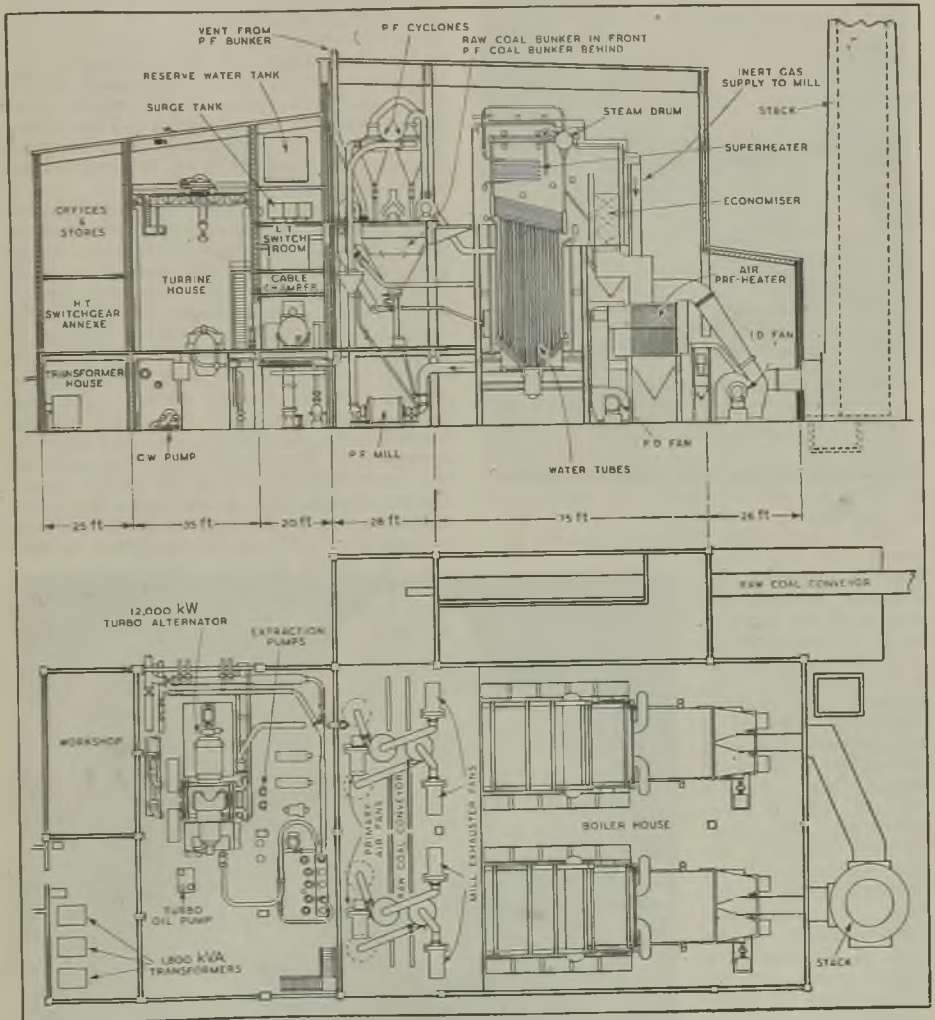
In last Monday's Order of the Day Marshal Stalin acknowledged the valuable aid which we and the United States had afforded Russia. So far there has been little detailed information, but in this and subsequent articles we are able to give some particulars of equipment sent from this country

product being carried first to a classifier and then to cyclone separators. Fuel of insufficient fineness is rejected at the classifier, which is so disposed with relation to the pulveriser that the rejected coal can be returned by gravity to the pulveriser inlet for further treatment.

The air flow through each pulveriser is induced by an exhauster on the discharge

within the pulveriser but, due to the highly bituminous nature of the fuel, pulverising is effected in the presence of inert gas. The air supply to the pulveriser is, therefore, formed by gases extracted from the boiler exit and diluted with air from the atmosphere, the suction necessary for this purpose being provided by the pulveriser exhauster.

The fuel separated in the cyclones is dis-

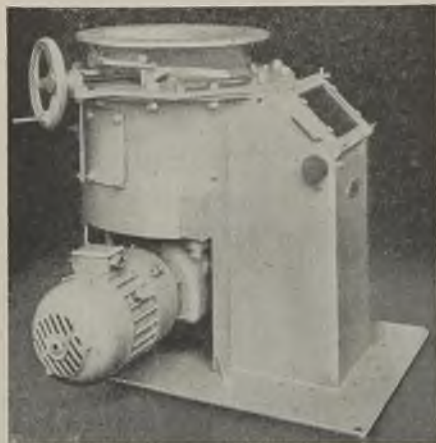


Elevation and plan of the main equipment

side of the cyclone separator, and therefore handles relatively clean air, the discharge from the exhauster being passed on to the combustion chamber for use as tertiary air. The necessary degree of drying can be effected

charged through rotary air locks into the storage bunkers, from which it is taken by Bailey feeders to the boilers, each of which has four feeders. To obtain regulation of the rate of feed each feeder is driven by a DC

motor with a three-to-one speed range. From each feeder the pulverised fuel is fed into a mixing tee where it again becomes air-borne and is conveyed through piping to the pulverised-fuel burners. In this



Disc-type raw-coal feeders at the firing-floor level receive the coal from the boiler-house bunkers and chute feed it to two pulverising mills in the basement

instance the air flow is derived from primary-air fans, one for each boiler and each driven by a 60-HP s.c. motor.

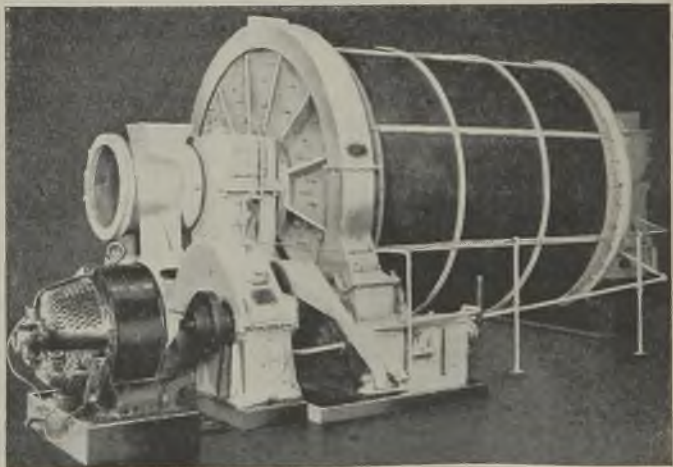
Four burners are provided—one in each corner of the combustion chamber and directed towards the centre of the furnace, so as to be tangential to a circle of about 3 ft. diameter. The secondary air for combustion is admitted at the burners, and at a convenient distance above the burners tertiary air is also admitted. The combustion chambers are also equipped with oil burners for starting up, and in emergency approximately 40 per cent. of the maximum boiler rating can be obtained on oil firing alone.

The combustion chamber is completely water-cooled by fin tubes and is provided with a hopper bottom for dry-ash removal. The inclined faces of the hopper bottom are also water-cooled to facilitate the discharge of ash which is

taken away from the boiler house by trucks.

The boiler is of the straight-tube sectional header type with a heating surface of 4,200 sq. ft. In view of the disposition of the heat-absorbing surfaces, only a relatively small amount of heating surface is installed in the boiler proper, this, for the most part, being arranged between the combustion chamber exit and the superheater inlet. Both the boiler and the combustion chamber are arranged for natural water circulation, the furnace being served from two feed drums at the base of the unit which are connected by standpipes to the water space of the 54-in. diameter boiler drum, which is of fusion welded construction. The superheater is of the multi-loop type, having a heating surface of 7,575 sq. ft., and is contained within the boiler casings.

The gas flow is in an upward direction from the combustion chamber and through the boiler and superheater tubes in a single pass, and on leaving the boiler the gases pass in a downward direction through an economiser. This is of the steel-tube flash-welded type, having a heating surface of 9,500 sq. ft., and is arranged in three elements, each fourteen tubes high, to facilitate cleaning of the external heating surface. At high duty a certain amount of steam will be formed at the economiser exit and there is, therefore, an unrestricted water flow between the economiser exit and the boiler drum. Upon leaving the economiser the gases pass through a tubular-type air heater (heating surface of 31,175 sq. ft.) designed to pre-



The 5.9-ton per hour pulverising mills are of the tube and ball type, each being driven by a 130-HP motor through girth gear at one end

heat the secondary and primary air. On the air side the heater is served by a single forced-draught fan driven by a 135-HP motor; the gases from the heater exit are

connected to a single induced-draught fan driven by a 260-HP motor, the inlet of the fan being equipped with scroll-type dust collectors. The fans operate at constant speed and control of output is obtained by the manipulation of dampers.

Where possible hoppers are arranged in the layout of the interconnecting flues, so that grits may be precipitated from the gases at these points and ultimately removed by dust-extraction plant which exhausts to a storage bunker. Each unit is arranged with an instrument panel from which the unit can be completely controlled. Remote control of the motors and regulation of the dampers is through a hydraulic system.

In this installation a considerable amount of steam is extracted for process work, and there is, therefore, a heavy make-up of feed water, and the treatment of this is a very important part of the station equipment. To obtain the water in the requisite condition it is necessary to utilise a continuous blow-down and to pass the make-up water through the treatment plant which comprises lime softening and filtering, and base exchange softening equipment. The water is further conditioned by the introduction of caustic soda into the feed mains, and the boiler water is treated by dosage with phosphate.

Double Pass-out Turbine

The prime mover of the turbo-alternator set is a 3,000-RPM, 15-stage, single-casing, double pass-out turbine arranged for 110,250-lb. per hour extraction at about 100 lb. per sq. in. and 88,200 lb. per hour at about 26.5 lb. per sq. in. The stop-valve conditions are 425 lb. per sq. in. and 750 deg. F. The turbine is provided with its own steam receiver on which all the isolating valves are of the motor-operated type. There are four live steam admission valves under the control of the governor, and at each pass-out point there are four control valves operated by a bellows-type constant-pressure regulator. The pass-out valves are interconnected with the main regulating valve, so as to ensure constant speed at constant load, irrespective of the amount of steam extracted. The pass-out steam branches are provided with isolating non-return and relief valves.

The relief valves which protect the high-pressure portion discharge into the low-pressure portion for the double purpose of saving the steam and maintaining the load. The non-return valves are operated by live steam. Steam is bled from the turbine for serving the feed heater and de-aerators, and leakage steam from the gland packing is condensed in special feed-water heaters vented to atmosphere to maintain automatically atmospheric pressure at the discharge annuli of the packings.

The turbine has three oil coolers, and a standby steam-turbine-driven oil pump is

arranged to come into operation automatically should the main pump fail. There is also a flushing pump for use during barring which is provided for by motor-driven gear at the exciter end of the alternator.

The Worthington-Simpson surface condenser is of the divided-flow type to enable one half to be cleaned while the other half is in service. It is equipped with duplicate two-stage air ejectors and a starting ejector, duplicate condensate extraction pumps and two 60 per cent. duty circulating-water pumps. A British Arca reducing valve and desuperheating equipment provide, if re-



Feeders on the storage bins pass the pulverised coal into the air stream serving the four tangential burners

quired, make-up steam direct from the boilers to the pass-out mains.

For dealing with the pass-out condensate return there is a 1,800 cu. ft. main collecting tank which is served by duplicate motor-driven centrifugal pumps for returning the condensate to the main feed system. The turbine instrument panel is equipped with Bailey instruments for indicating, integrating and recording the h.p. steam to the turbine, the first and second pass-out steam quantities, the make-up steam from the reducing valve and desuperheating equipment, and the condensate return.

The alternator is directly coupled to the turbine shaft, as are the main and pilot exciters. It generates at 6,000 V, three-phase, 50 cycles, and the m.c.r. of 12,000 kW is provided at 80 per cent. power factor. It is equipped with thermo-couple temperature-indicating equipment, field suppression apparatus, protective gear, neutral earthing and an automatic regulator. It is cooled on the closed-circuit principle, the air cooling equipment having hand-controlled damper gear.

The main 6.6-kV switchgear is being supplied by the Russian authorities. From the 6,000-V main busbars power for the station auxiliaries is taken through three

1,800-kVA, 6,000/3,150-V transformers to a 28 panel S.V.D. switchboard of 75 MVA capacity. All the circuit-breakers are solenoid operated and are controlled either from the main control board or the boiler control board. The S.V.D. board is divided into two equal parts separated by two bus section switches. The supply from the transformers is so arranged that each half of the board is normally fed from one transformer, and, in turn, each half of the board supplies the auxiliaries for one boiler. The third transformer is available as a standby for either half. The bus section switches are interlocked so that the two parts of the board

provides for the turbine auxiliaries. There are further 400-V feeders for supplies to the crane, workshops, laboratory and battery-charging motor-generator sets.

A variety of services require a 220-V DC supply, namely, the variable-speed motors for the pulverised-fuel feeders, the magnetic separator, emergency lighting, alarm circuits, and the closing and tripping circuits for the main and auxiliary circuit-breakers. The supply is provided by a 400-Ah battery and two motor-generator sets. Each motor-generator set is large enough either to charge the battery or to drive the DC load, and the switchgear is so arranged that either set can

be used for either purpose. Alternatively, the load can be supplied direct from the battery, or from one of the motor-generator sets with the battery floating across the mains and receiving a trickle, or conditioning, charge at the same time. The emergency lights, alarm circuits and closing and tripping circuits are always supplied from the battery.

A control board is installed in front of each boiler and from this point those motors



Section assembly of the steel-tube flash-welded economiser

cannot be paralleled. This arrangement enables circuit-breakers of relatively small breaking capacity to be used, thereby minimising both the size and cost of the switchboard.

The larger motors for the various auxiliaries, *i.e.*, the circulating-water pump, primary-air fan, exhaust fan, pulverising mill, etc., are fed direct from the 3,150-V busbars, and except for the pulverising mills they are all squirrel-cage machines arranged for direct-to-line starting. For supplying the smaller motors, two 560-kVA transformers (3,150/400 V) are provided, one being fed from each end of the 3,150-V switchboard. The 400-V supply from these is taken to a 17-panel switch-fuse distribution board. One transformer acts as a standby for the other.

From this point power is taken to various contactor starting panels individually housed in totally enclosed sheet-steel cubicles. A seven-panel starter board in the crusher house controls all the motors associated with the handling of the raw coal; an eight-panel starter board controls the motors operating the rotary air locks and raw coal feeders; one 16-panel starter board serves the water-treatment and dust-extraction plants and oil-firing pumps; and a nine-panel

directly associated with the boiler can be controlled, namely, exhaust fans, induced-draught and forced-draught fans, etc. The pulverised-fuel feeders can also have their speed adjusted from this point.

The Navy's Electrical Services

THERE are now 1,000 electrical engineers serving in the Electrical Branch of the R.N.V.R. Captain R. A. Jackson, of the Torpedo and Mining Division of the Admiralty, made this statement in the course of a Press conference in London, adding that a large number of these officers had been university graduates.

Outlining the diverse electrical services in ships, he said that all galleys where sailors' meals were prepared were now to be electric. If the electricity supply failed the ship became practically derelict; the steering went, the fans failed and the boiler rooms became unbearably hot. The guns were electrically controlled and fired. However badly a ship might be damaged, the electric power must be maintained, and this meant a complicated system of alternative supplies.

Captain Jackson said that "Wrens" were doing most useful work as electricians at the bases. At the Western Approaches Base at Londonderry they had been largely responsible for the electrical maintenance of the Atlantic escort forces.

Star-Delta Starter

Avoiding Initial Current Peaks

A NEW form of star-delta starter, designed to enable squirrel-cage motors to be employed for many applications instead of slip-ring motors without causing heavy current peaks at starting, is described by Mr. A. Wauchope in the *I.E.E. Journal*

The transient peak is due, in general, to the magnetic field of the motor not collapsing immediately the winding is disconnected; consequently a residual voltage persists in the stator winding. When reconnected this residual voltage is likely to be out of phase with the supply voltage, resulting in a heavy current rush.

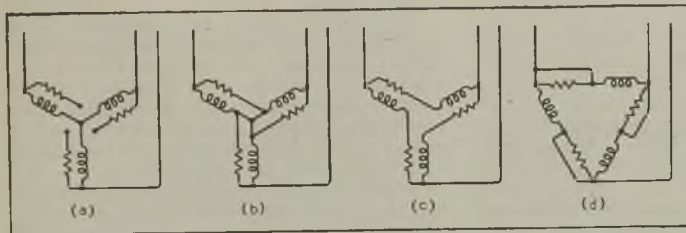


Fig. 1.—The sequence of operations

(Part 2) for April. The motor windings are not disconnected from the line during transition from star to delta and the torque exerted is continuous throughout the starting period. Sequence of starting is as follows:—

- (1) The motor is connected in star (Fig. 1a) and accelerates to a steady speed.
- (2) A resistor (Fig. 1b) is now connected in each phase from the line to the end of the adjacent phase winding; this does not affect the running of the motor, but the current taken from the line is momentarily increased by the amount passing through the resistors.
- (3) The star point is then opened (Fig. 1c), putting the motor windings in delta each with a resistor in series, resulting in increased voltage across the windings and a corresponding increase in torque, the motor accelerating to a higher steady speed.
- (4) The resistances are then short-circuited (Fig. 1d), connecting the motor windings in delta across full line voltage and producing further acceleration with decreasing current up to full speed.

Starting-current-time curves for a star-delta starter and for the new starter, both of the contactor type, are shown in Fig. 2. The 15-HP motor was driving a centrifugal pump and was started with the discharge valve opened.

With the conventional star-delta starter, when the windings are changed over from star to delta connection a peak current of 5.5 times full-load current may be taken, which is liable to be even higher than the direct-on delta current on account of transients consequent upon loss of speed during disconnection.

so that there are no such slowing down or transient effects. In general, the new starter limits the current taken initially from the line to about twice full load and allows two further increments of about half full load.

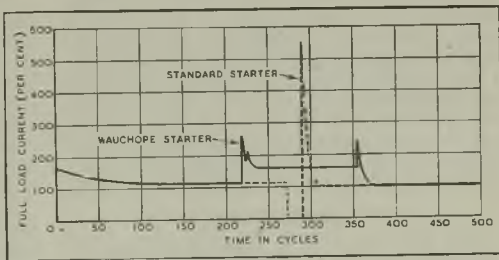


Fig. 2.—Oscillograms showing comparative starting currents for a standard s.c. motor started by a normal star-delta starter and by the new starter

Although with the conventional star-delta starter, the first increment may be only twice full-load current, the second increment may be five or six times that amount.

Electric Fire Quota

MR. Chater asked the Minister of Fuel and Power last week whether he would increase the quota of "one unit" electric fires which might be sold, having in mind the large stocks at present held by wholesalers and, in view of the necessity on health grounds, of enabling some slight heating facilities to be made available in buildings affected by the ban on central heating.

Major Lloyd George said he was not. Except by official permit the use of electric fires and other alternative forms of heating was forbidden in the premises covered by the Control of Fuel (Restriction of Heating) Order, 1944.

Kelvin Lecture

Magnetism in Theory and Practice

THERE was an attendance of over 500, including visitors from the Dominions, in the lecture theatre at the Institution of Electrical Engineers last week for the thirty-fifth Kelvin Lecture.

Dr. E. C. STONER (Professor of Theoretical Physics, University of Leeds) presented a general theoretical explanation of the properties of ferromagnetic materials, being chiefly concerned with that common ground where theory and practice met. He pointed out that all substances were magnetic in the sense that they became magnetised when placed in a magnetic field. Diamagnetics were magnetised in the opposite direction to the field and repelled by a magnet, while paramagnetics were magnetised in the same direction as the field and attracted by a magnet, tending to move from weaker to stronger fields. The forces involved were in general very feeble by comparison with those observed in ferromagnetics.

Starting with magnetisation curves and the cyclic change of field which caused the hysteresis loop, it could be shown that the area of this loop was a measure of the energy converted into heat (loss) in traversing a cycle. The loss in a single cycle corresponded to a rise in temperature of seldom more than a few thousandths of a degree. The temperature changes that occurred when the loop was traversed step by step were very minute, but in recent years successful measurements of great value in elucidating the mechanism of the magnetisation process had been made.

"Magnetic History"

The behaviour of a given ferromagnetic depended not only on its state of magnetisation, or even on the magnetisation and the field, but also on how that state had been reached, which meant on the previous magnetic history of the specimen.

Elementary magnets and intrinsic magnetisation were illustrated by contrasting the behaviour of typical paramagnetics and ferromagnetics, leading up to the old Ewing model which, in spite of its convincing simplicity, was completely misleading.

The origin of the "molecular field" suggested by Weiss was not satisfactorily explained till twenty years later. Nevertheless, development of the consequences of his simple formal assumption of the existence of a quasi-magnetic molecular field proportional to the intensity of magnetisation led to remarkable co-ordination of a wide range of ferromagnetic properties, thermal as well as purely magnetic.

The process of magnetisation by means of

an applied field consisted essentially of lining up the directions of magnetisation of individual "domains," rather than of changing the numerical magnitude of the already existing magnetisation. The applied field merely made apparent what was, in a sense, already there.

Apart from magnetic moments being associated with electrons owing to their orbital moments, it had been found that electrons themselves were magnets; not by direct measurement, but as an inescapable conclusion from an enormous range of experimental facts, particularly in connection with spectra and atomic structure.

The first step in applying quantum mechanical ideas to ferromagnetism in this connection was made by Heisenberg, but in detail the theory had by no means reached a final stage yet. Promising theoretical investigations on ferromagnetism in relation to paramagnetism in metals, and to the general theory of metals, were in active progress just before the war.

Evidence of Causes

The lecturer indicated without going into detail the nature of the experimental evidence for the occurrence of processes of the kind he had described as being the causes of magnetisation, provided most directly from the study of the Barkhausen effect, which offered almost direct experimental confirmation of the general "domain" theory for which previous evidence, though strong, was indirect and quantitatively vague.

In the later portion of the lecture brief reference was made to a few of the main types of magnetic materials in commercial use including sheet steels, high permeability alloys and permanent magnet materials.

This survey of some of the main principles in terms of which an explanation was gradually being obtained of the properties of ferromagnetics illustrated in a striking way that no sharp division could in fact be made between theory and practice. For instance, the answer to an eminently practical question about the core losses of transformers might involve reference to electron spins and quantum mechanical interchange interaction forces. All of this pointed to the need for greater collaboration between industries and universities, but the number of university workers whose normal duties left them opportunities for effective collaboration was minute. Instead, many more suitable young men from industry should be encouraged to approach their problems from the wider theoretical point of view while keeping in close touch with practical needs.

X-ray Inspection

North East Coast Institution Discussion

A GENERAL discussion on radiological testing recently took place before the North East Coast Institution of Engineers and Shipbuilders at Newcastle-upon-Tyne. In a general introduction, SIR LAWRENCE BRAGG (Cavendish Laboratory, Cambridge) dealt with the relationship between the structures of metals and their strengths, clearly explaining the fundamental nature of the metallic state and indicating how, by X-ray diffraction, the dimensions of the crystal lattice structure could be measured; thereby enabling such physical characteristics as the yield stress of the metal to be estimated. Actual demonstrations with apparatus indicated the progress that is being made in the investigation of slip in metals.

In the first of three short introductory contributions, DR. S. F. DOREY (chief engineer surveyor, Lloyd's Register of Shipping) remarked upon some of the practical ways in which X-rays could be of direct service in engineering. For instance, it was only by virtue of this means of examination that complete confidence had been established in the welding of water-tube boiler drums. It was now a routine test requirement of Lloyd's Rules for pressure vessels of all kinds.

Examination of Castings

Increasing use was being made of X-rays in the steel casting industry, for examination before any machining was done; it was an expensive operation, but might be restricted to those parts which experience had shown to be most vulnerable to casting defects. The method must be used with discretion in order to strike a balance between the cost of the test and the value of the casting.

There was a trend towards the employment of X-ray apparatus of greater electrical capacity. The sets more commonly in use at present were seldom suitable for commercial application to thicknesses over 3.5 in. of metal. Gamma-rays were roughly equivalent to X-rays generated at one million volts and in consequence had a high penetrating power; but radiations of the longer wavelengths produced better contrast and definition on the photographic negative. Moreover, the intensity of gamma-rays could not be varied and X-rays were more sensitive in that they revealed small defects more clearly, though this advantage decreased with increasing thickness of metal.

A special advantage of gamma radiology was the simplicity of the equipment needed. The tiny size of the radium or radon capsule enabled it to be more conveniently applied

than the more cumbersome X-ray tube, being specially suitable for exploring complicated castings.

Before long the X-ray analysis camera would become as essential a part of the equipment of the industrial metallurgical laboratory as the microscope. Not the least interesting of its uses was the measurement of strains in materials, from which the actual magnitude and direction of the stresses could be evaluated. The method involved the accurate measurement of the displacement of atomic spacing caused by applied stress, being limited to the investigation of biaxial strains in the surface of the part under test. Skin stresses were, however, usually of first importance.

Welded Work

The introductory paper by DR. V. E. PULLIN (consultant to the Ministry of Aircraft Production) was concerned mainly with welding, representing the attitude of the specialist. Dr. Pullin said he had been impressed with the big variations that occurred in the quality of engineering radiography. He considered that lack of uniformity to be serious because it made assessment of the reliability of the method and proper interpretation of results more difficult. The variation, for the most part, was due to carelessness and lack of precision in procedure.

Dr. Pullin considered radiography to have separate values in respect of development work and inspection. In ship construction, for example, it was impossible adequately to X-ray every weld and he had no doubt that if a percentage inspection were made there would always be a tendency to assess the non-X-rayed portions in terms of those which had been examined, in spite of the fact that those which had not might have been the most difficult actually to weld. That tendency was very often inarticulate, but nevertheless it existed. If it were not possible to obtain a radiograph of a weld under proper conditions, radiography should not be attempted as a means of inspection.

As to the photographic aspect of the subject, high-voltage X-raying made the selection of suitable film more difficult, rendering the necessity for research in this respect more apparent. It was desirable not to use salt screens whenever it was economically possible to do without them. The author hoped that every radiographic laboratory in this country would soon be equipped with automatic or semi-automatic means of processing X-ray films and he considered that

the design of cassettes had been sadly neglected. Uniformity of negative density should be aimed at in every work and it was impossible to recommend any particular background density for engineering radiography. Dr. Pullin was in favour of long focus film distances and considered the use of accurate penetrometers to be most desirable. He favoured the employment of high voltages rather than the deliberate choice of the lowest voltage consistent with penetration, although the choice must be governed by *ad hoc* considerations. Bad radiographs were frequently due to the use of too great a length of film (too much attempted in one shot). The limiting length of film for circumferential seams (boiler welds) should be 10 in.; this did not apply to longitudinal seams. With regard to interpretation, the author was opposed to all attempts to systematise routine methods of assessing flaws in welds.

Finally, a paper by DR. H. HARRIS (works metallurgist, Babcock & Wilcox, Ltd.) dealt with the examination of welded pressure vessels, explaining why every inch of the

seams, both longitudinal and circumferential, needed to be X-rayed. Examination of the whole had proved that a high standard of weld quality could be maintained consistently as a manufacturing routine, indicating that equal attainment was possible in other branches of welding.

X-ray equipment and methods of taking radiographs were briefly described. In the welded pressure vessel industry it was mandatory to place near the welded seam being examined a gauge, or penetrometer, which would reveal the degree of sensitivity of the inspection routine.

Fundamentally, X-rays compared the relative densities of weld and parent metals; they were of no use in determining the physical characteristics of welds and did not strictly furnish any quantitative data. Their efficacy as a means of non-destructive testing and the potency of the method were being slowly recognised. But the costs involved made it impracticable to utilise radiography to the same extent in other branches of welding as in making pressure vessels.

Fuel and Power

Labour Party's Nationalisation Plan

A REPORT which is to be presented at the Labour Party's Whitsuntide conference sets out a post-war policy for the fuel and power industries. After surveying the history and development of each it states the case for the nationalisation and co-ordination of all three, on grounds that the balanced utilisation of the country's fuel resources is preferable to the unrestrained development of the several services individually.

It is proposed that the Ministry of Fuel and Power should appoint a National Coal and Power Corporation which should acquire the ownership of mines and utilisation industries, compensation, to be assessed by selected commissioners, being dependent upon the general circumstances prevailing at the time. Members of the Corporation should be selected on the basis of their competence to manage the affairs of the various industries and should include representatives of labour.

Under the Corporation there should be a separate board for coal and one for gas and electricity. The Coal Board would be divided into three sections dealing with production, distribution and by-products.

Under the Gas and Electricity Board there should be regional boards with management powers in the sphere of generation and responsibility for the development of an effective distributive and sales organisation. No private industrial or commercial undertakings should be allowed to establish generating stations for their own needs without the approval of the Gas and Electricity Board.

Although the recommendations refer only to a Gas and Electricity Board, in the section dealing with the electricity supply industry the establishment of a National Electricity Board is proposed in place of the present Electricity Commissioners

and the Central Electricity Board; to this Board all authorised electricity supply undertakings, including the grid, railway and traction generation and certain non-statutory undertakings, would be transferred. The members should be appointed by the Minister of Fuel and Power and should include workers in the industry. It is further proposed that a Joint Consultative Committee should be appointed by the Minister consisting of representatives of the various interests—undertakings, consumers and workers. It is contended that organised planning of the industry can only be achieved on regional lines as opposed to the area monopolies advocated in the McGowan Report. For this purpose there would be regional boards which would be further sub-divided into districts as the primary units of day-to-day administration.

The recommendations also provide for the establishment under the National Corporation of a Research and Development Board and a joint wages authority in each industry.

Training of Mining Engineers

SPEAKING at a meeting of the North of England branch of the Association of Mining Electrical and Mechanical Engineers at Newcastle-on-Tyne, Mr. E. E. Grover, the national president, suggested two new measures to further the Association's objects in educational matters. He proposed the introduction of an apprenticeship certificate to be granted to engineering apprentices on the completion of their time in the mine. This, he stated, might be given without examination, and be based on the completion of a satisfactory course of not only technical training but craftsmanship. Mr. Grover also advocated the setting up of a board of examiners.

Reorganisation Proposals

Joint Memorandum to go to Minister

IT will be recalled that the memorandum prepared by the Incorporated Municipal Electrical Association, the Provincial Electric Supply Association, the London Electricity Supply Association and a group of power companies (members of the Incorporated Association of Electric Power Companies) was discussed at an extraordinary meeting of the I.M.E.A. on March 16th. It was then decided to refer the memorandum back to the Joint Committee responsible for it with a proposal that Part III, referring to the future organisation of the electricity supply industry, should be deleted. In its place it was suggested that a clause should be inserted recommending the Minister of Fuel and Power to obtain from each Association concerned an independent expression of views on the ownership of distribution undertakings; the ownership of generating stations; and the introduction of a national standard bulk supply tariff.

These proposals were subsequently considered by the Joint Committee and rejected. The Committee did, however, make two amendments. The first related to Paragraph 32, which proposed that the Minister of Fuel and Power should be empowered to make Orders requiring undertakings giving non-standard supplies to adopt a standard three-phase, 400/230-V, 50-cycle system within a given period of years; and that arrangements should be made for the continuance of non-standard supplies to industrial consumers where necessary.

Two Amendments

The Committee proposed the deletion of this paragraph and the substitution of the following:—

"The Minister of Fuel and Power should be empowered to make orders requiring those undertakings which give non-standard supplies to adopt a standard voltage distribution system, namely, 400/230 volt, 3-phase (4-wire), 50 cycle AC, within a given period of years. This should not preclude the final distribution to be 230-volt single-phase supplied from the 3-phase (4-wire) system where small single-phase supplies only are required in residential and rural areas. In some cases the continuation of non-standard supplies might be required by certain consumers, and arrangements should be made for their needs to be met."

The other amendment related to Paragraph 49, dealing with the establishment of Area Committees which *should be composed of not less than ten or more than fourteen members of whom not less than half should be*

engineers engaged in undertakings within the area. The italicised words were replaced by "of which 50 per cent."

The memorandum as amended was re-submitted at a further extraordinary meeting of the I.M.E.A. on April 26th, when, we are informed, it was adopted by an "overwhelming majority." It will now go forward to the Minister "as the considered views of 90 per cent. of the distribution interests of the industry."

The I.M.E.A.'s own memorandum on the ownership of distribution undertakings and generating stations and a national standard bulk supply tariff was accepted at the March meeting, but its submission to the Minister was deferred until the fate of the Joint Memorandum was settled.

Undertaking's Rating

Appeal Committee Reduces Valuation

THE assessment of the South London Electric Supply Corporation, Ltd., was considered by the Rating Appeals Committee of the County of London Quarter Sessions (chairman, Mr. Eustace Fulton, K.C.) on April 20th and 21st, when the rateable value of the undertaking was held to have been reduced from £37,350 to nil. The respondents were the Camberwell Borough Council.

Mr. A. S. Comyns Carr, K.C., for the company, said that the appellants contended that the rateable value had been reduced owing to causes directly attributable to the war, including loss of gross revenue, increased cost of current and working expenses, higher renewal funds, and increased tenant's share, and that these causes must be correctly taken into account under the provisions of the Rating and Valuation (Postponement of Valuations) Act, 1940. The undertaking was last valued on the accounts for the year ended December 31st, 1934, and there had been a small increase in rateable value owing to extensions of the undertaking since that date. The accounts material to ascertain a reduction in value were those for the year ended December 31st, 1941.

Mr. A. R. Craig Hall, F.S.I. (Craig Hall & Co., chartered surveyors), gave evidence for the company, and proved a statement showing for each of the years 1934, 1939 and 1941 the increase or reduction in the gross receipts, working expenses, renewal funds and tenant's share since the rateable value was fixed on the 1934 accounts as compared with the Corporation's accounts for the year ended December 31st, 1941, and indicated the effect of excluding any increase or reduction which was not directly attributable to the war. Mr. Craig Hall explained that the total of the reductions in each of the items material to a valuation on receipts and expenditure exceeded the total rateable value at present in force, with the result that the rateable value was reduced to nil.

He did not agree with the valuations put forward by the respondents' valuer, because those were notional valuations for the years 1939 and 1941 which did not give to the hypothetical tenant an adequate return for the increased capital which it was necessary to employ in the undertaking.

The witness agreed that the gross receipts in 1941 were greater than in 1934, but stated that in order to earn these greater receipts increased capital had to be invested in the business and the fall in receipts between 1939 and 1941, coupled with an increase in working expenses and an increase in renewal funds, left an insufficient balance to reimburse the hypothetical tenant for the capital which had to be invested to earn those receipts.

Mr. H. B. Williams, for the Borough Council, contended that there had been no reduction in the cumulo rateable value of the undertaking

and that in fact the value of the undertaking on the 1939 accounts was higher than it was in 1934, and no increased assessment had been claimed by the rating authority. On the 1941 accounts it was contended that the cumulo rateable value was still higher than that fixed in 1934. Mr. F. Levy, the valuation officer for Camberwell, stated that the balance in 1941, after deducting from the gross receipts the cost of current and working expenses, was higher than the comparable figure in 1934, and as the values appealed against were fixed on the 1934 accounts there was no evidence of a fall in value.

The Court held that there was a fall in value, due to the emergency, and the appeal was allowed with costs at the *ex gratia* values set out in the appellants' case. A reduction in value had previously been agreed in the other boroughs into which the undertaking extends.

The Budget Statement

Allowances for Development and Research

IN dealing with Sir John Anderson's Budget speech last week, we should have made it clear that the proposed 20 per cent. allowance deductible from taxable profits on expenditure on new plant and 10 per cent. on new industrial buildings is to apply during the reconstruction period—not immediately. It is also proposed as part of the post-war policy that in the case of a continuing business the obsolescence allowance should be given when plant and machinery are scrapped, whether they are replaced or not.

With regard to the depreciation of buildings, it is intended that in the case of factories and buildings associated with them the cost shall be written off on the basis of fifty years' life by an annual depreciation allowance of 2 per cent. of the cost, with an initial allowance of 10 per cent.

In his references to excess profits tax, the Chancellor said that he could not entertain any suggestion for a reduction of the rate of 100 per cent. which was imposed from other than fiscal considerations. He reminded the House of the post-war credit of 20 per cent. of the tax. Allowing for the income tax payable on all refunds of E.P.T. the post-war credit represented a net sum of 10 per cent. of the annual produce of the tax; that represented a fund growing at the rate of between £40 million and £50 million a year.

He had found it possible, however, to grant a modest relief, especially important to small businesses. As from April 1st all standards, except profit standards, would be increased by £1,000; the increase would apply to the cases where the standard was a minimum standard, a personal working proprietor standard or a standard representing a percentage of the capital employed in the business. It would benefit 30,000 small businesses, 10,000 of which would pass out of charge. There was the one qualification that deficiencies of profits below the standard in any accounting period could only be set against excess profits of future, not past, periods.

Introducing his concessions with regard to expenditure on research, Sir John Anderson said that such expenditure stood on a different

footing from the other expenditure of a trader. It was not immediately related to the making of profits as in the case of expenditure incurred in the manufacture and sale of goods, nor did the benefits accrue merely to the originator. Therefore he proposed that any research expenditure of a capital character, which meant normal expenditure on laboratory buildings, plant and machinery, should be allowed over a period of five years or for the life of the asset if there was a deduction from profits for income tax purposes. In addition, all current research expenditure such as salaries, wages, cost of materials, repairs, etc., would be allowed as and when incurred.

Moreover, he proposed that any payment, whether for a capital purpose or not, made by a trade to a central research body approved by the Department of Scientific and Industrial Research should be allowed, as and when made, as a deduction in computing the profits of the concern. Contributions to research being carried out by a university or college on matters of concern to the traders' business would be similarly treated.

L.N.E.R. Radio-Telephone Tests

EXPERIMENTS with radio-telephone apparatus enabling engine crews and guards of freight trains to converse *en route* which were successfully made some months ago by the L.N.E.R. in collaboration with Rediffusion, Ltd., have been carried forward a further stage.

During tests which have just been carried out Sir Ronald Matthews, chairman of the L.N.E.R., sitting in his office at a London terminus, conversed by radio-telephone with Sir Charles Newton, chief general manager, who was travelling north on the East Coast main line in a specially equipped train. Reception both ways was very satisfactory and during the experiments contact was made *via* three different trunk telephone exchanges of the L.N.E.R.

The tests have shown that the installation of radio-telephone on trains after the war, enabling the traveller to converse at ease with his office or home, is a practicable proposition.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IN the lecture theatre of the Institution of Electrical Engineers last week **Sir Ernest Fisk**, who earlier in the year was elected an honorary member of the Institution in appreciation of the services he has rendered in Australasia in the field of radio-communications, was presented with the certificate of honorary membership by the President, Col. Sir A. Stanley Angwin.

The General Purposes Committee of the London and Home Counties Joint Electricity Authority recommends that the salary of **Mr. A. L. Burnell**, its finance officer, shall be increased from £1,200 to £1,350 per annum, and then by annual increments of £50 up to £1,500.

Mr. A. Brookes, M.Eng., chief of the research laboratories of Ericsson Telephones, Ltd., has been nominated for the chairmanship of the I.E.E. East Midland Sub-Centre for the 1944-45 session, with **Mr. D. B. Hoseason**, a director of the Brush Electrical Engineering Co., Ltd., as vice-chairman.

Mr. D. Garnett has been nominated as chairman of the I.E.E. Bristol Students' Section for the 1944-45 session.

The first presentation of testimonials by the English Electric Co., Ltd., to employees who have retired on pension after lengthy periods of service was recently made at the company's Stafford works by **Mr. J. W. C. Milligan**, manager of the works. The recipients were: **Mr. T. R. Stanton** (58 years' service) and **Mr. O. C. Strike** (43 years' service), both of the planning department; and **Mr. O. Moffat** (43 years' service), of the machine drawing office.

Mr. A. J. Boyd has been elected a director of Associated Electrical Industries, Ltd.

In an essay competition open to all members of the Institute of the Motor Trade, Inc., **Mr. W. R. Montgomery**, managing director of the Alton Battery Co., Ltd., submitted a paper on "The Relative Responsibilities of Employers and Employees to Each Other," for which he has been granted a special merit certificate.

Mr. A. A. Harris, senior clerk and administrative assistant to the Coventry Corporation Electricity Department, is retiring this month after forty-five years' service with the Corporation.

Under the direction of **Mr. F. S. Waterman**, the Henley choir gave a choral concert before a large audience in the Dorking County School Hall on April 20th. **Sir Montague Hughman** presided and during the performance **Dr. Dunsheath**, on behalf of the choir, presented

Mr. Waterman with a silver pencil. The choral version of "Greensleeves" as arranged by **Dr. Vaughan-Williams** was given its first public rendering. The proceeds of the concert, nearly £25, were given to the Red Cross and St. John Fund.

Sir George Nelson has been elected president of the Federation of British Industries for a second year.

Col. David Sarnoff, who was president of the Radio Corporation of America in civilian life, has been appointed on temporary duty as special consultant to the Communications Branch of the Public Relations Division, Supreme Headquarters, Allied Expeditionary Force.

Col. Sarnoff was the principal guest at a recent luncheon of the Radio Industries Club. The accompanying picture shows him with **Sir Noel Ashbridge**, president of the Club, and **Mr.**



Sir Noel Ashbridge, Col. D. Sarnoff and Mr. H. de A. Donisthorpe at a luncheon of the Radio Industries Club

H. de A. Donisthorpe the chairman. At the luncheon a presentation was made to **Mr. Donisthorpe** by the members to commemorate his completion of four years in the chair.

A "valuable invention in connection with radiolocation" has won a Royal Society of Arts Prize of £50 for two scientists, **Dr. J. T. Randall** and **Dr. H. A. H. Boot**. Under the Thomas Gray Memorial Trust the Council of the Society offered the prize for an invention which was considered to be an advancement in the science or practice of navigation. Last week the Society announced that it recognised the eminent services which **Drs. Randall** and **Boot** had rendered to the Merchant Navy by their invention which would make for the greater safety of life at sea.

At a meeting of the Birmingham Centre of the Illuminating Engineering Society on April 21st the president of the Society, **Dr. H. Buckley**, delivered an address on "18th Century Photometry," which dealt with the work of **Bouguer**, **Lambert** and **Rumford**.

Dr. Buckley also presented the prizes to the winners of the essay competition sponsored by the Birmingham Centre, which was open to students of technical schools in the area. The

title of the essay for this year was "My Views on Artificial Light," and the first and second prizes were awarded to K. M. Poole, Old Hill Technical School, and J. R. Dyson, Rugby Technical College, respectively. Certificates were also awarded to five other students.

Mr. A. C. Bernard, at present assistant manager, has been appointed manager of the Carron Company in succession to **Mr. George Pate**, O.B.E., J.P., who is retiring on the grounds of ill-health. Mr. Bernard joined the company as superintending engineer in 1933.

Sir Vyvyan Board, Senior Economy Officer of the Ministry of Supply, has been appointed Rubber Controller in succession to **Col. E. Gore-Browne**, who has been elected chairman of the Southern Railway Company. Sir Vyvyan Board will continue to be the Minister's adviser on economy matters.

Obituary

Mr. H. C. Morgan, whose death at Melbourne is reported in the *Electrical Engineer and Merchandiser*, was formerly manager in Australia for W. T. Henley's Telegraph Works Co., Ltd. He joined the company at its head office in London in 1888 and had thus completed fifty-one years' service when he retired in 1939. He visited Australia in 1907 to open the company's Melbourne branch, and on returning home helped in the selection and fitting up of the branches at Newcastle, Birmingham and Glasgow. In 1909 he went to Australia again to take charge of the Sydney branch, and in 1913 he was transferred to Melbourne as the company's manager for the Commonwealth.

Fatalities

Electrician's Death.—While working on low-voltage fuses half-way up a high-voltage pole **Mr. S. W. E. Ellaway** (31), an electrician employed by the Wessex Electricity Co., shouted out and collapsed. **Mr. W. MacIntyre**, who was at the bottom of the ladder, tried to get him down and eventually managed to carry him away and apply artificial respiration, which, however, was unavailing.

At the inquest at Abingdon, **Mr. MacIntyre** said that **Mr. Ellaway** had been working with his gloves on and as far as he knew nothing was left undone that should have been done. Medical evidence was given by **Dr. J. K. Davidson**, who stated that there were no signs of burns. He certified the cause of death as heart failure following electric shock and in reply to a question said he did not think death could have been due to heart failure without shock. **Mr. S. A. Rushby**, district manager, who examined **Mr. Ellaway's** work, described it complete except for the final connection; there was no faulty workmanship and every possible precaution had been taken so far as he could see. He had never known of a fatal accident arising out of this type of work.

The coroner, remarking that it was a complete mystery how it had happened, returned a verdict in accordance with the medical evidence.

Shock from Vacuum Cleaner.—Recording a verdict of "Death through being accidentally electrocuted" at an inquest on **Mrs. M. M. C. Bradwell**, aged forty, the Carlisle coroner

observed that the vacuum cleaner concerned had apparently been in a dangerous condition for some time and he emphasised the importance of having electrical appliances regularly overhauled.

The dead woman's husband stated that he found his wife lying on the floor of the kitchen with the cleaner beside her; the flex was attached to the lighting point in the ceiling and the other end was in her hand and was disconnected.

Mr. H. P. Baynham, deputy city electrical engineer, stated that, with either the lampholder adaptor or the switch connector in one of two positions, the metal case of the cleaner was "alive." He said that the practice of connecting a flexible cord to a lampholder for the purpose of supplying electrical apparatus had been condemned for many years. Safe accessories were available and should be used for all portable appliances.

Resuscitation from Shock

IN a letter to the editor of the *British Medical Journal*, **Dr. F. C. Eve** refers to a remarkable recovery from severe electric shock by a youth whose respiration had ceased. **Schafer's** method was applied for ten minutes without response. In the meantime a fulcrum of concrete blocks, 3 ft. high, had been improvised for the stretcher in which the patient lay, and **Eve's** rocking method was performed a dozen times a minute through an angle of 45 deg. each way. After twenty minutes of rocking respiration was restored. No time was spent in this case in tying wrists and ankles to the stretcher handles, as, the wire mesh of the stretcher having bulged from use, the patient did not slip. Blankets had been placed above and below. Respiration failed again in the ambulance but soon responded to the **Schafer** treatment.

Dr. Eve advocates starting with **Schafer's** method at once on the ground. The body is blanketed and rolled on to the stretcher as soon as this can be brought, **Schafer's** method being continued while the ankles and wrists are bandaged to the handles. The stretcher is then placed on the trestle and rocking is started by a full head-down tilt of 45 deg. The feet-down tilt is not started until fluid from the lungs or stomach has ceased to flow. Rocking is continued at ten double rocks a minute, i.e., 4 sec. head down, 2 sec. feet down. Warmth is essential.

Radio Relay Agreement

NEWCASTLE City Council proposes to enter into a new agreement with Northern Rediffusion Services, Ltd., regarding the placing of wires over streets and the attachment of wires to Corporation property. Hitherto the company has been operating under an agreement, dated 1931, whereby it paid to the Corporation £250 per 1,000 subscribers, with a minimum of £500 per annum. Owing to legal difficulties it is now proposed that the company shall pay 7½ per cent. of its gross revenue from city subscribers, plus £180 in respect of the services of the city engineer as the officer responsible for giving consent to the attachment of wires to Corporation properties. Under the new agreement the Corporation will receive about £5,900 per annum against £4,450 before.

Appliance Design

Possible Future Developments

THE design and performance of domestic appliances are dealt with in a paper by MESSRS. W. N. C. CLINCH (Northmet Power Co.) and F. LYNN (Brighton Corporation) submitted to the Installations Section of the Institution of Electrical Engineers. It is pointed out that an enviable amenity of one generation becomes the apparent necessity of the next, in which respect electricity has fulfilled the duties required of it to a degree unapproached by any of its predecessors. But it must be remembered that the real test of any apparatus is its performance in the hands of its users.

Need for Robustness

Just before the war ideas of electrical domestic service had begun to crystallise and in this paper the authors consider some of the improvements which may be expected upon the return to peace. They have not sought to be prophetic, but to record suggested betterment of current practice which would be welcomed by well-informed users. They stress the fact that the service rendered by an appliance can be prejudiced by its accessories and emphasise the importance of robustness and low maintenance cost. Manufacturers should be aware that progress, which is to their advantage, will cease if their consideration is "sales" instead of "service." The servicing done by suppliers of electricity will be of negative benefit if it becomes too frequent and the cost incurred is unprofitable to the user.

As a case in point, the authors mention a connector that will last for years when properly used, yet in hired appliances it is a constant source of trouble; the plastic mouldings have little substance and are brittle. The authors have recently put into service over 1,000 kettle connectors made of hardwood, primarily intended as a stop-gap, but in practice they are standing up to their work better than the standard article. Neglect and misuse cannot be condoned, but domestic appliances must not be made for sheltered existence only. As they become more and more accepted features in every home they must inevitably lose their former distinction of rather unusual possessions to be accorded special treatment.

Table-type Cooker Favoured

The authors' survey is divided into five sections, covering cooking, refrigeration, heating, hot water and cleaning. It is pointed out that housewives would welcome larger hobs (not necessarily cooking surface) and more hot-cupboard space. There is little

doubt that cooker makers would have satisfied those wants, without undue rise of cost, if they had been free to do so, but the small floor area of the kitchen in the average house has imposed severe limitations on the space available for the cooker. The Ministry of Works has stated that the kitchens of small post-war houses will be able to accommodate cookers measuring 42 by 20 in. overall, in which case the table cooker may well become popular. In recent canvasses of opinion, women's organisations have shown a preference for the console model with the oven raised alongside the hob-plate for greater accessibility; although this occupies more wall space, there is room beneath for storing utensils.

Immediately before the war there was a noticeable tendency towards straight lines and unrelieved surfaces, but it is doubtful whether large self-coloured plane surfaces can be recommended; signs of wear and tear become very much more noticeable on surfaces that are not broken up or are without a mottled finish. Suppliers of electricity having many cookers connected to their systems will recognise the problems of dilapidation raised by this.

Reduction of Weight

The trend towards reduction of cooker weight will continue, which means the utilisation of fewer castings; yet vitreous enamel is liable to flake off when sheet metal yields to blows, so a new kind of finish will be needed. Weight could be reduced by employing heavy pressings, but so far they have been denied the designer because of the relatively small quantities produced. Is it too much to hope that sufficient agreement might be reached to enable cooker manufacturers to benefit from the production of components in large power presses?

A different lead towards profitable standardisation has been given by the E.D.A. proposal to fix certain dimensions for permitting interchangeability of the "wearing parts"; great simplification of service would follow, to the ultimate advantage of the user. Another improvement to which the industry must look is greater protection of the electrical parts from liquids and grease. The authors view with favour a design in which the boiling plates and boiler-griller are fixed in the hob-plate with water-tight joints to prevent spillage from getting below the top surface.

Enclosed boiling plates have been most favoured, but the need for a particular kind of utensil to obtain the best results must be

regarded as a disadvantage. Their comparatively large thermal capacity is a further drawback, which delays operations. It is easy to exaggerate the psychological value of the visible source of heat in radiant boiling plates and it is significant that this point is seldom raised by a younger generation which has grown up with electric cooking.

Considerations of control suggest that the future lies in progressive development of the radiant or semi-radiant boiling plate, which would be much stimulated by the production of a lasting outside finish for light-gauge hollow-ware that would approximate to the absolute black body. Although manual regulation of oven heat is easy and reliable, automatic control is even more desirable; but it is clear that the best position for the active element of the thermostat within the oven will have to be found experimentally for each design.

Agreement about the prospects of thermostatic control is likely to be general, but opinions differ as to whether some form of side and bottom heating should be adopted as standard. Whether the heating elements should be outside the actual cooking space (withdrawable oven interior) or within it is still a matter of controversy.

Compression and Absorption Refrigerators

Compressor refrigerators are unchallenged in the sense of duty performed and energy consumed. The hermetically sealed type certainly appeals most strongly for future development when AC becomes universal. But the class of machine suitable for climatic conditions and social habits in America should not be accepted too readily as the right class for general distribution in the British Isles, only needing adjustment of production cost for the lower-price market. Repair or service charges that are acceptable in the more affluent circles can be a real embarrassment in households of lower incomes where there is no margin for unexpected demands; so that maintenance charges are unlikely to rank high in priority for attention, causing a danger of the refrigerator's falling into disuse. In those circumstances the claims of absorption refrigerators, which have no moving parts, but conserve more energy and have less overload capacity, are strong and call for careful consideration.

Heating Methods

In pointing out some of the defects of portable fires, the authors indicate that they can be cheap without being nasty. They earnestly hope that common faults of built-in (inset) fires may be avoided in future and remark upon the causes of the early convectors' lapse from favour. The total heating requirements of a residence vary so much with the number, age and habits of the

occupants that it is difficult to find a common denominator even within those of roughly the same economic class. Nevertheless, the authors think it profitable to speculate on what may be termed the fundamental heating requirements of a medium-sized house.

They assume that for economic reasons maintenance of a steady temperature throughout the whole house would not be possible; indeed in a very large portion of this country relatively few people would consider it desirable. But there would be general appreciation of a smaller amount of background heat dispersed sufficiently to keep the chill out of the hall and ground floor rooms. That basic heat would be furnished by non-luminous sources under thermostatic control, while additional requirements could be regarded as intermittent and catered for by fires of the radiant type.

In existing houses convectors might create the best dispersion of background heat, while for houses yet to be built the possibilities of floor heating are of great interest. Special cables could be developed for the purpose, as the bare wire method is unlikely to be applied to domestic heating since the transformer is an unnecessary complication and expense. The authors include brief details of two reinforced concrete buildings to which they have applied floor heating since Mr. R. Grierson's paper of 1942. One of them is a works air-raid shelter and the other combines a shelter with a factory canteen with a kitchen and large and small dining rooms. The permissible watts density for comfortable floor temperature in a private house has yet to be determined.

Water Heater Standardisation

Aspects of water heater standardisation omitted from BS.843 are discussed by the authors under the headings of overall dimensions and lagging, dimensions of apparatus, plate and heating elements, method of making joints, corrosion, and scale. Consideration is given to the form of electric water heating which would be best adapted to small post-war houses, with regard for the incomes of their occupiers. It is urged that agreement should be sought with the solid fuel interests on typical installations which will give superior service, whichever kind of fuel is used.

Architects, builders and manufacturers of solid fuel systems must be convinced that they will lose the goodwill of their ultimate customers (the people who live in the houses) if they do not provide, at the time of installation, full facilities for the alternative use of electricity.

Some faults of suction cleaners are mentioned while, by inference, it appears that oscillatory movement is considered superior to the rotary for floor polishers.

Home laundry is much more a feature of

the northern than of the southern counties, where the electric washing machine has not so far attained to great popularity. It is principally a matter of social habit, but the problem of how clothes are to be dried frequently overshadows the undoubted advantage of the washer itself. The latter might be made self-heating, while the best solution of the drying problem does not appear to lie in portable appliances; it requires the co-operation of architects and builders in providing a cupboard with intake from and exhaust to the outside atmosphere.

CORRESPONDENCE

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

Consumer Sampling

ARISING out of the article published in your issue of April 28th, your readers may be interested to know that for some time the application of statistical methods to problems of electricity supply has been under consideration by the E.R.A. A sub-committee has recently been set up to consider *inter alia* their application to investigations in the field of supplies for domestic purposes.

E. B. WEDMORE,

Director and Secretary,

British Electrical & Allied Industries
London, W.C.2. Research Association.

Illegal Supply of Lampshades

YOUR attention is particularly called to recent prosecutions which have taken place in connection with the illegal manufacture of lampshades.

For manufacturing controlled goods (Class 9b—Lighting Fittings—Limitation of Supplies Orders) without a licence which it was necessary for them to secure, as they were not manufacturers on December 1st, 1941, one firm was fined £600 plus 15 guineas costs. Another firm was fined £260 plus 60 guineas costs or five months' imprisonment for the same offence.

A third supplier was fined £500, plus 20 guineas costs, for exceeding his permitted quota of manufacture under Class 9b (Lighting Fittings—Limitation of Supplies Orders) and was also sentenced to four months' imprisonment for failing to collect purchase tax.

Members of this Association are aware that very large quantities of lampshades which contravene Government Orders have been manufactured and sold, and they are particularly anxious that all retailers should be aware of these prosecutions.

London, E.C.4.

B. G. ARTHUR,
Secretary, Lampshades & Standards Manufacturers' Association.

Argentine Exports

Chiefly to Neighbouring Countries

WHILE the total value of Argentine electrical exports in 1942 showed a decline on the previous year, this was almost wholly accounted for by a sharp decrease in shipments of radio material which had risen greatly in 1941. Other items increased, with the exception of accumulators and batteries, exports of which, however, were above the 1940 figure. Details

Class	1942 Pesos (000)	Inc. or dec. on 1941
Accumulators, batteries and parts—	33	- 40
To Bolivia	6	+ 1
" Brazil	3	- 2
" Chile	7	- 19
" Paraguay	9	- 15
" Peru	4	+ 4
" Uruguay	2	- 8
Telephone apparatus and accessories	265	+ 180
To Brazil	65	+ 44
" Chile	126	+ 110
" Paraguay	42	+ 5
" Peru	19	+ 7
Radio apparatus and accessories—	3,415	- 735
To Brazil	1,254	- 1,128
" Chile	582	- 414
" India	503	+ 503
" Paraguay	250	+ 150
" Peru	213	- 71
" Portugal	190	+ 190
" Uruguay	240	- 6
Lamps—	406	+ 1
To Chile	118	+ 1
" Paraguay	50	+ 3
" Peru	64	- 14
" South Africa	58	+ 51
" Uruguay	64	- 14
Unspecified electrical goods—	1,117	+ 432
To Bolivia	147	+ 75
" Brazil	68	- 22
" Chile	311	+ 91
" Peru	306	+ 253
" Venezuela	80	+ 76
Electric motors—	110	+ 64
To Brazil	21	+ 11
" Chile	52	+ 25
" Paraguay	3	+ 3
" Uruguay	20	+ 14

are given in the accompanying table which also shows the principal customer countries—nearly all South American—and the increase or decrease compared with 1941 (17 Arg. pesos equal £1).

Presumably with the object of encouraging the manufacture in Argentina of electrical plant, the Government now exempts from duty electrical equipment and steel to be used in industrial motors and engines (including electrical of more than ¼ HP) provided that 80 per cent., in terms of weight, of the designing, casting, finishing and assembling of the motors or engines is done in Argentina.

Australian Farm Electrification

THE Victorian Electricity Commission plans to connect 1,200 farms to the public mains by the end of this year in order to assist in the production of foodstuffs. The capital expenditure involved, states *Tenders* (Melbourne), is £265,000. Some 2,000 miles of copper and steel conductors will be required and the consumers will need 1,500 electric motors and other equipment.

COMMERCE and INDUSTRY

Stimulating Overseas Trade. Patent Procedure Inquiry.

Welding-Machine Licences

THE Minister of Supply has issued a new Direction (No. 4) on the subject of welding machines. This direction (S.R. & O. No. 445) relates to the Control of Machine Tools (No. 13) Order and makes it necessary for purchase certificates to be obtained for single operator AC arc welding machines up to and including 250A continuous hand welding capacity which have previously been excluded from licensing by virtue of the No. 1 Direction. By this new arrangement all welding machines irrespective of capacity or value are now subject to licensing. The procedure for applying for purchase certificates for all types of welding machines remains unaltered.

Promotion of Exports

In a foreword to a brochure which is being published by the Institute of Export, Mr. Harcourt Johnstone, Secretary of the Department of Overseas Trade, commends the service which the Institute performs in setting itself the task of providing education, in the widest sense of that word, for exporters. The Institute, he says, is attempting to build a national organisation to cope with national problems of the first magnitude. He emphasises the important part which exports will play in the country's reconstruction, and asserts that in international affairs the Government will spare no effort to create both the physical and psychological conditions necessary to avert a return to the jungle of restrictive measures which hampered trade before the war.

The aims and objects of the Institute, which was incorporated in 1935, are concisely set out in the booklet, together with membership conditions and educational programme. The Institute is described as an entirely professional body, non-sectarian and non-political. Its address is Royal Empire Society Building, Northumberland Avenue, London, W.C.2.

Export Trade Journal

There is general agreement that after the war export trade will be of greater importance to this country than ever before. Consequently any means of stimulating that trade is to be welcomed. Among the plans to this end is the metamorphosis of the *British Engineers' Export Journal* as soon as circumstances permit. The title of this monthly is to be altered to the *British Engineering Exporter*

and from a "dummy" copy which we have seen it promises to be a worthy ambassador of British trade overseas. It measures 11 $\frac{1}{8}$ in. by 8 $\frac{1}{2}$ in. (type area 10 in. by 7 in.) and has an attractive three-colour cover. Colour is effectively used in both editorial and advertisement pages; the paper and typography are of excellent quality.

The articles will be of the highest technical standard and it is proposed to introduce at least one foreign-language supplement into each issue. The journal will have at its disposal all the resources of the Associated Iliffe Press, the largest organisation of its kind in the world. Engineers and their publicity advisers can examine a copy of the "dummy" upon application to Mr. W. H. Bowers, Dorset House, Stamford Street, London, S.E.1.

The Letchworth Supply

Mr. C. Gould, chief engineer of the Letchworth electricity undertaking, points out that the figure of 15 million kWh mentioned in the note on the Letchworth exhibition in our



The Letchworth model kitchen

April 21st issue, relates to the electricity sold in the Letchworth area only. A further 8 million kWh was sold in the company's outside areas. These figures, of course, have materially increased since the beginning of the war.

Since the publication of the notes on the exhibition, we have received photographs of the model kitchen which we reproduce herewith.

Open-Cast Coal Dispute

Last February Mr. D. Bellamy, general manager of the Hull Electricity Department, reported to the Electricity Committee that a committee representative of power station owners in the Mid-East England Area had passed a resolution protesting strongly against the 3s. a ton increase in the price of mined coal being applied to open-cast coal

(*Electrical Review*, March 3rd). The matter has further referred to in the *Sheffield Telegraph*, particularly with respect to Sheffield and Rotherham. Mr. J. R. Struthers, general manager and engineer of the Sheffield Electricity Department, stated in an interview that as the coal was not obtained by miners but by public works contractors the increased price could not be justified. Sheffield power stations, he said, took about a fifth of their fuel in the form of outcrop coal, some of which was not screened to a size suitable for feeding to the furnaces and often contained clay and stone. The advanced price would mean a difference of from £500 to £1,000 a week to the city. He added that Yorkshire undertakings were not paying the amount of the increase but they were willing to do so if it could be shown that the advance was justified. At the moment they were awaiting a move by the Ministry of Fuel and Power.

Mr. W. H. Duffett, borough electrical engineer of Rotherham, said that his undertaking had an elaborate system for testing the value of fuels and the price fixed by the Ministry for outcrop coal was higher than its value for steam raising.

Patent Law Reform

Replying to a question in the House of Commons last week Mr. Dalton, President of the Board of Trade, said that he had appointed a Committee to report on what changes, if any, were desirable in the Patents and Designs Acts, and in the practice of the Patent Office and the Courts in relation to matters arising therefrom.

The Committee, Mr. Dalton said, would submit an interim report on the initiation, conduct and determination of legal proceedings, including the constitution of the appropriate tribunals, and the provisions of the Acts for prevention of the abuse of monopoly rights. It would suggest any amendments of the statutory provisions or of procedure thereunder which in its opinion would facilitate the expeditious settlement, and the reduction of the cost, of legal proceedings in patent cases and would encourage the use of inventions and progress of industry and trade.

Mr. Kenneth Swan, K.C., is to be chairman of the Committee, the other members of which are Mr. H. G. Gill (past president of the Chartered Institute of Patent Agents), Mr. James Mould (a member of the Patents Bar), Capt. B. H. Peter (managing director of the Westinghouse Brake & Signal Co., Ltd.), Dr. David Pye, F.R.S. (Provost of University College, London), Mrs. Joan Robinson (University lecturer in economics, Cambridge), Mr. H. L. Saunders (assistant controller in the Patent Office), and Dr. A. J. V. Underwood (consulting chemical engineer).

British Patent System

A report adopted by the Council of the Chartered Institute of Patent Agents deals with criticisms of the existing patent system and particularly with a suggestion made in some quarters that patents should be compulsorily licensed.

Some people, the report says, consider that the safeguards of the patent law against abuse of patent monopoly rights, such as blocking competitive development, pooling patents to produce a dictatorial control of a branch of

industry and to place marketing arrangements in the hands of an exclusive group, and the use of patents by foreigners to protect their importations against production here, are ineffective and that the only remedy is to abolish the monopoly right. These people say that the universal adoption of some general system of issuing licences under all patents as a right open to all persons interested in the manufacture of the patented invention would lead to a freer exchange of ideas and a wider availability of products.

In the Institute's opinion it is difficult to conceive of any abuse which is not covered by existing patent law. There is, however, one omission which, in its view, should be rectified, namely, a provision designed to ensure that monopoly rights held in Great Britain shall not be a hindrance to the full creation and satisfaction of the demand for a patented article in export markets.

The Institute is definitely of the opinion that a general system of compulsory licensing of patents is inadvisable on the ground that it would retard the progress of invention. It considers that enterprise in developing and exploiting inventions would suffer on account of uncertainty and insecurity; research by individual firms would be restricted; and the practice of secret working of inventions would develop, thus removing the incentive to scientific progress which is derived from publicity and wide circulation of information.

First North Scotland Project

Mr. Tom Johnston, Secretary for Scotland, replying to a question by Mr. MacMillan in the House of Commons last week, said he understood that the North of Scotland Hydro-Electric Board's first constructional scheme, if approved by the Electricity Commissioners, would be submitted to him for confirmation at an early date. Information would then be forthcoming as to the site of the project covered by the scheme, and the scheme itself would be available for inspection at the Board's offices and elsewhere.

Railway Electrical Workers' Wages

The National Railway Electrical Council, on which the National Union of Railwaymen, the Electrical Trades Union and the main line railway companies are represented, has agreed to wage increases of 5s. a week for men and women adult workers, 2s. 6d. for juniors aged 18 to 21, and 1s. 3d. for those up to 18. The increases take effect as from April 17th.

Replacing Dnieper Dam Equipment

The Russian Government is now negotiating in Canada for the purchase of hydro-electric equipment to replace the Dnieper installations destroyed before the German advance in 1941, states the *Toronto Globe and Mail*. The cost of the equipment that Russia's trade representatives are seeking to buy is understood to be in the neighbourhood of £5,500,000.—*Reuter*.

Excess-Lighting Summons

At Kingston-on-Thames recently Max Stone, Ltd., trading as J. & M. Stone, Upper Richmond Road, Putney, were fined £25 with £15 15s. costs for using more electricity than permitted

in their shop in Richmond Road, Kingston. For the Ministry of Fuel and Power it was stated that 840 W was used, while the permitted amount was 699 W. The manager, Mr. John Johnson, who was fined £2 for aiding and abetting, stated that the shop was used solely for lighting fittings and in order to show the colours of lampshades to customers it was necessary to have demonstration lamps. He thought that the amount of illumination was well within the regulations. Two very powerful lamps alight at the time were there for demonstration purposes only, and should have been switched off.

Breaches of Quarry Regulations

At Bolton County Police Court last week fines and costs amounting to £186 were imposed on Richard, Walter and Leonard Philipson, trading as George Philipson & Sons, Cox Green Quarries, Bromley Cross, for breaches of the quarry regulations. There were ten summonses against each relating to failure to protect electrical equipment and plant.

Two divisional inspectors of mines spoke of finding 15 live terminals exposed within 12 to 18 in. of a crane driver's body, knife blades of a starter that could be touched by anybody, and a cable that had been walked on to such an extent that it had been worn through and was "turning the rain into steam." In reply to a letter giving notice of the intention to prosecute defendants wrote stating that in late 1938 they undertook replacement and renewal of their electrical system and the work was completed in 1940 at a cost of over £600. In March last year they had the misfortune to damage one of the main cables supplying two cranes and a new cable was ordered, but delivery could not be obtained. The contracts in hand were so important that temporary cables were run to keep the work going.

The defence was that the whole case turned on the fact that they could not get the cable delivered, and when they did obtain it there were difficulties about getting it installed.

Port Kembla Extensions

The New South Wales Public Works Department has placed a contract (£66,189) with the Australian General Electric for a 7,500-kW turbo-alternator for the Port Kembla power station, extension "D".

Production Lectures

Last week we referred to the first of three conferences held in Newcastle by the Northern Regional Board of the Ministry of Production. Another of the lecturers at the first conference was Mr. F. J. Bown, M.I.E.E., of A. Reyrolle & Co., Ltd., whose subject was "Production Flow—Materials, Stores, and Progress." At the second conference Mr. F. Baker, M.I.P.E., also of A. Reyrolle & Co., Ltd., delivered a lecture on "Principles of Interchangeable Manufacture."

Payroll Methods

A booklet on payroll methods (B.S.1100: Part 4; 1944) just issued by the British Standards Institution outlines some general principles, procedure and standards concerned in payroll methods enabling those in charge of factory offices to review present practices and introduce

improvements. Copies of the booklet can be obtained from the B.S.I. Publications Department, 28, Victoria Street, Westminster, S.W.1, price 2s. post free.

Planning Centre

The Town and Country Planning Association will move to its new Headquarters at The Planning Centre, 28, King Street, Covent Garden, W.C.2, on May 8th. The new premises provide more adequate office space, a room for public meetings, space for exhibitions and film shows, and a meeting room for the Association's members and guests. The Association's library service will be greatly extended.

Life of Cutting Tools

Information on the grinding and honing of cutting tools is contained in M.T.C. Leaflet No. 10, published by the Ministry of Supply. Micrographs show the superiority of the cutting edges of precision machine ground tools over those which have been hand ground, resulting in a much longer effective life.

Change of Address

The London address of Taylor, Tunnickliff & Co., Ltd., Taylor, Tunnickliff (Refractories), Ltd., and the Electric & Ordnance Accessories Co., Ltd., is now 125, High Holborn, London, W.C.1 (telephone: Holborn 1951/2).

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month from April 26th.

ERM. No. B623,373, Class 6. Also a design. No. 623,538, Class 6. Ingots, wirebars, cakes, rods, wire (non-insulated), sheets and strip, all of zinc, copper, or aluminium, or of alloys of these metals with other non-ferrous metals.—Enfield Rolling Mills, Ltd., Millmarsh Lane, Brimmsdown, Enfield, Middlesex.

ROMAC. No. 619,489, Class 11. Electric lamps, radiator lamps, etc.—Romac Industries, Ltd., Romac Works, The Hyde, Hendon, London, N.W.9.

ALZAK. No. 627,575, Class 11. Heating and lighting appliances.—Aluminitex & Alzak, Ltd., 40, Brook Street, London, W.1.

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:—

Cord grip pushbar E.S. lamp-holders.

English agent for WAHL hair cutting machine.

Future of Generation

Arguments for the Transfer of Stations to the C.E.B.

OF the various recommendations in the recent "White" and "Brown" memoranda on reorganisation, none has received more attention or criticism than that relating to "Ownership of Generating Stations" and "National Standard Bulk Supply Tariff" put forward by the I.M.E.A. Council in its "Brown" Memorandum. Paragraph 16 submits certain specific technical arguments in favour of transferring generating stations to the Central Electricity Board. It seems unfortunate that the opponents of this proposal have not put forward an equally specific technical refutation of these arguments instead of generalisations which must fail to convince the unbiased observer who is desirous of ascertaining the true position. The following examination has been made with a view to encouraging them to state their case in detail.

Present "Ownership"

The first question would seem to be: To what extent does an authorised undertaking "own" its selected station? The manner and times at which the "owner" can use the generating plant and other associated generating assets is entirely outside his control, and all electricity generated in the station must be sold to the C.E.B. at a price which is determined by statute. The freedom to add to or part with the generating plant does not rest with the "owner." Even the absolute right to refuse to increase his financial commitments on generating plant does not belong to the "owner," nor (in wartime) does the right to specify what he shall buy with the money which he is directed statutorily to expend on generating plant.

Hence, a successful fight to retain "ownership" would be a Pyrrhic victory, except for one thing. By virtue of this nominal ownership, the selected station owner has certain protection and rights (under Section 13 and probably under Section 7 of the 1926 Act) which may result in his paying less for electricity purchased from the C.E.B. for his undertaking than the non-generating undertaking is required to pay. If we assume that claims under Section 7 (4) (a) of the 1926 Act are denied to the selected station owner, he is left with the right to pay for electricity purchased from the C.E.B. not more than he would have paid as the owner (in the absolute sense) of a hypothetical station if the C.E.B. had not been created.

Examination of the reasons which have been given by the "Manchester Committee" for objection to transfer are based upon three main suppositions, viz.:—(1) Equation of

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Norwich)



charges, whereby the selected station owners would subsidise the non-selected station owners; (2) Loss of bargaining rights under Section 13, which at present maintain "the incentive to individual generating station efficiency" and prevent the C.E.B. becoming "an intolerably bureaucratic institution, more and more removed from reality"; (3) Introduction of the "thin end of nationalisation."

With regard to the first supposition, there would seem to have been much confused thinking. It is even possible that some selected station owners envisage that the proposal would involve paying on the present grid tariff, which, on an averaged basis, would involve a 10 to 20 per cent. increase on their present charges under Sections 7 and 13. The real position is that the non-generating owners (chiefly) purchase about one-fifth of the C.E.B. supply at grid tariff. The balance is purchased by selected station owners, chiefly, at a price averaging about one-sixth below grid tariff.

Possible Price Increase

Thus, if the price to the non-generating owners were reduced to the averaged price of the selected station owners and the latter had to bear the cost of such a reduction, they would have to pay one-fifth of one-sixth or one thirtieth more than they are paying now. So far as an opinion may be hazarded, this "subsidy" would represent an amount equal to an increase in coal prices of about 1s. 6d. per ton. To keep some sense of proportion it must be realised that electricity charges to selected station owners have increased from 30 to 60 per cent. during the last four years, which gives a better perspective to the proposed 3 or 4 per cent. increase. But, in any case, paragraph 14 of the Brown Memorandum recommends that transfer of ownership shall be "subject to suitable protection" to selected station owners.

In connection with the second supposition, it would be difficult to substantiate the value of Section 13 as an efficient bargaining pawn. The statutory definition of its basis has

already lost most of its validity. The originally somewhat hypothetical basis becomes more hypothetical with the passage of time and it is surely the claims under Section 13 and not the C.E.B. which are "becoming more and more removed from reality." In this connection there is a question which no one seems yet to have asked. For how long can selected station owners claim to retain the protection and benefits which they receive by virtue of Sections 13 and/or 7 of the 1926 Act? Can they claim them morally, or even legally, in perpetuity? If not, what is the term to be? The draft 1926 Bill provided that the benefits of Sections 13 and 7 should be limited to a period of seven years.

Finally, the value of Section 13 in maintaining the incentive to individual generating station efficiency is not so great as might be suggested. This would be fairly true of Section 7, but it would be interesting to know how many owners are permitted to obtain the benefits of Section 7—or even whether engineers are stimulated to efficiency only by incentive and reward. Its value in this respect is limited seriously by the inability of the owner to control the times of operation and the loading of his selected station.

As an engineer, I do not consider it wise or possible to examine the third feature, nationalisation. I think, however, that I am competent to suggest that the issue is primarily a technical rather than a political one and that the advantages which transfer of stations to the C.E.B. might give to the community should receive careful attention, completely free from motives of emotion or self-interest. Some of these alleged advantages are now described briefly.

Co-ordinated Coal Buying

Advantages Accruing from the more Favourable Purchase and Use of Coal.—The 1930 Coal Mines Act placed the coal owners in a favourable position to increase the price of coal supplied to electricity undertakings by providing powers for the setting up of district selling organisations and, in 1936, the Board of Trade issued Orders under the Act for each of the district marketing schemes. The effect of these schemes was to bring about an increase in the delivered price of fuel to electricity supply undertakings, from an average of approximately 13s. 7d. per ton in 1935 to 18s. 10½d. per ton in 1938, an increase of 39 per cent. No other commodity showed any such increase during this period and it is obvious that there is discrimination in respect of the price of electricity fuel.

For a total annual purchase by electricity undertakings of 20 million tons, this increase represents an increased burden of over £5,000,000 per annum to the electricity supply industry, as compared with 1935.

Just as the coal owners increased their

bargaining power by eliminating individual selling, it is reasonable to suppose that the C.E.B., as a single purchaser of over 20 million tons per year, would have a considerably greater bargaining power than about a hundred separate purchasers buying coal entirely independently, as regards both quantity and quality, and would be able to achieve a considerable reduction in price. If, to this reduction in price is added the equally important reduction in cost due to the ability of the C.E.B. to make a selective use of coal at individual power stations, a very substantial reduction in the cost of generation would accrue, which is entirely outside the power of the unco-ordinated selected station owners.

The figures quoted refer only to the increases between 1935 and 1939. Very much greater increases have taken place since the outbreak of war, but, as these increases have been entirely under Government control both in respect of pithead prices and transport costs, a central authority would probably have not succeeded in restricting this rise. There is no doubt, however, that such a body could have dealt more effectively with the widespread complaints and difficulties arising from unsuitable quality and the existing wartime price structure, which appears to bear little relation to the quality of the fuels supplied.

Relief for Managers

Advantage Accruing from Specialisation of Functions.—The functions of the person acting as the manager and engineer of an undertaking which owns a single selected power station are limited chiefly to those of an administrative nature so far as the station is concerned. When new generating plant is needed, there is some small exercise by the manager-engineer of the function of basic and selectional design, although the main function of design is carried out by the manufacturer of the plant. But the return on specialised skill devoted to improving power station efficiency is very small in these days when we have approached so quickly and closely towards the theoretical limit of the thermal efficiency of the steam cycle.

An equal amount of skill devoted by a manager to improving commercial sales and the efficiency of distribution will, on the other hand, provide much greater returns. The conclusion to be drawn is that there is an advantage which should result in lowering the cost of distribution, if the manager-engineer devotes his whole time and skill to the administrative, engineering and commercial functions connected with the distribution of electricity and permits the equally highly specialised function of generation to be left to specialists of the C.E.B. In these times the manager of an undertaking is, or should be, primarily an administrator.

Advantages Claimed in Paragraph 16 (a to g) of the I.M.E.A. Memorandum.—It is particularly unfortunate that these suggested advantages have not been examined critically and refuted publicly by the opponents to transfer. It does not appear that there is any question that the exercise by the C.E.B. of the powers resulting from the facilities enumerated in Paragraph 16 (a to g) would be of advantage to the industry and therefore to the consumer.

The argument put forward appears to be that the C.E.B. already possesses these powers and is operating them. If this were true, then the addition of these powers to the extensive powers of control and of limited ownership conferred on the C.E.B. by the 1926 Act would appear to constitute the possession by the C.E.B. of almost everything except the legal title to the generating station. In fact, one must ask why there should be such an immense potter about the selected generating station owners retaining something which would appear to have very little substance.

The reason seems to be that the proposals are not being considered disinterestedly, nor from the view point of the possible ultimate gain to electricity supply undertakings as a whole. We are really facing the question of equating the national burden, not of rating or national education cost or even of rural electrification, but of the cost of bulk electricity. Against this, it is claimed that an individual or a community has a right to enjoy special local benefits exclusively and without reference to less favoured communities. The local benefits may have ensued from good fortune or special skill or enterprise; ought they to be shared in the same manner

as medical discoveries by those who have not earned them?

These questions are political or ethical in their nature; but if we rule out, as invalid, personal objections such as pride in retaining ownership, etc., there does appear to be a real fear in the minds of some of the opponents that the C.E.B., with full ownership, will not only equate charges but will not be competent to reduce the overall cost of generation below the present figure. If the transfer is decided upon by Parliament (as it may be quite independently of the I.M.E.A. recommendations) only the C.E.B. and the efflux of time can answer these fears.

It would, however, be contrary to the twentieth century tendency of business organisation and integration to suggest that generating stations can remain indefinitely under their present multiple and individualised ownership. Even Parliament demands some measure of progress in its statutes. We have before us the success achieved by the West Midlands Joint Electricity Authority, the London Power Co., Edmundsons, and the North-Eastern Supply Co. as generating authorities which have merged individually-owned generating stations into a group of stations with a centralised and co-ordinated policy.

The problem as to the maximum size of the integrated unit which can achieve greatest efficiency has to be solved at some time or other. In my view the known facts are so much more definite than the unknown facts and fears, that we can adopt safely the proposed transfer of generating stations to the C.E.B. with reasonable assurance that it will result in ultimate gain to all undertakings and to the community.

Domestic Electrical Appliances

The Post-War Prospect

SINCE the beginning of the war, manufacturers of domestic electrical appliances have been engaged almost entirely in producing equipment needed for the prosecution of the war, and therefore during the past four and a half years they have had little time or labour which could be used for the production or development of those standard products for which there was a growing demand when these activities were curtailed.

The industry has, in fact, found it extremely difficult, and in some cases impossible, even to fulfil demands for repair and replacement parts for pre-war apparatus already in service, though it has done, and will continue to do, everything possible to maintain existing equipment to the maximum extent that circumstances allow. The diversion of material, labour and productive effort must, as in other industries, seriously delay the preparation of new designs and prototypes for post-war models, as well as the manufacture of the new tools necessary before full scale production of new types can commence.

The unprecedented demand for electrical appliances of all kinds that will undoubtedly arise immediately after the war, not only for replacement of apparatus that is wearing out or has been destroyed by enemy action, but also for the hundreds of thousands of new houses, will call for the maximum efforts on the part of all concerned, to produce quickly what the public require, at prices which are economically sound and within the reach of the average consumer.

The electrical manufacturing industry is fully aware of the seriousness of this problem, but in the meantime through the British Electrical and Allied Manufacturers' Association it emphasises that while it is hoped when peace returns to produce within a reasonable time adequate supplies of apparatus of the 1939 designs for immediate needs, there must be, for the reasons stated, an unavoidable delay before it will be possible to produce new designs which will incorporate all the latest available scientific electrical developments.

ELECTRICITY SUPPLY

Longer Loan Periods? Oldham Cooker Question.

Carlisle.—**BAN ON WASH BOILERS.**—The *Yorkshire Post* reports that the wives of agricultural workers moving into new houses erected in Cumberland by the Border Rural Council will not be able to wash their clothes in boilers, though priority certificates and machinery licences were obtained. The Electricity Department of Carlisle Corporation, which was to have fitted electric boilers in the houses, now otherwise complete, has them in stock, but the Board of Trade has refused permission for them to be fixed. The Board states that an alternative means of heating water in bulk is provided by the ordinary hot water system from the fire. An appeal by the Ministry of Health to the Board of Trade has had no effect, and the Border Council has decided to ask its M.P. to raise the question in the House of Commons.

Gateshead.—**LIGHTING OF MAIN ROADS.**—The Corporation is calling a conference of neighbouring local authorities to discuss the question of uniformity of lighting of main roads.

Hythe (Kent).—**STREET LIGHTING.**—In its estimates the Council has made provision for street lighting next winter.

London.—**LOAN PERIODS.**—To encourage post-war development it will be necessary to keep electricity charges as low as possible. The Electricity Committee of Poplar is therefore asking the Commissioners to consider the question of extending loan periods as follows: cooking and heating 20 years; wiring installations 20 years; change-over 15 years and AC meters 20 years.

Middlesex.—**SUPPLY TO INSTITUTION.**—As the generating plant at the Woodlands Park Institution is out of date and of insufficient capacity the County Health Committee is arranging for a mains supply. It will also be necessary to modify the wiring installation.

Morecambe.—**TARIFF FOR WELDING.**—Having received an application for an electricity supply for welding purposes, the Electricity Committee has decided that such supplies shall be granted on the ordinary power rate plus a demand charge of 10s. per kVA of load, the determination of this to be at the Corporation's discretion.

Oldham.—**PURCHASE OF ELECTRICAL APPLIANCES.**—Mentioning that a number of people would like to use electrical appliances, Alderman H. Shepherd asked at a meeting of the Electricity Committee whether it was still impossible to obtain electric cookers. Mr. E. Binns, joint chief engineer and manager, replied that his colleague (Mr. R. G. Whitehead) hoped to make a report on electrical appliances at the next meeting. The Department would have to pay an increased price for them and the Committee would have an opportunity of expressing its views.

The chairman (Councillor F. Kenyon) said he understood that they could not take on new customers except in cases of hardship.

Alderman Shepherd remarked that he had heard of a town where a cooker was supplied on hire-purchase and he thought that if one town could do it Oldham could. Some people would be willing to buy the equipment outright.

Rochdale.—**BULK SUPPLY.**—The Electricity Committee proposes to give a bulk supply to Whitworth U.D.C.

LOAN.—Sanction is being sought to borrow £2,000 for mains and services.

SUPPLY TO WORKS.—Extension of supply to the works of J. Holroyd & Co., Ltd., will cost £1,165.

Sunderland.—**COOKING AND HEATING INSTALLATIONS.**—Following representations from the Electricity Committee, the Town Council has agreed that when it is proposed to install cooking or heating appliances in premises owned by the Corporation, the electricity undertaking shall be invited to submit proposals in connection with the matter.

York.—**ELECTRIC COOKING.**—The Health Committee has asked the electrical engineer to make arrangements for power cable and electric cooking appliances for the new wards at the isolation hospital.

TRANSPORT

Glasgow.—**RAILWAY ELECTRIFICATION.**—A network of electric railways serving Glasgow and the surrounding areas was suggested by Coun. H. T. MacCalman, chairman of the Clyde Valley Regional Planning Advisory Committee and the convener of the Glasgow Corporation Highways and Planning Committee, in an address to the Town and Country Planning Association. Mr. MacCalman said that before the war it was estimated that to extend the underground railway would cost a million pounds a mile. Given a single million and the co-operation of the railway companies to form a traffic board, he said, the railways which had fallen into disuse round Glasgow could be electrified to serve most of the city without much structural alteration. Instances were the railway running from the city to Kelvinbridge, Botanic Gardens, Anniesland, etc., and the line alongside the Clyde. The perfect example for electrification was the Cathcart Circular Railway.

Liverpool.—**EXPRESS TRAM SERVICES.**—Mr. W. G. Marks, manager of the Corporation Transport Department, says that the future of the tramways is closely linked with the ambitious new road prospects for the city. The aim is to get express services to the suburbs. With new roads it would be a comparatively easy matter to put on special express services. Traffic plans for Liverpool, he states, are only yet in the embryo stage and are largely dependent upon issues beyond the scope of the Tramways Department. The introduction of a new bogey system for trams would help to produce quieter, faster and more comfortable vehicles.

Spain.—**NEW ELECTRIC RAILWAY OPENED.**—General Franco last week inaugurated the newly electrified railway line between Madrid and the Escorial, the famous palace and monastery 26 miles north-west of the capital. The journey will now take 40 minutes. A branch line has been electrified as far as Cercedilla, at the foot of the Guadarrama range.—*Reuter.*

Mobile Rectifier Substations

Various Forms for Temporary Supply

THE mobile rectifier substations manufactured by the General Electric Co., Ltd., have been produced for DC outputs up to 4,000 A and for any commercial voltages. Both single and double truck designs are available for road transport, as well as alternative designs for rail transport. Their main purposes are to provide DC during construction works, an emergency supply where a substation has been put out of action, a temporary traction supply, or a shore supply for ships unloading or undergoing repairs.

The vehicles are weatherproof and can travel quickly, so that one substation may act as a standby for a number of others. Available ratings range from the 1,000-kW plant mounted in double wagons for road transport to 25-kW 110-V single-truck equipment for dock and harbour use. In a large dock or shipyard it is considerably more economical to distribute AC to a number of mobile substations, which can be

Mobile rectifier substation for railway workshop supply (1,000 kW, 500 V)



put into operation when and where required, than to take DC from a fixed converting substation.

The total cost of traction installations can be considerably reduced by having available a number of mobile substations capable of being shunted into sidings for quickly replacing fixed plant which may be under repair or for assisting certain lines that are, on occasion, liable to be heavily loaded by extra trains. Other temporary uses include the supply of power for fair grounds and exhibitions.

A mobile substation comprises switchgear for the incoming AC, main transformer, the rectifier cylinder, or cylinders, six or twelve phase of the air cooled, steelclad pumpless type, together with ignition equipment, surge absorbers, cooling fans, etc., rotary balancer (if required for 3-wire DC), DC switchgear, earthing spikes, cables, tools, etc. The output panel is usually fitted with a line contact circuit-breaker or a quick-break double-pole knife switch and an ammeter and voltmeter. At the bottom of the panel are terminals to which outgoing trailing cables can be connected.

The transformer may be of either the indoor type or of outdoor weatherproof construction. The primary windings are usually delta connected, and the secondary windings six or twelve phase star-connected with interphase transformers situated in the same tubular tank. The main transformer also has a tertiary winding for energising the rectifier fan and auxiliaries. Dual voltage equipment has a changeover switch for the selection of operating voltage.

For low voltage inputs the AC connections terminate in a special earthed and shielded three-pin fitting with a robust case provided with hand grips. A length of 4-core cable is supplied, with one of these special watertight plugs connected to each end. During transport, these plugs are carried on the special seatings at the front end of the truck, and the cable between them is coiled on to the brackets on the end wall above. In the case of high-voltage inputs trifurcating sealing boxes are employed.

The length of road trailers is less than 20 ft., or the equipment may be divided and housed in two vehicles; there are various standard covered railway goods wagons with four, and occasionally six, wheels and distributed loadings

between 10 and 15 tons; also very much larger special wagons with double bogies and loadings up to 60 or 80 tons.

One example is a 920-kW double-wagon equipment for road transport, converting from 11 kV, or 6 kV, 3 phase to 230 V DC with full load of 4,000 A. The equipment is housed in two fabricated, steel trucks with boiler plate sides and roof and stout oak floors, spring mounted and, where necessary, on double wheels, the front pair swivelling with the drawbar. All the wheels have solid rubber tyres and cast steel hubs and are free to rotate on the fixed stub axles. Internal expanding brakes can be operated either by hand or automatically from the towing vehicle.

At the other end of the scale are 100-kW sets for conversion from 415 V 3-phase to 220 or 110 V DC mounted on one truck.

One of a number built to the order of a British railway is illustrated. It consists of a 1,000-kW, 500-V 3-wire DC substation mounted on a standard two-axled well wagon with a transformer of the outdoor type while the switchgear and 1,000-A rectifier cylinders are all housed inside a welded boiler plate kiosk. The operators can perform all switching, control the rotary balancer and take the necessary readings under cover. An external emergency trip is provided for shutting down.

I.E.E. Benevolent Fund

Building Homes for Beneficiaries

THE report of the Committee of Management of the Benevolent Fund of the Institution of Electrical Engineers shows that at the end of 1943 the capital account amounted to nearly £34,000, which is invested. The income for the year increased by £2,072 to £8,077, representing an average contribution of 4s. 5d. per member. The fund benefited during the year by four legacies, totalling £1,525, while grants made amounted to £4,773, which is £5 more than during the previous year. Applications for assistance were made on behalf of 80 persons; in assisting them the fund also provided for the necessities of 61 dependants. There has been a gratifying increase in the number of contributors (now 717) who subscribe under the deed of covenant arrangement whereby the fund is able to recover more than £750 income tax.

The Committee has given considerable thought to the acquisition of a site for the purpose of building homes for beneficiaries. It is estimated that about five acres and the erection of houses and flats would cost, after the war, approximately £40,000. The Council of the I.E.E. has approved of the proposal and will shortly issue an appeal to members.

The capital of the Wilde Fund amounts to £3,050, which is invested, bringing in an annual income of about £105. Grants of £80 were made during 1943 from this fund, from which only full members and their dependants can benefit.

Estate duty has reduced the £20,000 capital of the Lord Hirst fund to £11,543, which produces an annual income of £346. One grant of £78 was made from this fund in 1943.

E.A.W. Annual Report

Educational Activities

MAJOR GWILYM LLOYD GEORGE, Minister of Fuel & Power, will address the Electrical Association for Women at its annual conference which is to be held on May 18th at the Institution of Electrical Engineers, London. The address will be at 3.30 p.m. following the annual general meeting at 2 p.m.

The annual report says that the result of some two years' study on reconstruction matters throughout E.A.W. branches was an interim report which has been received with great interest, not only in this country but abroad as well.

A new branch was formed at Southampton during the year and plans are in hand for a new branch in South-west Essex. In connection with the passing of the Scottish Hydro-Electric Bill, the E.A.W. formed a Scottish Council and an inquiry was made to ascertain the extent of electrical education in Scottish schools. Good work has been done in youth education, largely by means of homeworkers' courses which have been used in schools and in Girls' Training Corps, Women's Junior Air Corps, etc. In all, 227 certificates were awarded, 89 with credits and four with distinction, bringing the total to 832. In addition, many groups took shorter courses of training. Thirty-one electrical house-craft certificates (four with distinction) were

awarded to demonstrators and 77 (four with distinction) to teachers, bringing the respective totals to 888 and 904. There are 83 teachers and 357 demonstrators now holding the diploma.

A new chart, "The Electric Suction Cleaner," has been issued in the "How it Works" series and plans are in hand for a chart of the domestic refrigerator. Nearly 500 sets of the small desk charts in the "Electricity Made Easy" series were purchased by the Electrical Development Association for free distribution to schools. Every opportunity has been taken to co-operate with Government Departments and in several districts members have trained to become leaders and demonstrators in such matters as food and health, house repairs, house furnishing, rationing and zoning. Photographic exhibitions have been designed for the A.T.S., W.R.N.S. and W.A.A.F. depicting the main activities of electricity, and lectures have been given to members of the services.

Electricity in Hospitals

Heating Methods Compared

IN a paper presented to the Institution of Civil Engineers in Ireland on April 23rd Mr. M. JORDAN, B.E., B.Sc., dealt with the mechanical, electrical and electro-medical equipment of hospitals, including systems of space heating. He contended that for the successful construction of even the simplest hospital a preliminary sketch-planning stage was needed during which there must be careful consideration and consultation by representatives of varying and sometimes conflicting interests. The practice of deferring such consultation on the engineering and other features until the completion of structural plans was to be deprecated. The engineering viewpoint on the capital and maintenance cost of the mechanical and electrical equipment should be ascertained and considered at the earliest opportunity.

The growth of medical and surgical science had resulted in the increased use of mechanical electrical and electro-medical equipment in hospital treatment. These features merited careful and special consideration to such an extent that a new branch of engineering was gradually developing to cater for them. The initial cost of equipment of this kind varied from about 10 to 20 per cent. of the total capital cost of the hospital.

With regard to space heating, he considered that direct heating by electricity or gas in buildings that were continuously occupied was not financially competitive and was seldom used on that account. Because of their greater economy in fuel and labour and their greater cleanliness, the methods of space heating from a central source were now generally adopted in hospitals in preference to open fires.

I.E.E. Report and Accounts

COPIES of the annual report of the Council of the Institution of Electrical Engineers for session 1943-44 and of the accounts for the year ended December 31st, 1943, to be presented at the annual general meeting on Thursday, May 11th, at 5.30 p.m., can now be obtained by members of the Institution on application to the secretary.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Oriental Telephone & Electric Co., Ltd., states that no profit could be brought into the 1943 accounts from the Hongkong, Rangoon and Singapore undertakings. The net revenue fell from £34,941 to £19,431. Government securities have been reduced from £1,797,536 to £1,122,479 and cash from £108,018 to £50,580 as the result of the repayment of the preference capital and a bonus of £1 per share paid to ordinary shareholders. There is no charge for preference dividend; the ordinary dividend is maintained at 4 per cent.; £81,050 (against £84,427) is carried forward.

The chairman's statement issued with the report says that during the year the company's holding of debenture stock of the Bombay Telephone Co. was redeemed. Sir Henry McMahon expresses the hope that the Japanese will be ejected before long from the countries in which the company is interested. Problems which will then arise are being discussed with the Governments of Great Britain and Burma. The company has heard that all its European staff in Singapore have survived the hostilities there and have been interned by the Japanese.

Johnson & Phillips, Ltd., report a gross profit of £510,223 for 1943 (against £507,797) after meeting maintenance charges. The net profit is £139,873 (against £111,454). Taxation at £280,000 was £30,000 lower. The ordinary dividend is maintained at 15 per cent. by a final payment of 7½ per cent., research and development account receives £15,000 (against £5,000) and special contingency reserve £30,000 (same). The balance carried forward is £116,242, subject to staff bonus.

Lacrinoid Products, Ltd.—Speaking at the annual general meeting last week, Mr. P. L. Horabin, M.P. (chairman) said that output had been increased substantially although the labour situation had become increasingly stringent during the year. The company's laboratories had been used to carry out research on new lines.

Davis & Timmins, Ltd., report a gross profit for 1943 amounting to £72,167, as against £114,135 in the previous year. The net profit was £50,733 (£50,540) and £51,940 (£48,207) is carried forward.

Allen West & Co., Ltd., are to maintain their dividend at 7½ per cent. The net profit for the year ended January 31st last, after providing for taxation, was £49,873, as compared with £50,829 for the previous year.

The Ever Ready Co. (Great Britain), Ltd., announces a net profit of £621,813 for 1943-44 (against £584,887). The final ordinary dividend is 25 per cent., again making 40 per cent. for the year.

The Philco Radio & Television Corporation of Great Britain, Ltd., is to pay the dividend on its 6 per cent. redeemable preference shares for the half-year to March 31st last.

St. Austell & District Electric Lighting & Power Co., Ltd., is to pay a final dividend of 6 per cent., making 10 per cent. (same).

The West Devon Electric Supply Co., Ltd., is again paying a dividend of 5 per cent. for the past year.

General Refractories, Ltd.—Owing largely to the incidence of E.P.T. the net profit for the past year was £10,323 lower at £49,271. The dividend is maintained at 7½ per cent.

Broom & Wade, Ltd., are to pay an interim dividend of 7½ per cent., as last year.

The Associated Equipment Co., Ltd., is paying an interim dividend of 6d. per £1 unit of stock, tax free.

Glensfield & Kennedy, Ltd., are paying a final dividend of 5 per cent. and a bonus of 10 per cent. on the ordinary shares, again making 20 per cent. for the year. The profit was £60,871, against £63,149.

New Companies

Little Gearies Electricals Ltd.—Private company. Registered April 24th. Capital, £500. Objects: To carry on the business of electrical and wireless engineers, etc. Directors: L. E. H. Carpenter, 112, Clayhall Avenue, Ilford and C. E. Chinery, 12, Hamilton Gardens, Barking-side, Essex, radio and electrical engineer. Registered office: 12, Hamilton Gardens, Cranbrook Road, Barking-side.

C. H. S. Components, Ltd.—Private company. Registered April 20th. Capital, £1,000. Objects: To carry on the business of mechanical and electrical engineers, manufacturers of, and dealers in, wireless parts, plastics, engineering equipment, etc. Directors: G. Charlton, 8, Pasture Close, D. F. Searle, 12, Stappenhall Road, and E. Harrison, 53, Oldborough Road, all of Wembley. Registered office: 126, Wembley Park Drive, Wembley, Middlesex.

Sight and Sound Radio Corporation, Ltd.—Private company. Registered April 14th. Capital, £100. Objects: To carry on the business of managers, promoters and producers of, and agents for, television and radio programmes (commercial and otherwise), etc. Directors: D. M. Levy, 131, Clarence Gate Gardens, N.W.; and three others. Registered office: 9, Idol Lane, E.C.3.

Ipac, Ltd.—Private company. Registered in Dublin, April 20th. Capital, £2,000. Objects: To carry on the business of salesmen and vendors of, agents for and dealers, in Eire and elsewhere, in electrical and engineering equipment, vehicles, instruments, etc. Directors: F. R. L. Barrett, Willow Park, Dundrum, Co. Dublin, and C. R. L. Barrett, 21, Wasdale Park, Terenure, Dublin. Secretary: E. L. Barrett.

Process Plants, Ltd.—Private company. Registered April 21st. Capital, £1,000. Objects: To carry on the business of electrical, radio and general engineers, etc. Directors: L. J. Ive, 15, Albert Road, Watford (director of L. J. Ive, Ltd.), O. Margetson, White Cottage, Cherry Tree Lane, Farnham Royal, Bucks (director of Buell Combustion Co., Ltd.), and M. G. Hill, 10, Portrush Road, Port Stewart, Co. Derry (manager of same company). Registered office: 131, Victoria Street, S.W.1.

White Bros. & Lamden, Ltd.—Private company. Registered April 22nd. Capital, £1,000. Objects: To carry on the business of ventilating, heating, meter, electrical, wireless and general engineers, etc. Directors: E. S. White, 21, Highfield Road, W. C. White, 73, Grove Road, and C. S. Lamden, 116, Eastworth Road, all of Chertsey, Surrey. Registered office: 41, London Street, Chertsey.

James Coomber (Rubber & Plastics), Ltd.—Private company. Registered April 24th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and wholesale and retail dealers and workers in, rubber, rubber substitutes, plastics, ebonite, vulcanite, bakelite, and other materials, etc. Subscribers: G. M. Lancum, 15, Oak Avenue, Ickenham, Middlesex and Edna Self, 192, Longlands Road, Sidcup, Kent. C. E. R. Coomber is the first director. Solicitor: L. A. Hart, 44, Brook Street, W.1.

Frig Spares, Ltd.—Private company. Registered April 20th. Capital, £2,000. Objects: To acquire the business of a dealer in refrigeration supplies carried on by N. K. Sanders at 2, Dyer's Buildings, Holborn, E.C.1, and at Ferring-on-Sea, as King's Refrigeration Supplies Co. Directors: N. K. Sanders and Muriel Sanders, both of Gaywood, Yew Tree Road, Epsom, and Olive L. Harrison, 55, Southbrook Road, Lee, S.E.12. Registered office: 2, Dyer's Buildings, Holborn, E.C.1.

Lodge Radiovision, Ltd.—Private company. Registered April 11th. Capital, £3,000. Objects: To acquire the business of a radio engineer carried on by W. Lodge at Kirkgate, Wakefield, etc. Directors: W. Lodge and Mabeth M. M. Lodge, both of 9, Kirkgate, Wakefield. Registered office: 9, Kirkgate, Wakefield.

Franbrec, Ltd.—Private company. Registered April 18th. Capital, £500. Objects: To carry on the business of electrical contractors and engineers, manufacturers of, and dealers in, automobile, portable, and other lamps and wireless goods, etc. Directors: L. C. Plummer (permanent managing director), and Mrs. M. A. G. Plummer, both of 152, Cherrywood Lane, Morden, Surrey.

Companies' Returns Statements of Capital

Insulators, Ltd.—Capital, £25,000 in £1 shares. Return dated December 3rd, 1942 (filed March 3rd, 1943). 19,000 shares taken up. £19,000 paid. Mortgages and charges: £10,000. A further 6,000 shares were allotted for cash and fully called up between March 7th and March 10th, 1944.

Nalder Bros. & Thompson, Ltd.—Capital, £40,000 in £1 shares (15,000 preference and 25,000 ordinary). Return dated December 29th (filed January 4th). 15,000 preference and 24,500 ordinary shares taken up. £14,064 paid. £25,436 considered as paid. Mortgages and charges: Nil.

Flexible Lamps, Ltd.—Capital, £5,000 in £1 shares. Return dated May 21st (filed January 15th). All shares taken up. £2,300 paid. £2,700 considered as paid. Mortgages and charges: Nil.

Delagoa Bay Development Corporation, Ltd.—Capital, £166,300 in 267,400 ordinary shares of

10s. each and 130,400 preference shares of 5s. each. Return dated January 4th. 267,400 ordinary and 68,400 preference shares taken up. £105,840 paid, including £40 paid on 100 shares forfeited. £45,000 considered as paid. Mortgages and charges: Nil.

Barker's Electric Service, Ltd.—Capital, £1,000 in £1 shares (all ordinary). Return dated December 15th. All shares taken up. £500 paid, £500 considered as paid. Mortgages and charges: Nil.

Mullard Wireless Service Co., Ltd.—Capital, £50,100 in £1 shares (50,000 "A" and 100 "B"). Return dated January 13th. All shares taken up. £49,300 paid, £800 considered as paid. Mortgages and charges: Nil.

John Spencer, Ltd.—Capital, £75,000 in £5 shares (10,000 preference and 5,000 ordinary). Return dated December 28th (filed January 6th). 10,000 preference and 1,027 ordinary shares taken up. £55,135 considered as paid. Mortgages and charges: Nil.

Kartret Switchgear, Ltd.—Capital, £2,500 in £1 shares. Return dated January 3rd. All shares taken up. £2,500 considered as paid. Mortgages and charges: Nil.

East Indian Tramways Co., Ltd.—Capital, £135,000 in £1 shares. Return dated January 13th. 133,334 ordinary shares taken up. £133,334 considered as paid. Mortgages and charges: Nil.

Increases of Capital

Kenneth E. Beswick, Ltd.—The nominal capital has been increased by the addition of £5,000 beyond the registered capital of £2,000. The additional capital is divided into 1,000 ordinary and 4,000 7½ per cent. non-cumulative redeemable preference shares of £1 each.

Radelec, Ltd.—The nominal capital has been increased by the addition of £900, in £1 ordinary shares, beyond the registered capital of £100.

Mortgages and Charges

Correx Communications Equipment, Ltd.—Assignment on March 29th of proceeds of contract, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Sterling Distributors, Ltd.—Satisfaction to the extent of £1,850 on March 24th of charge dated May 25th, 1934, and registered June 2nd, 1934.

Winding-up Order

In the Companies' Court last week Mr. Justice Uthwatt made an order for the compulsory winding up of the Princely Battery Co., Ltd. The company did not appear. Counsel stated that the petition was by a judgment creditor for £147.

Bankruptcies

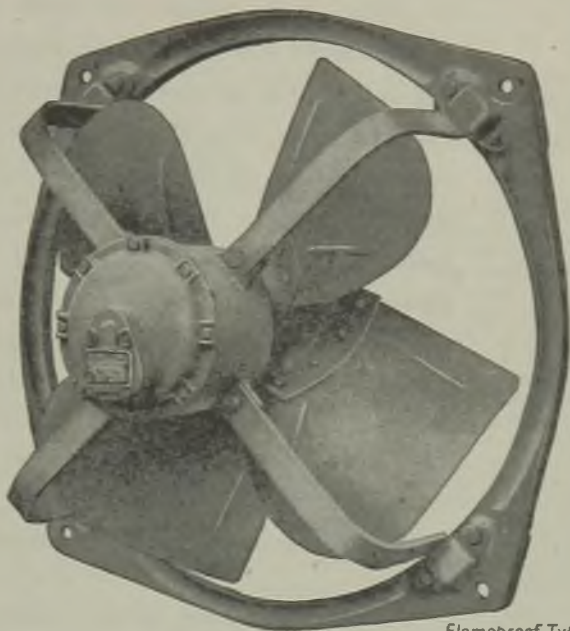
H. Lee and A. W. Verity, electrical contractors, lately carrying on business at 143A, Leeds Road, Bradford.—Proofs for dividend by May 10th to the trustee, Mr. E. T. Sanders, Halffield Chambers, 71, Manningham Lane, Bradford.

A. A. Glossop, radio service engineer and radio dealer, lately carrying on business at 7 and 12, Norfolk Market Hall, Sheffield.—Proofs for dividend by May 10th to the trustee, Mr. A. H. Ward, 55, Queen Street, Sheffield.

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LONDON AND BRANCHES

STOCKS AND SHARES

TUESDAY EVENING.

THE Budget is out of the way, but it has introduced a fair number of favourable features which are reflected in Stock Exchange prices. The income tax allowance in respect of wear and tear, and of actual expenditure upon plant and machinery in any year, is held to be a bull point for the Home Railways and for companies engaged more particularly in the heavy industries. These include the manufacturing and equipment undertakings in the various electrical sections. Shares in the electricity supply group have scarcely moved. As the manufacturing companies' shares came into the limelight upon a comparatively modest demand, the scarcity of supply showed itself plainly. The measure of uneasiness introduced by talk of expropriation in the case of certain overseas issues has had the effect of increasing the demand for domestic securities.

Manufacturing and Equipment

Ever Ready shares no longer show a yield of more than 5 per cent. on the money. A rise of 9d. lifted the price to 40s. 6d. and on the 40 per cent. dividend now being paid, this gives a return of £4 18s. 9d. per cent. Telegraph Constructions have risen 1s. 6d. to 52s. and Ericssons to 54s. 6d. General Electrics improved to 92s. 6d., Hopkinsons to 66s. 3d. and British Vacuum Cleaners to 29s. 6d. Telephone Manufacturing 5s. shares are a few pence harder at 11s. Last week's rise of 2s. 6d. in Aron Electrics has been retained; the price is 60s. Automatic Telephones, also, held their gain of 2s. 9d., the price remaining at 64s. Newman Industries ordinary shares are better at 6s. The 20 per cent. dividend declared in March was at the same rate as that paid for each of the five preceding years. During the dark days of 1940, the price fell to the nominal value of 2s. The present quotation is the highest touched for years past.

Radio Shares Advance

The Chancellor of the Exchequer, by promising to give an E.P.T. concession to companies in respect of research work, provided a stimulus to business in the shares of the radio industry. E.M.I. shares were bought in sufficiently large numbers to force up the price to 31s. 3d., a gain of 1s. 9d. on the week. Simultaneously, A. C. Cossor shares went ahead to 25s. E. K. Cole put on 1s. to 27s. 6d., and Pye deferred 9d. to 27s. Philco shares remained at 13s.

Price Fluctuations

Three rises, of 6d. a share each, are the only price movements amongst the Home Electricity supply group. Of the overseas

issues, Victoria Falls ordinary were quoted $\frac{1}{8}$ lower at 4 $\frac{1}{2}$, awaiting settlement of the demand for higher wages by the white labour employed in the mines. Jerusalem Electric regained the 1s. lost last week and Montreal Power at 21 $\frac{1}{2}$ are $\frac{1}{2}$ better, after their previous drop of 1 $\frac{1}{2}$. Other dollar stocks show no decided tendency. Brazilian Tractions at 26 $\frac{3}{4}$ are ex the dividend, reckoned as being worth about half a point. Mexican Light & Power fives hardened to 102 $\frac{1}{2}$. Of the Indian sterling shares, Calcutta Electrics and Calcutta Trams are both 6d. down. Great Northern Telegraphs fell a point to 20 $\frac{1}{2}$ on the virtual isolating of Denmark by the Germans.

Home Railway stocks enjoyed a sudden spurt last Friday afternoon. The buying which caused it was said to be due to the promised income tax allowance to the heavy industries.

Globe Telegraph & Trust

Early in March mention was made in these columns of there being a few thousand Globe Telegraph & Trust ordinary shares on offer at 37s. or thereabouts. It was pointed out at the time that at their then price, Globe ordinary returned £2 14s. 1d. net, on the basis of the last paid dividend of 5 per cent. free of tax. The yield, equivalent to £5 8s. 2d. gross, allowing for 10s. tax, was sufficiently satisfactory to warrant notice. Investment took the hint and the shares; some 10,000 were placed, in the neighbourhood of 37s. 6d., and now there are buyers at 38s. 6d. or a shade more. The company, as is generally known, holds a substantial stake in Cable & Wireless, the ordinary stock in which, standing at 81, would give a yield of £4 18s. 9d. per cent. Therefore, some people consider, a purchase of Globes is equivalent to taking an interest in Cable & Wireless stocks. An improvement to 40s. would not be surprising in view of the demand that prevails nowadays for shares in front-rank companies.

Redeemable Preference

When investment seeks preference shares of good class in the list of electrical manufacturing and equipment companies, a difficulty is found in securing the offer of any reasonable supply. For example, there are 100 Callender's "B" preference on offer at 37s. to pay £4 1s. 1d., and with the dividend service covered 20 times over by the last earnings. Enfield Cable preference and Ferranti preference have both been on offer in a small way, but were promptly taken. United River Plate Telephone 5 $\frac{1}{2}$ per cent. preference shares, with dividends payable quarterly, can be bought at 22s. 3d.; these pay £4 19s. per cent. on the money. The shares are redeemable out of profits at 21s. by cumulative sinking fund, operating by annual drawings which began on December

(Continued on page 649)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend		Middle Price May 2	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price May 2	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	61/-		4 2 0	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	114		4 7 9
City of London ..	7	5½	27/6		4 0 0	1951-73 ..	4½	4½	107		4 4 1
Clyde Valley ..	8	8	41/6		3 17 0	1963-93 ..	3½	3½	104		3 7 4
County of London	8	8	40/-		4 0 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	121½		3 14 1
Elec. Dis. Yorkshire	9	9	45/-		4 0 0	B ..	5	5	119½		4 3 8
Elec. Fin. and Securities ..	12½	12½	55/-		4 11 0	C ..	3	3½	71		4 11 7
Elec. Supply Corporation ..	10	10	46/-		4 7 0	West Midlands J.E.A. 1948-68	5	5	108½		4 12 4
Isle of Thanet ..	Nil	Nil	18/-		—	Telegraph and Telephone					
Lancs. Light and Power ..	7½	7½	36/-		4 3 4	Anglo-Am. Tel.: Pzcl. ..	8	8	118		5 1 8
Llanely Elec. ..	6	6	26/-		4 12 4	Def. ..	1½	1½	30	+1	5 0 0
London Assoc. Electric	3	4	23/-		3 9 7	Anglo-Portuguese Cable & Wireless:	8	8	24/6		6 10 7
London Electric ..	6	6	28/-		4 5 9	5½ Pref. ..	5½	5½	118½	-½	4 17 0
London Power Red. Deb. ..	5	5	103½		4 14 7	Ord. ..	4	4	81	-½	4 18 9
Metropolitan E.S. ..	8	8	40/-		4 0 0	Canadian Marconi \$1 Nil			9/6		
Midland Counties ..	8	8	40/6		3 19 0	Globe Tel. & Tel.: Ord. ..	8½*	5*	39/-	+1/-	2 11 3
Mid. Elec. Power ..	9	9	44/6		4 0 9	Pref. ..	6	6	30/-		4 0 0
Newcastle Elec. ..	7	7	30/6		4 12 0	Great Northern Tel. (£10) ..	Nil	Nil	20½	-1	—
North Eastern Elec. Ordinary ..	7	7	33/6		4 3 7	Inter. Tel. & Tel. Nil	Nil	Nil	16		—
7% Pref. ..	7	7	35/-		4 0 0	Marconi-Marine ..	7½	7½	33/-		4 11 0
Northampton ..	10	10	48/-		4 3 4	Oriental Tel. Ord. 16	10	44/-xd	+6d.		—
Notting Hill 6% Pref. (£10) ..	6	Nil	11		—	Telephone Props. 6	Nil	17/-	+1/-		—
Northmet Power: Ordinary ..	7	7	38/6	+6d.	3 12 9	Tele. Rentals (5/-) 10	10	11/6			4 7 0
6% Pref. ..	6	6	30/6		3 18 8	Traction and Transport					
Richmond Elec. ..	6	6	25/6		4 14 1	Anglo-Arg. Trans.: First Pref. (£5) Nil	Nil	2/6			—
Scottish Power ..	8	8	40/-		4 0 0	4% Inc. ..	Nil	Nil	6	+½	—
Southern Areas ..	5	5	23/-xd	+6d.	4 7 0	Brit. Elec. Traction: Def. Ord. ..	45	45	1185		3 19 4
South London ..	7	7	27/6		5 1 10	Pref. Ord. ..	8	8	175		4 11 5
West Devon ..	5	5	24/-		4 3 4	Bristol Trams ..	10	10	55/6		3 12 2
West Glos. ..	4½	3½	24/6	+6d.	2 17 4	Brazil Traction ..	\$1	\$1½	26½xd		6 9 8
Yorkshire Elec. ..	8	8	43/-		3 14 5	Calcutta Trams. ..	5½	6½	37/6	-6d.	3 9 6
Overseas Electricity Companies						Cape Elec. Trams 5	6	26/-			4 12 4
Atlas Elec. ..	Nil	Nil	6/3		—	Lancs. Transport 10	10	45/6			4 8 0
Calcutta Elec. ..	7*	6*	37/-	-6d.	3 4 10	Mexican Light: 1st Bonds ..	5	5	102½	+1	4 17 7
Cawnpore Elec. ..	10	10	35/-		5 14 3	Rio 5% Bonds ..	5	5	105½		4 14 0
East African Power	7	7	33/-		4 4 10	Southern Rly.: 5% Prefd. ..	5	5	77½	+1	6 9 0
Jerusalem Elec. ..	7	5	28/6	+1/-	3 10 2	5% Pref. ..	5	5	117	+1	4 5 6
Kalgoorlie (10/-)	5	5	10/-		5 0 0	T. Tilling ..	10	10	59/-		3 8 0
Madras Elec. ..	4*	Nil	23/-		—	West Riding ..	10	10	44/6		4 10 0
Montreal Power. ..	1½	1½	21½	+½	6 19 6	(Continued on next page)					
Palestine Elec. "A" ..	4*	5*	41/-		2 8 9						
Perak Hydro elec. 6	7	10/-			—						
Shawinigan Power 83cts.	90cts.	15½			—						
Tokyo Elec. 6%	6	15			—						
Victoria Falls Power 15	15	4½	-½	3 12 7							
Whitehall Inv. Pref. —	6	23/6		5 2 2							

* Dividends are paid free of Income Tax.

Company	Dividend		Middle Price May 2	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price May 2	Rise or Fall	Yield p.c.
	Pre-vious	Last					Pre-vious	Last			
Equipment and Manufacturing											
Aron.Elec.Ord. . .	10	15	60/-	..	5 0 0	General Cable (5/-)	15	15	15/-	..	5 0 0
Assoc. Elec. :						Greenwood & Batley	15	15	41/3	..	7 5 9
Ord.	10	10	51/6	..	3 17 8	HallTelephone(10/-)	12½	12½	29/-	..	4 6 2
Prof.	8	8	39/6	..	4 1 0	Henley's (5/-)	20	20	26/9	..	3 14 9
Automatic Tel.&Tel.	12½	12½	64/-	..	3 18 2	4½% Prof.	4½	4½	24/-	..	3 15 0
Babcock & Wilcox	11	11	50/6	+6d.	4 7 0	Hopkinsons	15	17½	66/3	+6d.	5 6 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 4	Intl. Combustion	30	30	6½	..	4 14 0
British Thermostat						Johnson & Phillips	15	15	73/6	..	4 1 9
(5/-)	18½	18½	19/6	..	4 14 10	LancashireDynamo	22½	22½	92/-	..	4 17 10
British Vac. Cleaner						Laurence,Scott(5/-)	12½	12½	13/-	..	4 16 2
(5/-)	15	30	29/6	+1/-	5 5 1	London Elec. Wire	7½	7½	39/-	..	3 17 0
Brush Ord. (5/-)	8	9	9/3	..	4 17 3	Mather & Platt	10	10	52/6	..	3 16 2
Burco (5/-) . . .	15	17½	15/6	..	5 13 0	Metal Industries(B)	5	5	47/6	..	3 7 6
Callender's . . .	15	20	5½	..	3 17 0	Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
ChlorideElec.Storage	15	15	80/-	..	3 15 0	Murex	20	20	103/3	..	3 17 6
Cole, E. K. (5/-)	10	15	27/6	+1/-	2 14 7	Pye Deferred (5/-)	25	25	27/-	+9d.	4 12 7
ConsolidatedSignal	24	27½	6	..	4 11 6	Revo (10/-) . . .	17½	17½	42/-	..	4 3 4
Cossor, A. C. (5/-)	7½	10*	25/-	+6d.	1 0 0	Reyrolle	12½	12½	68/9	..	3 12 8
Crabtree (10/-) .	17½	17½	37/9	..	4 12 9	Siemens Ord. . . .	7½	7½	33/-	..	4 11 0
Crompton Parkinson						Strand Elec. (5/-)	7½	10	7/9	..	6 9 0
Ord. (5/-)	20	22½	29/6	+6d.	3 16 3	Switchgear & Cow-					
E.M.I. (10/-) . .	6	8	31/3	+1/9	2 11 2	ans (5/-)	20	20	18/6	..	5 3 1
Elec. Construction	10	12½	52/-	..	4 16 2	T.C.C. (10/-) . . .	5	7½	20/-	..	3 15 0
Enfield Cable Ord.	12½	12½	57/6	..	4 7 0	T.C. & M.	10	10	52/-	+1/6	3 17 0
English Electric	10	10	49/6	..	4 1 0	TelephoneMfg.(5/-)	9	9	11/-	+3d.	4 1 10
EnsignLamps (5/-)	25	15	21/3	..	3 10 8	Thorn Elec. (5/-)	20	20	23/9	..	4 4 2
Ericsson Tel. (5/-)	22*	20*	54/6	+1/-	1 16 6	Tube Investments	20	20	96/6	..	4 3 0
Ever Ready (5/-)	40	40	40/6	+9d.	4 18 9	Vertric (5/-) . . .	Nil	Nil	14/6	..	—
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.O. :						Ward & Goldstone					
Prof.	6½	6½	34/-	..	3 16 6	(5/-)	20	20	26/6	..	3 15 6
Ord.	17½	17½	92/6	+1/-	3 16 1	WestinghouseBrake	12½	14	73/-	..	3 16 9
						West, Allen (5/-)	7½	7½	7/3	..	5 3 5

* Dividends are paid free of Income Tax.

Stocks and Shares (Continued from page 647)

31st, 1940. Redemption will be completed by the end of 1968. The company has the right to give three months' notice to redeem the whole, or part, at 21s. 6d. up to December, 1948, and thereafter at a guinea. This precludes, of course, any expectation of the price getting far away from that at which the shares can be redeemed.

Cash or Caution

The Budget has served to emphasise the difficulty with which the directors of many companies are faced in regard to the question of conserving resources on the one hand, and, on the other, of paying as large a dividend as possible in view of the cost of living. At meeting after meeting, the chairman will stress the importance of his company being well supplied with cash after the war, in order that every opportunity may be grasped for undertaking the business which is practically certain to be offered. Therefore, the need for building up substantial reserves is imperative. At the same time, and in spite of the curtailment of opportunities for spending money, the need for

ready cash is to most people more or less pressing, and for this reason the shareholders ask that their dividends may be as liberal as possible. The two considerations are in conflict with each other, but conservatism insists that the only safe plan in developing post-war policy is to keep substantial sums in reserve against future possibilities.

Clarke Chapman

Clarke Chapman ordinary shares of £1 each have been a very steady market at 42s. 6d. since the declaration of the dividend last February, making 12½ per cent. for the year. The business is one of general and electrical engineers; the company has agreements with John Brown & Co., Harland & Wolff, Fairfield Shipbuilding and other shipbuilding companies. Since 1939 inclusive, the dividend has been 12½ per cent. per annum, paid out of earnings of 21 per cent. and upwards. During the slump period of 1940, the shares fell to 22s. and the current quotation is almost the highest for a decade. The balance sheet is a good one, and at the present quotation for the shares, the yield of 6 per cent. on the money is satisfactory from an investment of this type.

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.

AKT.-GES. Brown, Boveri & Cie.—“Tilting pad for thrust and journal bearings.” 3204/43. February 12th, 1942. (560588.)
 “Rotatable moving blades for turbo machines.” 3252/43. February 4th, 1942. (560590.)

Akt.-Ges. für Technische Studien.—“Method for the regulation of the output of thermal power plants and arrangement for carrying out this method.” 3324/43. February 27th, 1942. (560593.)

Automatic Telephone & Electric Co., Ltd., and T. B. D. Terroni.—“Mounting arrangements for piezo-electric crystals.” 14106. October 7th, 1942. (560644.)

T. J. Bay.—“Device for preventing corrosion and erosion in condenser tubes.” 7955/42. March 18th, 1942. (560571.)

British Thomson-Houston Co., Ltd. — “Electric-discharge devices.” 10763/42. August 1st, 1941. (560574.) “Apparatus for sealing glass envelopes.” 3466/43. March 13th, 1942. (560622.) “Starting devices for electric-discharge tubes having thermionic cathodes.” 17256/42. December 10th, 1941. (560707.)

Budd Induction Heating, Inc.—“Induction heating apparatus.” 3852/42. March 21st, 1941. (560630.)

Ferranti, Ltd., and H. Easton.—“Electrical measuring or indicating instruments.” 15117. October 28th, 1942. (560683.)

Landis & Gyr Soc. Anon.—“Automatic electric switch.” 3186/43. March 11th, 1942. Addition to 557682. (560587.)

Marconi's Wireless Telegraph Co., Ltd.—“Electric signal transmission systems.” 14281/42. October 13th, 1941. (560702.)

J. W. Miller and Goodmans Industries, Ltd.—“Chucks for electrical coil-winding machines.” 18580. December 31st, 1942. (560582.)

D. Napier & Son, Ltd., and M. E. Clarke.—“Electrical means for the detection of gas in liquids.” 14072. October 7th, 1942. (560641.)

Pye, Ltd., and W. J. M. Boyd.—“Manufacture of snap-action electric switches.” 22. January 1st, 1943. (560583.)

N. Sandor. — “Multiple contact electric selector switches.” 14032. October 6th, 1942. (560677.)

Sangamo Weston, Ltd. — “Photo-electric cells.” 3802/43. April 3rd, 1942. (560652.)

Svenska Turbinfabriks Aktiebolaget Ljungström.—“Radial-flow turbines.” 3429/43. April 18th, 1942. (560620.)

Telephone Manufacturing Co., Ltd., and D. C. Threlfall.—“Guarding or protection devices for the rotating chucks or like parts of machine tools.” 17021. November 30th, 1942. (560705.)

D. J. Tibbs.—“Electric cigarette and cigar lighters.” 3455. March 2nd, 1943. (560621.)

Westinghouse Electric International Co.—“Vapour electric conversion systems.” 6008/43. May 21st, 1942. (560595.) “Insulation for silicon irons.” 11095/42. August 16th, 1941. (560667.)

London J.E.A.

THE following are among matters of interest which were to be dealt with at a meeting of the London and Home Counties Joint Electricity Authority yesterday (Thursday):—

Repairs to Buildings.—No provision has yet been made in the Authority's accounts in respect of the wartime deferment of expenditure on repairs and maintenance of buildings. The Local Distribution Committee has suggested to the Finance Committee that provision should be made to meet this liability, which up to December 31st last amounted to approximately £18,000, with a subsequent annual charge of £4,500. The Finance Committee is in agreement with this proposal.

Call-up of Electricity Supply Personnel.—The General Purposes Committee reports that it has received letters from the Ministry of Labour and National Service, the Electricity Commissioners and the N.J.I.C. for the Electricity Supply Industry in response to the Authority's representations with regard to recent changes in arrangements for deferment of call-up aimed at securing more men for the Forces and certain industries. The Electricity Commissioners stated that they had interviewed the Director-General of Man-Power of the Ministry of

Labour and National Service and Sir Percy Mills of the Ministry of Production and as a result instructions had been issued to Regional Controllers and District Man-Power Boards that sympathetic consideration should be given to applications made by electricity undertakings, and supported by the Electricity Commissioners, for further deferment of the calling up of key men employed in the maintenance of supplies. “Electricity Supply” had also been included in the list of products and services for which preference would be given to applications for additional staff.

Revocation of Lease.—In connection with the proposed arrangements for the erection of a selected generating station at Kingston-on-Thames after the war, the C.E.B. has suggested that the J.E.A. shall revoke the lease of land, granted by the Kingston-on-Thames Corporation, on which the J.E.A. has erected a switch-house accommodating switchgear of the Authority, the C.E.B. and the Corporation. In consideration of this the Board makes certain proposals with regard to increase of supply afforded and payment of annual charges. The Technical Committee of the J.E.A. recommends that the Authority agree to the revocation of lease as suggested.

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.

Birkenhead.—May 15th. Electricity Department. Cables and meters. (See this issue.)

Plymouth.—May 20th. Corporation Electricity Supply Department. Supply and delivery of portable filtration plant for electrical insulating oils, and one outdoor type three-phase auto-transformer. (April 28th.)

Orders Placed

Australia.—NEW SOUTH WALES.—Sydney County Council. Accepted. Heavy-duty cartridge fuses and fuse holders, Spec. 671 (£1,900).—Siemens (Australia) Pty.

Glasgow.—Corporation Health Committee Accepted. Repairs to X-ray therapy equipment at Stobhill Hospital (£414).—Victor X-ray Corporation.

London.—JOINT ELECTRICITY AUTHORITY.—Recommended. Extension of existing contracts: Cables.—Crompton Parkinson; Hackbridge; Connollys (Blackley). Electrical accessories.—Drake & Gorham (Wholesale).

ISLINGTON.—Electricity Committee. Accepted. Street lamp columns (£1,260).—W. Lucy & Co.

POPLAR.—General Purposes Committee. Accepted. Amplifying equipment for park entertainments (£300).—G. R. Fountain.

Seaham (Durham).—U.D.C. Accepted. Installation of equipment for a new substation on the Deneside estate (£5,093).—North-Eastern Electric Supply Co.

Sheffield.—Electricity Committee. Contracts for transformers extended for twelve months.—Electric Construction Co.; Hackbridge; Bonar Long & Co.

Contracts in Prospect

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

Birmingham.—Church, Quinton Road West; diocesan trustees.

Community centre, Glebe Farm estate; Birmingham Council for Community Associations.

Factory; Jarrett, Rainsford & Laughton, Ltd. Factory; Randle & Smith, Ltd.

Bolton.—School dining centres at Holy Trinity Schools and Central School; C. Herbert, borough engineer, Town Hall.

Brierley Hill.—Public hall and youth centre; secretary, Council of Social Service.

Chester.—Nursery, Wrexham Road; city engineer.

Coventry.—New convalescent home; secretary, Miners' Convalescent Home, Higham Grange, near Coventry.

Extensions and alterations to Coventry and Warwickshire Hospital; H. R. Brooks, chairman, Board of Management.

Extensions to Coundon School for Infants' Department; D. E. E. Gibson, city architect, 1a, Warwick Row.

Dudley.—Restaurant, Scotts Green; borough engineer.

Gateshead.—Substation in Queensway and additions to factory, Princes Way and Western Avenue, for the North-Eastern Trading Estates, Ltd., Team Valley Estate.

Hereford.—Workshop, Commercial Road; William Bowers & Co.

Ilford.—Two cold stores, Hitchman's dairies; C. Radley.

Convertor house, Huson Works, New North Road; H. Hughes & Son, Ltd.

Departmental store, 60, High Road; London Co-operative Society.

Lancashire.—School kitchen at Oswaldtwistle Technical School; A. J. Nicholson, county architect, County Buildings, Fishergate Hill, Preston.

Central school kitchen, Ulverston, for Lancashire Education Committee (£3,573); T. Croft & Sons, Ltd., builders, Blackpool Road, Preston.

Lye.—Church hall; Rev. W. Smith, vicar, Parish Church, Lye, near Stourbridge.

Manchester.—Bakery, Spear Street; C. Hartley, architect, 128, Buxton Road, Great Moor, Stockport.

Works extensions, Longsight; Wrathmell & Blackshaw, architects, Queen's Buildings, St. Peter's Square, Stockport.

Middlesex.—Farm buildings, Denham (£1,335) for County Council; E. & J. Cotton, Ltd.

Middleton.—Houses; F. Taylor, builder, Sunny Bank Road, Birch, Middleton.

Northampton.—Building as extensions to St. Edmund's Hospital Maternity Ward for Public Assistance Committee; R. A. Winfield, borough surveyor, Guildhall.

Canteen, The Riding; Amhurst Mantle Co., Ltd.

Extensions, Eagle Foundry, Cattle Dock Road; Rice & Co., Ltd.

Waterworks (£21,000); water engineer.

Oldham.—Works canteen; George Clegg (Oldham), Ltd., Coldhurst Mills.

Radcliffe.—School canteens on sites at Central School and Radcliffe Hall C.E. School; G. E. Wrigley, borough surveyor, Town Hall.

Renfrewshire.—Housing scheme at Barrhead; burgh surveyor or W. Gladstone, Browne & Muir, measurers, Glasgow.

Rochdale.—Girls' hostel, Caldershaw Lane; Turner Bros. Asbestos Cement Co., Spotland, Rochdale.

Additions, Holmes Mills, Mellor Street; Davey Kenyon & Co., dyers.

Rowley Regis.—Church Hall; Vicar, Parish Church, Rowley Regis, Staffs.

Sanquhar (Dumfries).—Fifty houses; burgh surveyor.

Sheffield.—Canteen, Eyre Street (£3,000); city architect.

Southgate.—Factory store, Rossendale Works; C. E. Owen Ward, architect.

Factory extensions, Grassendale Works, Orpington Road; Wallis, Gilbert & Partners.

Todmorden.—Works canteen; Fielden Bros. Ltd., Robin Hood Mills.

York.—Cooling room, Hull Road; Northern Dairies, Ltd.

Five central school kitchens; borough engineer.

Works additions, Bootham Row; Bootham Engineers, Ltd.

Forthcoming Events

Tuesday, May 9th.—*Manchester.*—At Engineers' Club, 6 p.m. I.E.E. North-Western Centre. Annual general meeting and paper on "Restriking-Voltage as a Factor in the Performance, Rating and Selection of Circuit-Breakers," by Messrs. J. A. Harle, M.Sc., and R. W. Wild.

London.—85, The Minories, E.C.3, 5.30 p.m. Institute of Marine Engineers. "Boiler Feed-Water Regulation," by Mr. H. Hillier.

London.—At Institution of Mechanical Engineers, Storey's Gate, S.W.1, 5 p.m. Illuminating Engineering Society. Annual general meeting followed at 5.30 p.m. by an address on "Tolerances and their Effect on Physical Measurements," by Sir Charles Darwin, K.B.E., Director of the National Physical Laboratory.

Wednesday, May 10th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Transmission Section. "Remote Switching by Superimposed Currents," by Mr. J. L. Carr, B.Sc.

Thursday, May 11th.—*London.*—Institution of Electrical Engineers, 5 p.m., Benevolent Fund annual meeting. 5.30 p.m., annual general meeting of Institution (corporate members and associates only), followed at approximately 6.15 p.m. by a paper on "Modern Submarine Cable Telephony and the Use of Submerged Repeaters," by Mr. R. J. Halsey, B.Sc. (Eng.).

London.—Anatomy Theatre, University College, Gower Street, W.C.1, 1.15 p.m. Public lunch-hour lecture on "Britain's Electricity Supply," by Prof. R. O. Kapp. Admission free without ticket.

London.—4, Grosvenor Gardens, S.W.1. Iron and Steel Institute. Annual general meeting. Morning session 10.45 to 12.45. Afternoon session 2.30 to 4.30.

Cambridge.—At University Engineering Department, 8.15 p.m. I.E.E. Cambridge and District Wireless Group. "The Contribution of Cambridge to Radio Engineering," by Dr. E. B. Moullin.

Friday, May 12th.—*London.*—Institution of Mechanical Engineers, Storey's Gate, S.W.1, 5.30 p.m. Exhibition of technical films.

Loughborough.—At Loughborough College, 6.30 p.m. I.E.E. South Midland Students' Section. "Installation and Repair of Industrial Electrical Equipment," by Mr. R. A. Joseph, B.Sc. (Eng.).

Manchester.—Engineers' Club, Albert Square, 6.30 p.m. Manchester Association of Engineers. Annual general meeting and paper, "Application of X-ray Crystal Analysis Methods to Engineering Problems," by Mr. F. Brech.

Saturday, May 13th.—*Leeds.*—Griffin Hotel. I.E.E. North Midland Students' Section. Luncheon, annual general meeting and film afternoon.

Monday, May 15th.—*London.*—Institution of Electrical Engineers, 7 p.m. London Students' Section. Annual general meeting.

Cardiff.—I.E.E. Western Centre, 5 p.m. "The Influence of Resistance Switching on the Design of Extra-High-Voltage Air Blast Circuit-Breakers," by Messrs. H. E. Cox and T. W. Wilcox. This paper will be followed by a discussion on the paper "Standards of Performance of Generating Plant Based on Five Years' Operating Data," by Messrs. R. W. Biles and G. W. Maxfield.

Liverpool.—At Royal Institution, 6.30 p.m. I.E.E. Mersey and North Wales (Liverpool) Centre. Popular lecture on "Some Water Power Possibilities and Achievements," by Mr. W. A. Hatch, M.B.E.

Manchester.—At Engineers' Club, 6.30 p.m. Women's Engineering Society. "Women, War and Industry," by Mrs. A. Wilson.

Tuesday, May 16th.—*London.*—At Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.15 p.m. Association of Supervising Electrical Engineers. "Statutory Wiring Regulations and Registration," by Mr. L. C. Penwill, director E.C.A.

Wednesday, May 17th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Wireless Section (extra meeting). "High-Speed Recording of Radio-Telegraph Signals," by Messrs. R. B. Armstrong and J. A. Smale.

London.—At Institution of Civil Engineers, 6 p.m. Institute of Welding and Institute of the Plastics Industry. Paper: "The Welding of Plastics," by Dr. J. H. Paterson, followed by a demonstration.

Birmingham.—At University (Latin Theatre), Edmund Street, 6.30 p.m. British Institution of Radio Engineers (Midland Section). "Relaxation Oscillators and Trigger Circuits," by Dr. Emrys Williams.

Institute of the Plastics Industry

THE North-Western Section of the Institute of the Plastics Industry is holding its annual general meeting at the Engineers' Club, Albert Square, Manchester, at 6.30 p.m. on Friday, May 19th. This will be followed by a dinner (6.45 for 7 p.m.) marking the Section's tenth "birthday" and members are asked to invite any friends who are interested. The charge for the dinner will be 5s. and reservations must be notified to the secretary, Mr. H. Jones, c/o the Geigy Colour Co., Ltd., Tenax Road, Trafford Park, Manchester, 17, not later than May 12th.

Lighting of Factories

A PLEA for co-operation of physicists and ophthalmologists in investigating the question of the lighting of factories is contained in a leaflet entitled "Eyesight and Industry" published by the University Press, Oxford, and covering a speech delivered by the Vice-Chancellor of Oxford University at the Mansion House in February.

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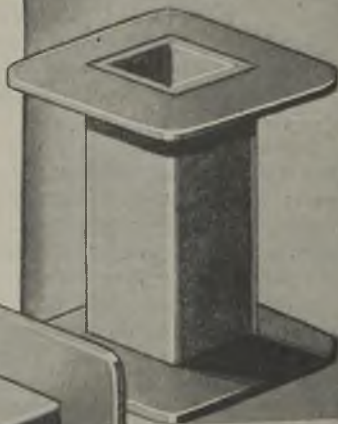
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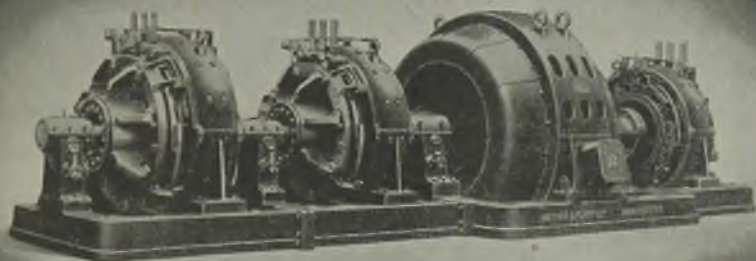
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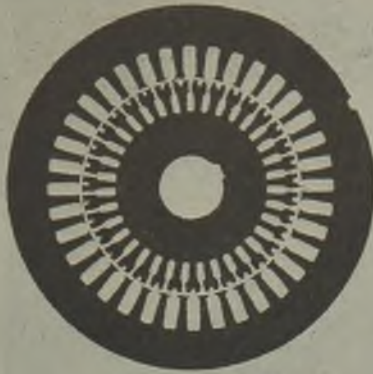
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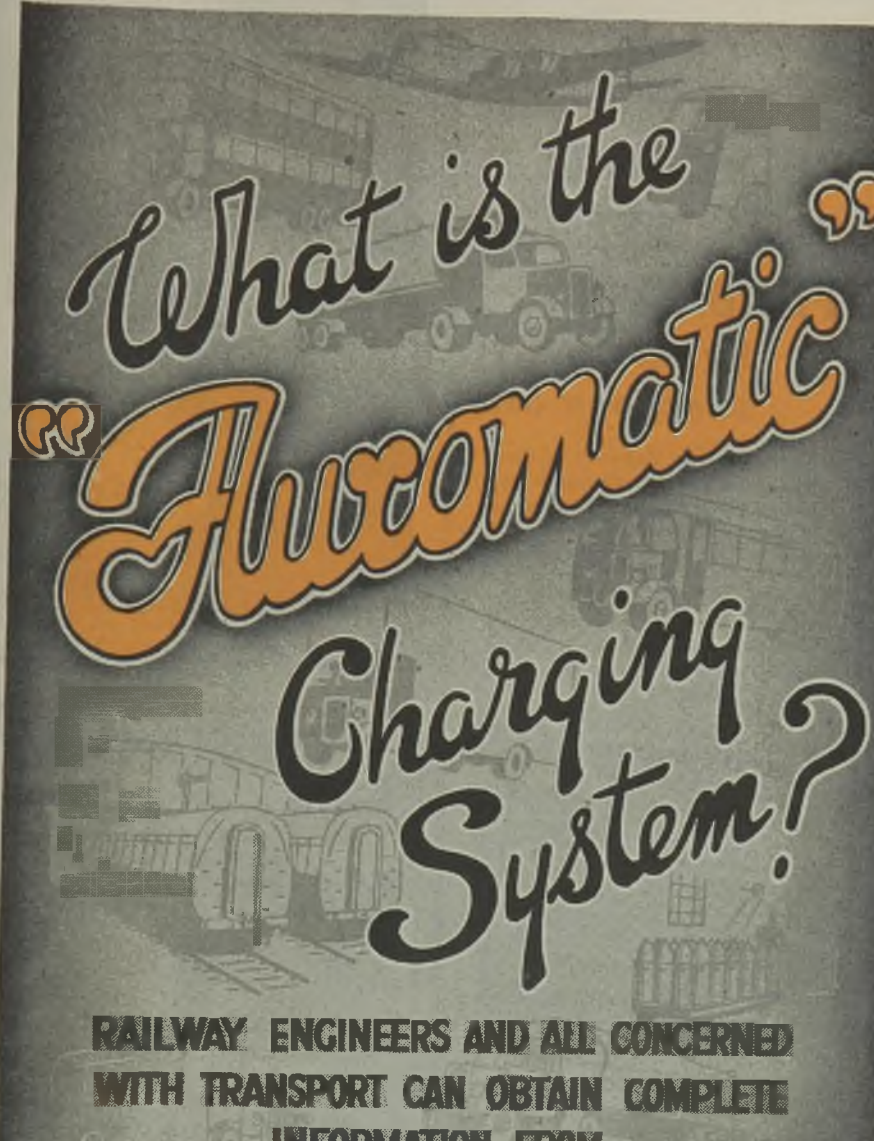
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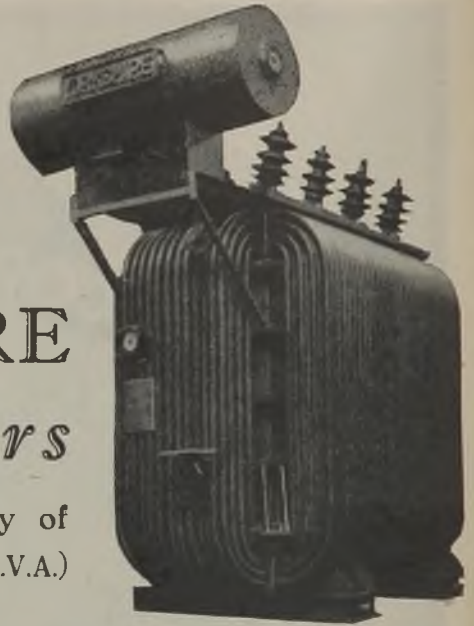
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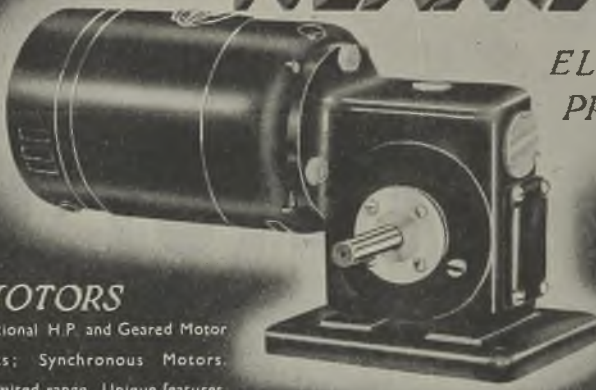


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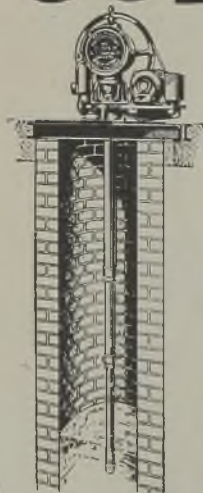
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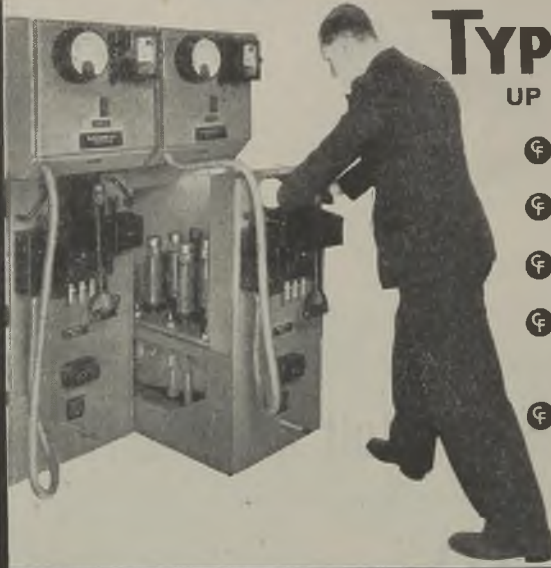
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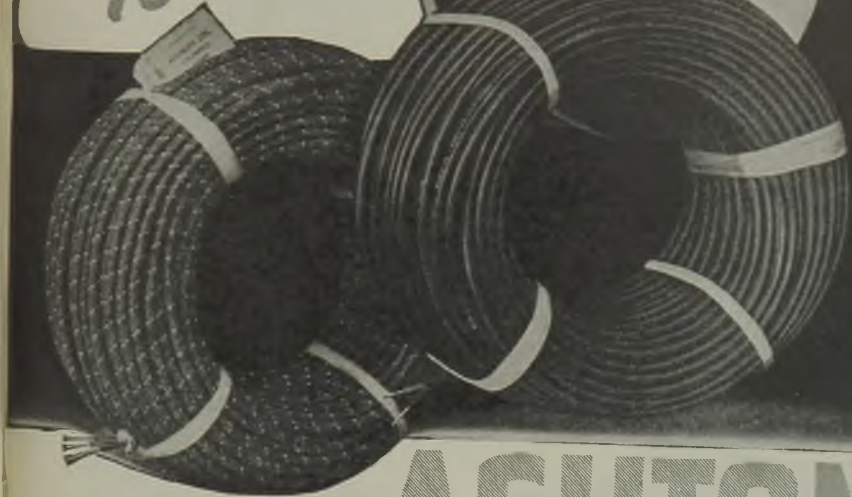
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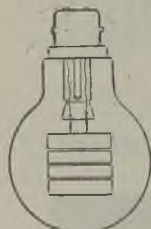
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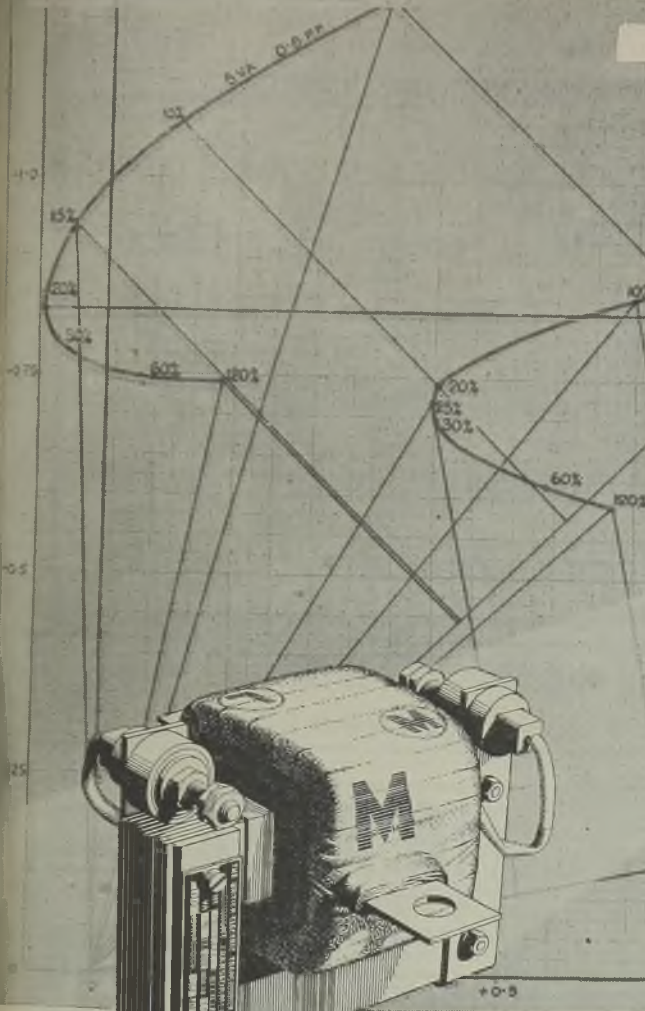
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PHONE FARNWORTH 676 (4 LINES) GRAMS: 'EBONITE' LITTLE LEVER



The British Electric Transformer Co., Ltd.
 Works and Office: HAYES, MIDDLESEX, ENGLAND.

Current Transformer Test Certificate

Transformer No. 317732, W.B. No. 19.10.1944.
 Size: 2001 Amps, Ratio Value: 4.0, Class: 10
 Load Factor: 0 V.A. Accuracy Specified: Class 0.2, To BS26-194

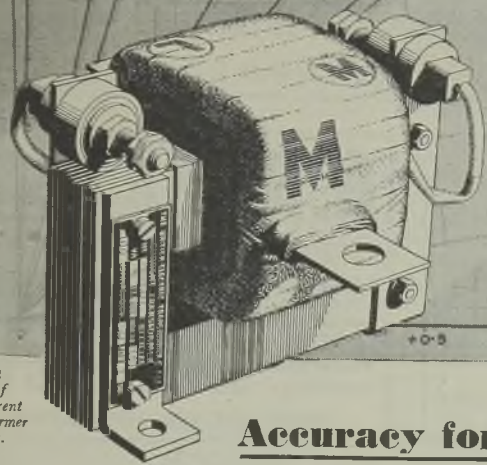
Burden	V/A	PF	Primary Current %	Phase Difference (Min)	Ratio Error (%)
					Max
1	1	1.00	100	+ 30	+ 0.14
			10	+ 45	+ 0.18
			5	+ 60	+ 0.26
2	0.8	1.00	100	+ 30	+ 0.19
			10	+ 45	+ 0.24
			5	+ 60	+ 0.34

High Voltage Test: Primary to Secondary and Core: 5000 V/Sec. Value for 1 minute.
 Secondary to Core: 2000 V/Sec. Value for 1 minute.

Date of Test: 19.10.44, Temp. Transformer: 25°C

1944

A. J. Jones



The net weight of this Current Transformer is 4 1/2 lbs.

Accuracy for the Meter Engineer

A current transformer is only as accurate as its makers know how to make it. Meter Engineers who insist on exact compliance with requirements, rely on B.E.T.'s long specialised experience and extensive production and test facilities . . .

The
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"Prevention is better than cure"

So why not cover your Electric Cables with NEWALLS MOULDED ASBESTOS and prevent damage to them by Fire.

We leave the job "right."

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Petrol Electric Generating Plants, H.T. Generators, D.C. Motors, Frequency Changers, etc., up to 25 K.V.A.

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Grams: RIX, KEIGHLEY

VICTORY WORKS, KEIGHLEY

MOTORS 1/10 to 5,000 H.P. and TRANSFORMERS
REWINDING SPECIALISTS

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LOWMOOR IRON

For Mining, Railway, Chemical, Electrical & Engineering Industries

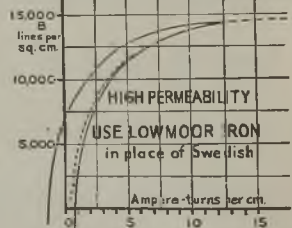


Unequaled for Forging & Welding

First class Electrical Qualities

LOWMOOR BEST YORKSHIRE IRON LTD.
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Typical Recent Independent Test





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by heat . .**

**How HY-MEG overcomes
Impregnation Problems**

Over-heating, whether due to protracted working or to tropical temperatures, can play havoc with ordinary varnish impregnations — but not with HY-MEG. For there is nothing ordinary about HY-MEG as you can readily understand by reading the recently published booklet, "STABILITY IN INSULATION." When you learn also that HY-MEG needs less stoving time, gives mechanical rigidity, improves the electrical properties of windings, resists moisture, oils, acids and alkalis, (besides being unaffected by heat), then the reasons why it is being more and more widely used by leading impregnators become apparent. HY-MEG, the successful outcome of the call for positive stability, has banished such faults as "throwing" of the varnish, softening of wire enamel, breaking of wires, failure due to coil movement, etc. More detailed information on these important matters is given in the booklet. Please apply for your copy on Business Heading or Card, enclosing 2d. to comply with the Control of Paper (No. 48) Order, 1942.



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IMPREGNATING VARNISHES

V. 6738. The Supreme Impregnating Varnish for withstanding severe mechanical stress. Suitable for "heavy duty" units.

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The HY-MEG "Brains Trust" is always in session, ready to deal with questions relating to insulation. Any special problem put to it brings helpful response.

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CONCORDIA ELECTRIC WIRE CO., LTD.
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SMALL GEARED MOTOR UNITS

Made Unidirectional and Reversing.

Unidirectional—Torque 36.5 lbs. at 1 r.p.m.

Reversing—60 lbs. at 1 r.p.m.

Enquiries are solicited.



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PUMPS FOR :
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AS SUPPLIED TO
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ROTOPLUNGE PUMPS

Pumps for
Petrol, Water,
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Suction lifts 25ft.
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ELCO design and build soldering irons, machines, melting pots, and special furnaces for all soldering needs to suit any voltage from 24 v. up. Illustrated are four interchangeable units. There are many others.

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Let **ELCO** Solve Soldering Problems



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4 — PROCESS CONTROL

Automatic motor control plays a most important part in assisting to operate plant for all kinds of process work where temperature, pressure or time are the determining factors, and/or where cyclic operations are involved.

To facilitate, physically, such processing, correlated control of material handling plant in the way of elevators, hoists, etc., is of paramount importance. Heat treatment of metals in electric furnaces exemplifies such combination. In a typical installation, material had to be hoisted, moved and released on to a bogey; the bogey moved into the furnace, the doors of which were automatically opened and closed, the material retained there for a predetermined period, and then withdrawn, similarly handled and subsequently quenched. The complete sequence of operations was repeated, forming a continuous cycle of operations simply and positively effected by means of electric motor control.

Sequence interlocking and automatic electric motor control is described in detail in booklet No. MC/C3.

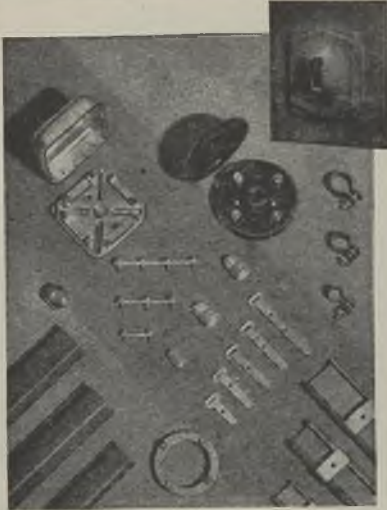
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BROOKHIRST SWITCHGEAR LTD. - CHESTER

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ELECTRICAL ACCESSORIES



IN the interests of your customers and the maintenance of your own reputation for first-class reliable work, you will do well to rely upon Tenby Electrical Accessories and Wiring Systems.

The range includes complete wiring systems and such accessories as switches, bell pushes and two- and three-pin sockets or switch sockets. All of these carry the stamp of sound practicable design and completely reliable manufacture.

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EKCO Lamps are selling in Liverpool as they are throughout Great Britain, and sales will gain impetus from the dominant posters now placed prominently in Liverpool and other great cities. They'll go on selling, too, because of the quality which marks all EKCO products. Stock them and link up with EKCO poster advertising and the consistent national and provincial newspaper campaign.

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No. 5050 Round type for one 2" or 2½" 5-ampere switch.
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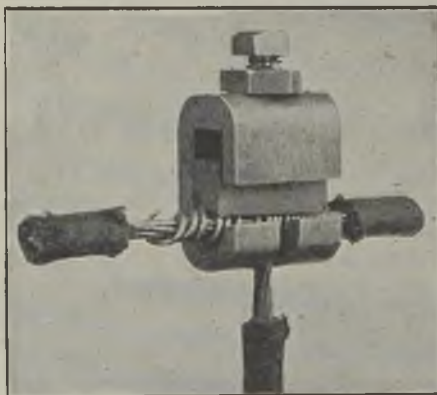
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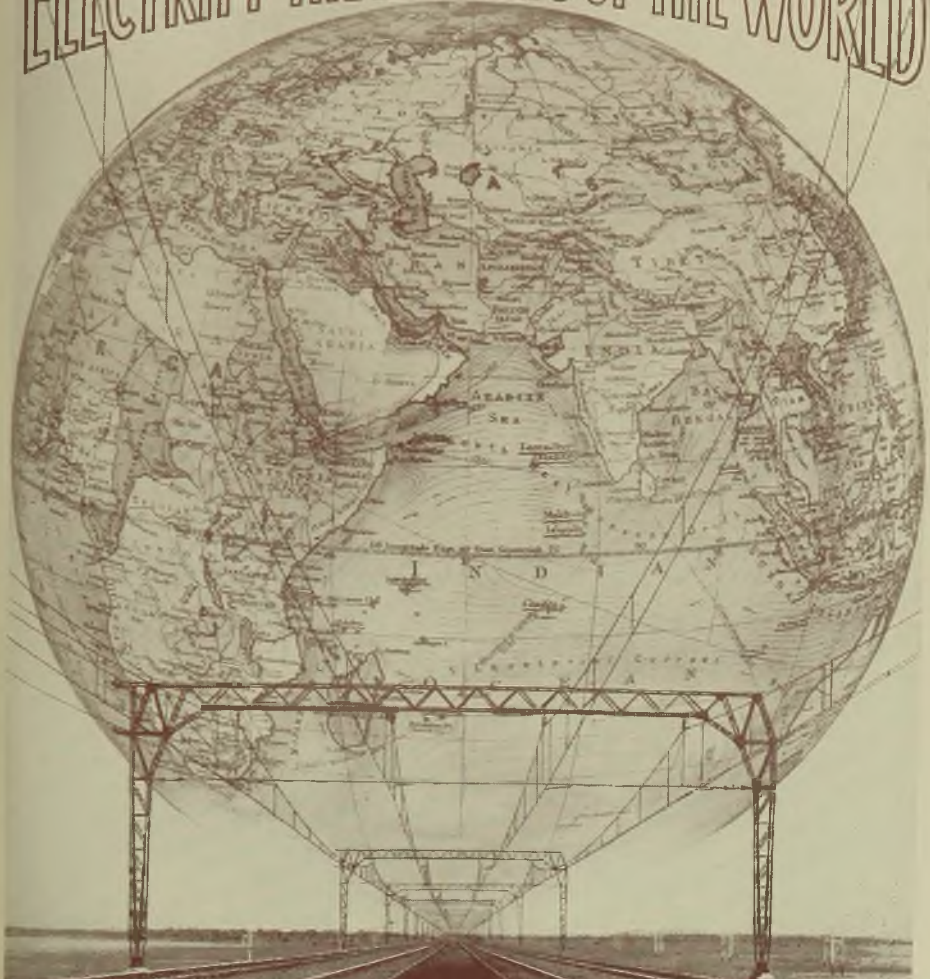
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Established over 50 years

To-day we cannot do all that we would like for you, but we hope to have the opportunity when the war has been won.

WHEN THE TIME COMES TO — ELECTRIFY THE RAILWAYS OF THE WORLD



When this time arrives all the resources of B.I. will be available to Railway Engineers, at whose disposal in the meantime, B.I. place the benefits of their Technical Advisory Service. This service incorporates a specialised experience in railway electrification extending over 30 years, in which time B.I. have carried out much important work in Great Britain and completed extensive contracts in Australia, India, South Africa, Poland and Brazil.

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Modern instruments for Modern Switchboards—Induction ammeters, voltmeters, watt-meters, power-factor meters, frequency meters and synchrosopes—all available in round sector and edgewise cases which are uniform in appearance and dimensions with "Metrovick" moving iron, moving coil and dynamometer instruments.

Outstanding features:—

- ★ Long, clear scales.
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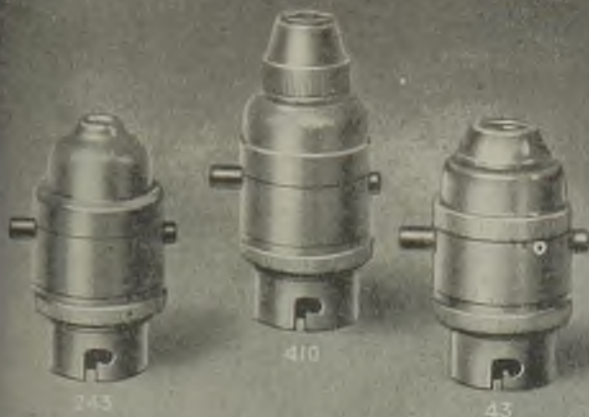


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A wide and comprehensive range of electrical accessories is available to customers for National Service.

Catalogue BH/1039, sent on request, gives full details.

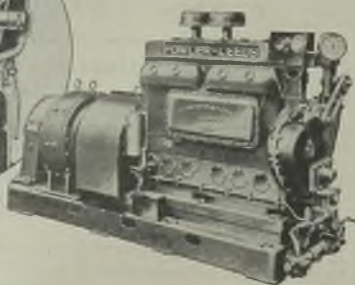
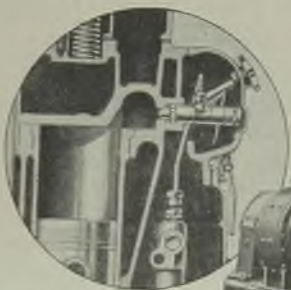
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ESTABLISHED OVER HALF A CENTURY

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Here is shown a recent development in Fowler practice. The Combustion Chamber, formed directly and wholly in the Cylinder Head, combines simplicity in design with greater strength and the elimination of unnecessary parts.

Fowler engines provide power for: Transmitting, Generating, Lighting and Welding Sets, also Diesel Electric locomotives and Cranes, etc.



Petrol Engines from 1½ B.H.P. to 16 B.H.P.

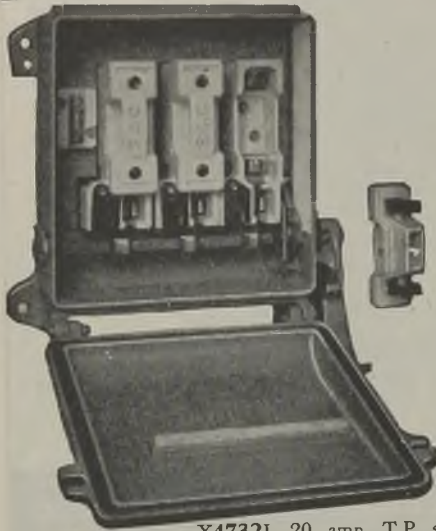
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JOHN FOWLER & CO. (LEEDS) LTD., LEEDS 10

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X4732L 20 amp. T.P. switch fuse with neutral connector and rewirable fuse carriers.

G.E.C. SWITCH AND FUSE GEAR

WITH INTERCHANGEABLE FUSE CARRIERS—REWIRABLE OR FOR H.R.C. CARTRIDGE FUSES making the range complete from 15 to 200 amperes.

DELIVERY FROM STOCK

Weatherproof. For circuits up to 500 volts A.C. or D.C.

WITH REWIRABLE FUSE CARRIERS

Amps.	Double Pole		Triple Pole		T.P. and Neutral	
	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price
15	X4720	9/4 ea.	X4730	12/6 ea.	—	—
20	X4722	14/6 ea.	X4732	19/6 ea.	X4732L	£1 0 8ea.

WITH CARRIERS FOR H.R.C. CARTRIDGE FUSE-LINKS *

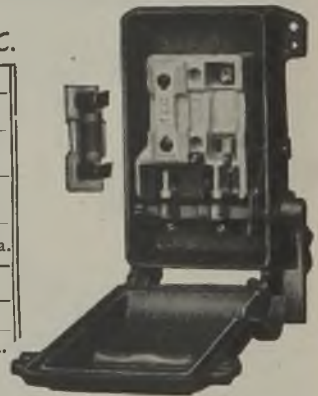
15	X4720F	9/4 ea.	X4730F	12/6 ea.	—	—
20†	X4722F	14/6 ea.	X4732F	19/6 ea.	X4732LF	£1 0 8ea.

* Prices exclusive of Cartridge Fuse Links.

H.R.C. CARTRIDGE FUSE-LINKS FOR USE WITH ABOVE
Category of duty B.S. 88—1939 440 A.C.4 and D.C.4

Rating Amps.	Cat. No.	Price	Rating Amps.	Cat. No.	Price	Rating Amps.	Cat. No.	Price
2	XE20Q2	8/- doz.	6	XE20Q6	8/- doz.	15	XE20Q15	9/- doz.
4	XE20Q4	8/- doz.	10	XE20Q10	8/- doz.	20	XE20Q20	11/6 doz.

† For the purpose of dealing with momentarily high switching currents, or for 20 amps. at category 440 A.C.4 and D.C.4 these fuse carriers can be adjusted to take XQ30C series H.R.C. Cartridge Fuse-Links (See page 8 G.E.C. Catalogue X & Y section. 7th edition).



X4720F 15 amp. D.P. Switch Fuse with H.R.C. type Fuse carriers.

All prices subject to current advance.

Cut out this page and insert it between pages 6 and 7 of your G.E.C. Ironclad Switch-gear Catalogue. X & Y section, (7th edition).

CLASSIFIED ADVERTISEMENTS

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

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

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

Original testimonials should not be sent with applications for employment.

REPLIES to advertisements published under a Box Number if not to be delivered to any particular firm or individual should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Letters of applicants in such cases cannot be returned to them. The name of an advertiser using a Box Number will not be disclosed. All replies to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. Cheques and Postal Orders should be made payable to ELECTRICAL REVIEW LTD. and crossed.

OFFICIAL NOTICES TENDERS, ETC.

COUNTY BOROUGH OF BIRKENHEAD

Electricity Department

TENDERS are invited for the supply and delivery of

1. E.H.T. & L.T. PAPER INSULATED CABLES
2. RUBBER INSULATED CABLES
3. METERS

over a period of 12 months, commencing 1st July, 1944. Specification, Conditions and Form of Tender may be obtained from the Borough Electrical Engineer, Craven Street, Birkenhead.

Tenders, on the form provided, enclosed in a plain envelope (which shall not bear any name or mark indicating the sender), sealed and endorsed as directed in the tender form, must be delivered to the undersigned not later than 2 p.m. on Monday, the 15th May, 1944.

Tenders which do not comply with these instructions will not be considered.

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

E. W. TAME,
Town Clerk.

Town Hall,
Birkenhead,
19th April, 1944.

4959

SITUATIONS VACANT

SALES EXECUTIVE REQUIRED

WELL-established concern, London area, manufacturing electrical components and accessories for domestic appliances and for industrial equipment, has immediate opening in its sales organisation at Main Office for a man with experience and executive ability. Knowledge of inside sales routine is essential and duties will also require small amount of travelling. A very excellent opportunity is offered in connection with present and post-war plans. The man we require should be under 45, well educated, with good general knowledge of electricity and thoroughly experienced in sales work in the electrical field. The Company is now engaged entirely on war work, but the opening is available immediately. Please write full particulars, giving age, education, details of past experience and connections, earning capacity, and when available. All replies will be treated in strict confidence. Reply—Box 4961, c/o The Electrical Review.

TRAVELLER for Potteries wanted, E.L.M.A. Lamps, experienced, must have reliable connection. Salary and expenses.—Box 4975, c/o The Electrical Review.

AN Electrical Contractor's Manager required by Eastern Counties firm at present engaged on work of national importance. Must be a "live," capable man with sound knowledge estimating, buying, labour control and up-to-date business methods. Permanent post with excellent post-war prospects. Replies treated in strict confidence. State experience, age and commencing salary.—Box 5841, c/o The Electrical Review.

ARC Welding Electrode Production Engineer required with experience of solid extrusion to take charge of latest type manufacturing plant. Preference given to applicant with American or Continental experience. Must be fully familiar with all phases of modern arc welding electrode manufacture and preferably have chemical knowledge. Good prospects. Salary £800 to £1,000. Preference to Member of a recognised Institute. Written applications (no callers) quoting O.N. Q.S.173, giving date of birth, name and address of present employer and setting out experience and qualifications to the—Ministry of Labour and National Service, Appointments Department, Sardinia Street, Kingsway, London, W.C.2. 4977

INSTALLATION Contracts Manager for established contractors having pre-war activities throughout Great Britain. Applicant would be required to control branch office in large Midland town and have necessary qualifications to negotiate large contracts, mainly new construction works and preferably wide experience of consulting engineers' and architects' requirements. The position envisages post-war developments and is not for the duration of the war. Replies, giving detailed previous experience and remuneration required, will be treated in strict confidence by principal only.—Box 4956, c/o The Electrical Review.

LARGE company manufacturing electrical equipment requires for India, Electrical Engineer with commercial experience in that country. Good salary and conditions to first class man. Preliminary application, stating experience, salary required, age, etc., to—Box 457, c/o Streets, 8, Serle Street, W.C.2. 4976

LEVER Brothers & Unilever Limited announce that after reinstatement of the large number of their technical staff who have been employed on national service they will still have vacancies in their research departments and their factories for a considerable number of qualified chemists, physicists and engineers. At a later date applications for these appointments will be invited. An appreciable proportion of the positions available will be suitable for scientists capable of controlling research sections, and applicants will require to be in the 30/40 age group. The remaining posts will require men with good scientific and technical training in the age group about and below 30. Whilst applications are not invited at present, if intending applicants would like further information regarding these posts they should apply to the Personnel Department, Lever Brothers & Unilever Limited, Unilever House, Blackfriars, London, E.C.4. 4968

SALES Representative required for Yorkshire by very old-established manufacturers and factors. Knowledge of all wiring supplies essential. The position is permanent and progressive. Please state age, experience and salary required. Replies treated in strict confidence.—Box 4967, c/o The Electrical Review.

STOREMAN required by London office of wholesale distributors. Please write, stating experience, age, salary required, etc., to—Box 4974, c/o The Electrical Review.

STORES Assistant. Applicants, stating age and salary required, should have had stores experience and thus familiar with goods handled by—Wholesale Electric Co. Ltd., 37, Vauxhall Bridge Road, S.W.1. 4887

APPOINTMENTS FILLED

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

SITUATIONS WANTED

A B.Sc. (Eng.), 20 years production, design, development and management, seeks substantial post, £850 p.a. Works, technical-sales or general management.—Box 5820, c/o The Electrical Review.

A DVERTISER (41). 25 years integrating meters and electrical instruments, 12 years as test superintendent and assembly foreman in mass production, desires change with advancement and post-war prospects.—Box 5792, c/o The Electrical Review.

C HIEF Time Study Engineer now available. Qualified mechanical engineer. Extensive engineering experience incorporating standard costing and production control.—Box 5839, c/o The Electrical Review.

E LECTRIC Heating. Electrical Engineer (50), experienced in design and sales of space and water heating equipment, cooking and domestic appliances, wishes to contact manufacturer. London and Southern area. Contacts with Government departments & supply authorities.—Box 5834, c/o The Electrical Review.

E LECTRIC Contract Engineer (33), extensive experience all types of installations, underground and overhead distribution, estimating and administrative duties, seeks similar position home or abroad. Free soon.—Box 5800, c/o The Electrical Review.

E LECTRIC Contractor's Foreman, 25 years in trade, 15 years with London firm. Free.—Box 5795, c/o The Electrical Review.

E LECTRIC Engineer, responsible for works maintenance and installation, etc., commercial administration, organisation, planning and aircraft experience, age 49 years, free immediately.—Box 5845, c/o The Electrical Review.

E LECTRIC Engineer (30). Higher National, seeks technical position, industrial and supply (up to 33kV) experience on electro-mechanical and building, design and construction, also testing and plant installations. Must be position where initiative and ideas can be utilised. Present salary £400.—Box 5842, c/o The Electrical Review.

E LECTRIC Engineer (34), with a wide range of experience in installation work, contracts up to £60,000, and of proved business ability, seeks appointment abroad.—Box 5819, c/o The Electrical Review.

E LECTRIC Engineer (36) seeks senior post. Wide practical and executive experience in works maintenance, plant installation, contracting and repair work. A.M.I.E.E. Salary commensurate with responsibility. Present level £550.—Box 5802, c/o The Electrical Review.

E LECTRIC Supervising Engineer seeks position electrical contractors. 25 years' experience in control of contracts, office routine, labour, store control. Free.—Box 5794, c/o The Electrical Review.

E NGINEER, Mechanical and Electrical, seeks position as Works Manager, held similar, also production manager and superintendent. Long practical experience on electrical instruments and similar precision apparatus, including tool and mould design, planning, rate fixing, estimating, conversant with modern machine tools, metals and alloys. Used to all classes of labour and training of same to get best results. Over 40 years of age. Salary £1,000 p.a.—Box 5822, c/o The Electrical Review.

G ENTLEMAN, aged 44, requires situation, assistant-buyer, stock-clerk, etc., many years' experience electrical trade, London area.—Box 5844, c/o The Electrical Review.

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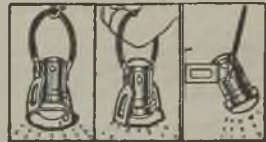
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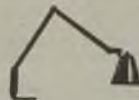
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