

ELECTRICAL REVIEW

FOUNDED
1872

Vol. CXXXIV. No. 3473

JUNE 16, 1944

9d. WEEKLY



IT WORKED WELL, *but Mr. Scott wasn't satisfied*

When Mr. Scott's first customers expressed their satisfaction he decided to plan improvements, and we have never been able to rid ourselves of that restless urge to do better.

We started this war with a new range of industrial A.C. motors. With improved ventilation and protection and numerous other features that put them years ahead of current practice, we thought that they would stay put for a long time.

They have given uncommonly good service and our determination to keep well to the fore in our business is our only reason for enlarging the range, improving the terminal box, increasing the shaft diameters and bearing sizes in certain instances (to beat users who are always thinking up more unfairly punishing drives) and introducing other detail improvements.

These new features will be in production soon, in time (but only just, we hope) for your post-war needs.

LAURENCE, SCOTT & ELECTROMOTORS LTD.

Makers of electric motors for sixty years
(and still not satisfied)

NORWICH • MANCHESTER



LONDON AND BRANCHES

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

From the power supply of the mightiest armament works to the smallest domestic connection for lighting, cooking and heating, C.M.A. Cables are faithfully transmitting thousands of millions of units twenty-four hours every day throughout the country.



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 Phone : Holborn 7633

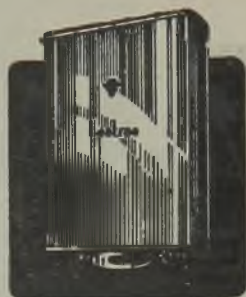
The Art of Knowing How



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

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

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



**LEADERS IN
ELECTRIC
WATER HEATING**

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HEATRAE LTD., NORWICH

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WE MAKE

ELECTRIC WELDING MACHINES



11 kVA Spot Welder

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WELDERS**

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Automatic or Non-
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With or without
Electric Control

The quickest and
most economical
method of Welding
Oil Drums, Bars,
Tyres, Wheel Rims,
Tubes and Angles.

The WESTMINSTER ENG. Co. Ltd.
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Dynamos, Motors, Alternators and
Transformers Rewound and Re-constructed.
"Westminster" Brush Holders. Process
Arc Lamps

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FOR WIRELESS
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CONNECTIONS

A WIDE RANGE OF
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TERMINAL SCREWS



to the spec-
ific require-
ments of our
customers

Makers of all
types of re-
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ducts from
the bar in all
metals



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

ON LOAD TAP CHANGERS

7,000,000 kVA

of INSTALLED PLANT—
proves FULLER reliability

THE Company have delivered since first manufacturing "on load" tap changing equipment over 1,250 gears aggregating over 7 million kVA of installed plant. This probably constitutes the largest output of tap changing equipment for any single manufacturer in the United Kingdom. Resistor type or reactor type can be supplied as desired.



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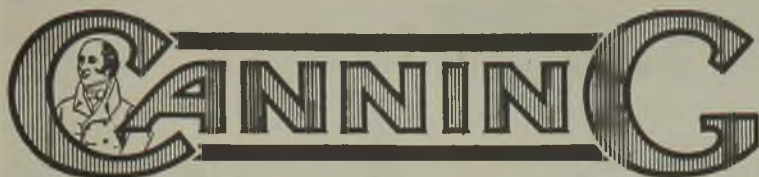
Associated with ASEA ELECTRIC LTD.

Head Offices: Fulbourne Road, Walthamstow, London, E.17.

Telephone: Larkwood 2350 (10 lines).

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Branch Offices: Manchester 2,
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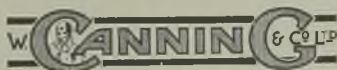


ELECTRO TINNING

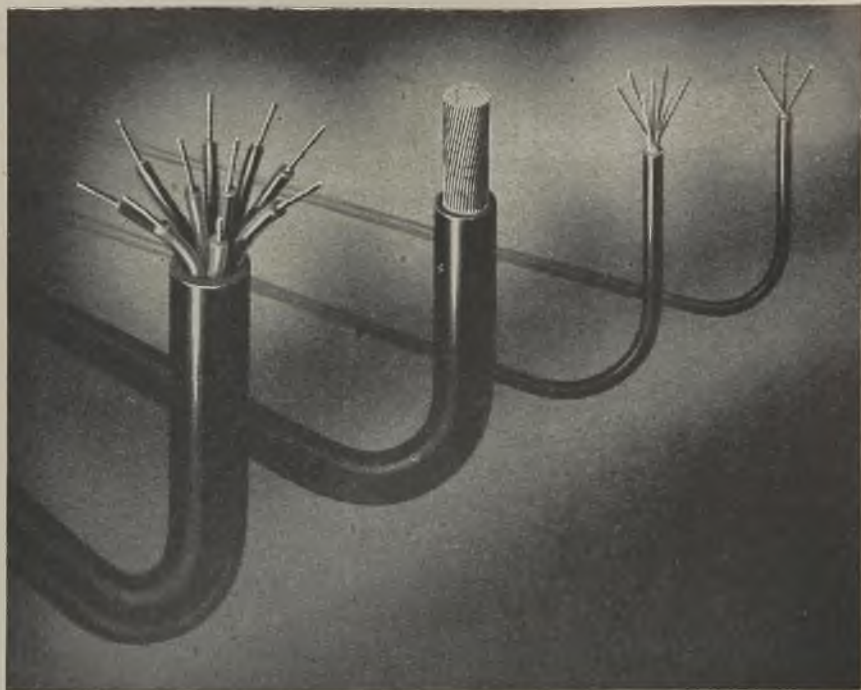
The Modern Process, using Stannate Tin Solution, produces strictly controlled coatings, predetermined and uniform in thickness, even on articles of irregular shape.

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.



**GREAT HAMPTON STREET
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“WELVIC” CABLE COVERING

“Welvic” polyvinyl chloride compositions have found a permanent place in the electrical industry for the sheathing and insulating of wires and cables and for the manufacture of sleeving and tubing. “Welvic” is thermo-plastic and can be extruded direct on to wire or cable, or over other dielectrics; it is resistant to water, oxidation, chemical attack and solvents.

Full information concerning properties and processing of “Welvic” is given in *Plastics Technical Bulletin No. 3*. Please write for a copy to your nearest Sales Office.



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Sales Offices at Mill Hill, London, N.W.7; Oldbury, near Birmingham; Alderley Edge, Cheshire; Bristol; York; Newcastle-on-Tyne; Leicester; Bradford; Cardiff; Sheffield; Glasgow; Belfast; Dublin.

STURTEVANT LARGE AND SMALL SCALE PRECIPITATORS FOR ELIMINATING DUST, FUME AND MIST

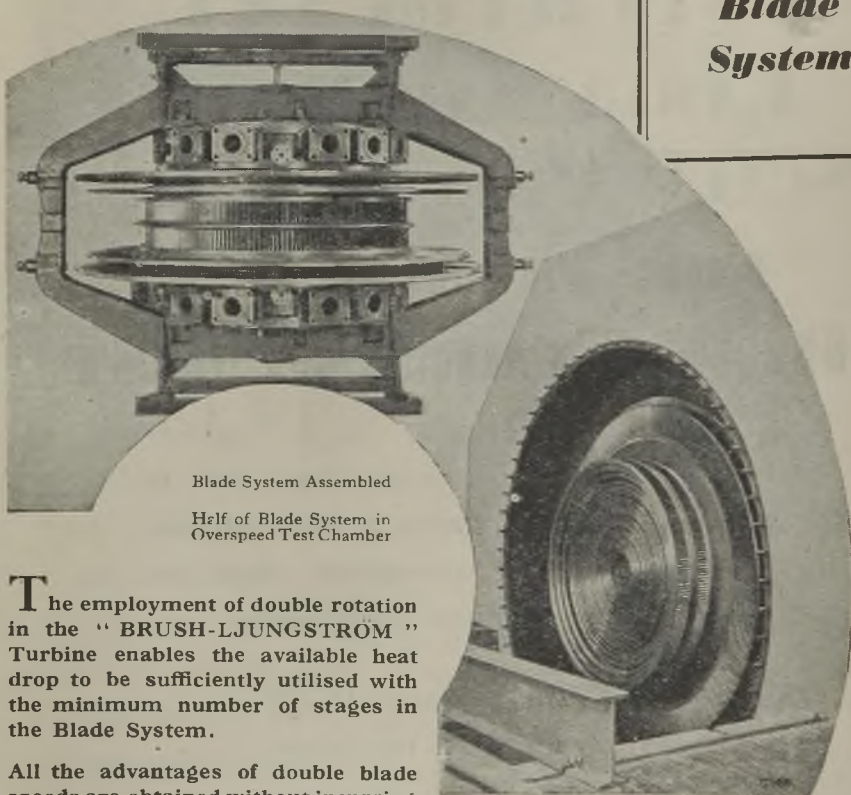
Special designs for prevention of oil haze in machine shops and removal of welding fumes, cleaning of air of atmospheric dust for optical, photographic and similar work.

Our reference W114/U will gladly supply full particulars.

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Large**BRUSH****LJUNGSTRÖM
TURBO-ALTERNATORS**

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Double
Rotation
Blade
System***



Blade System Assembled

Half of Blade System in
Overspeed Test Chamber

The employment of double rotation in the "BRUSH-LJUNGSTRÖM" Turbine enables the available heat drop to be sufficiently utilised with the minimum number of stages in the Blade System.

All the advantages of double blade speeds are obtained without incurring greater stresses or larger diameters and with very marked economies of space and weight.

The process of manufacture throughout many years' experience has attained the highest degree of accuracy and perfection of construction.

The results achieved are outstanding in performance and service,

THE BRUSH
ELECTRICAL ENGINEERING
LOUGHBOROUGH
ENGLAND

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

THE more efficiently these **Wedge Grinders** are maintained, the greater the life of all working parts and freedom from breakdown. These are the points we strongly recommend.

1. Frequently blow out all dust from sinter housing and switch case
2. Frequently examine all terminal connections, at switches, plugs and sockets, and test cables for weakness or breakages.
3. Keep all nuts, bolts and screws tight.
4. Dismantle, wash and repack bearings at regular intervals, also change grease in gear case, using recommended grade.
5. Avoid running a **Wedge Grinder** when the wheel is out of balance as this brings excessive wear on to the valuable bearings and gears.
6. Never carry a **Grinder** by its cable: never leave it lying on the floor as this causes dust and dirt to enter the housing.

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

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

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DIAMOND DRILLS · OIL WELL TOOLS

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13	D.C. or A.C.	22	1,000	PB
16	D.C.	27	1,250	PB
22	D.C.	37	1,200	PF
30	D.C. or A.C.	52	1,500	PG
40	D.C.	65	1,400	SA
50	D.C. or A.C.	80	1,500	SB

Vital services . . . they must go on, under all conditions. Perkins Diesel Plants are their safeguard . . . ready to meet immediate demands for light, power and communications . . . ready to fill the breach when mains failures threaten to cripple organisation. Perkins Diesels ensure that vital services shall go on.

They are used by the most important Civic Centres, Hospitals, Fire and other Services in the country.

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PERKINS DIESELS AND ELECTRIC PLANT FOR STATIONARY, PORTABLE AND MARINE APPLICATIONS—PROVED INVALUABLE IN MANY APPLICATIONS BY ALL THREE FIGHTING SERVICES THROUGHOUT THE WORLD

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**AUTOMATICALLY
CONTROLLED**

The photograph, reproduced above, shows the most effective solution to the problem of low power factor, a problem which may have to be faced eventually by every industrial consumer, particularly where the load comprises a large number of individually driven machines.

In the example illustrated, the overall power factor is never less than .95, obtained by the employment of automatically controlled B.I. Condensers, without which the power factor would not be higher than .68.

High power factor ensures the most efficient use of distribution and shows a substantial saving in power costs.

The B.I. Technical Advisory Service is available to investigate conditions on site, and to recommend the best arrangement for ensuring efficient and reliable Power Factor Correction.

Write for full particulars.

B.I.

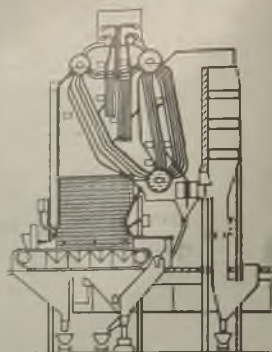
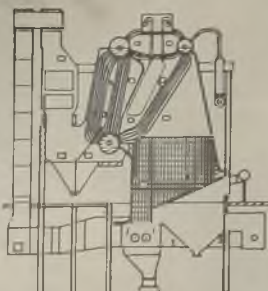
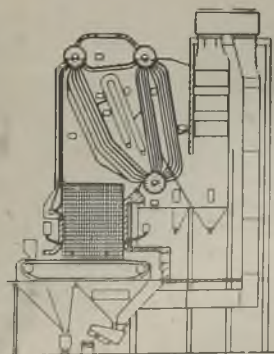
SYSTEM OF
AUTOMATIC
POWER FACTOR
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BRITISH INSULATED CABLES LTD.,

Head Office: PRESCOT, LANCs.

Telephone: PRESCOT 6571.



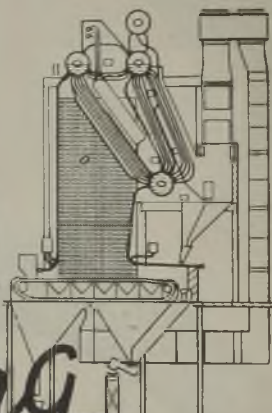
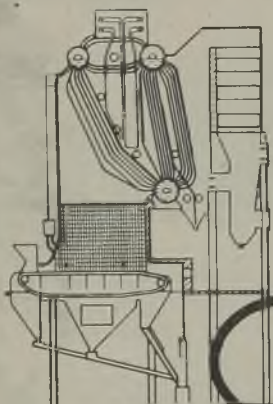


PROGRESSIVE LEADERSHIP

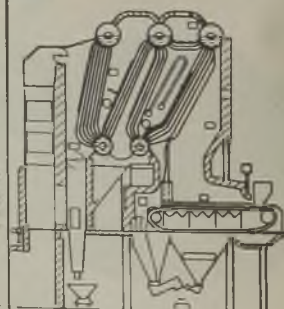
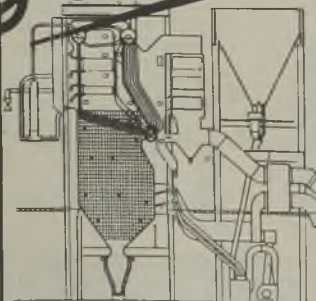
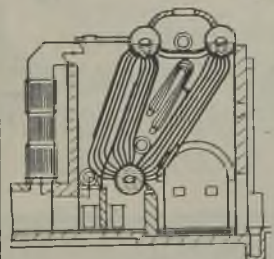
As the original of its type the Stirling bent tube boiler has had more imitations than any other basic design of boiler. That it is still the leading boiler of its kind is due to our continual striving for perfection in design, workmanship and service.

THE
STIRLING BOILER
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LONDON, E.C.A.



Stirling



The complete answer to —

Clause 4 (e) B.S. 1086:1942. Maintenance of Electrical Switchgear.
IN view of the fact that completely isolated equipment may be made alive at any time by electrostatic or electromagnetic induction, and in view of the dangers attending the earthing of equipment which is alive by direct connection or by electromagnetic induction, it is recommended that consideration be given to the use of a suitable form of live line detector of a type which provides the necessary discrimination.

THE FERRANTI *High Voltage* INDICATOR

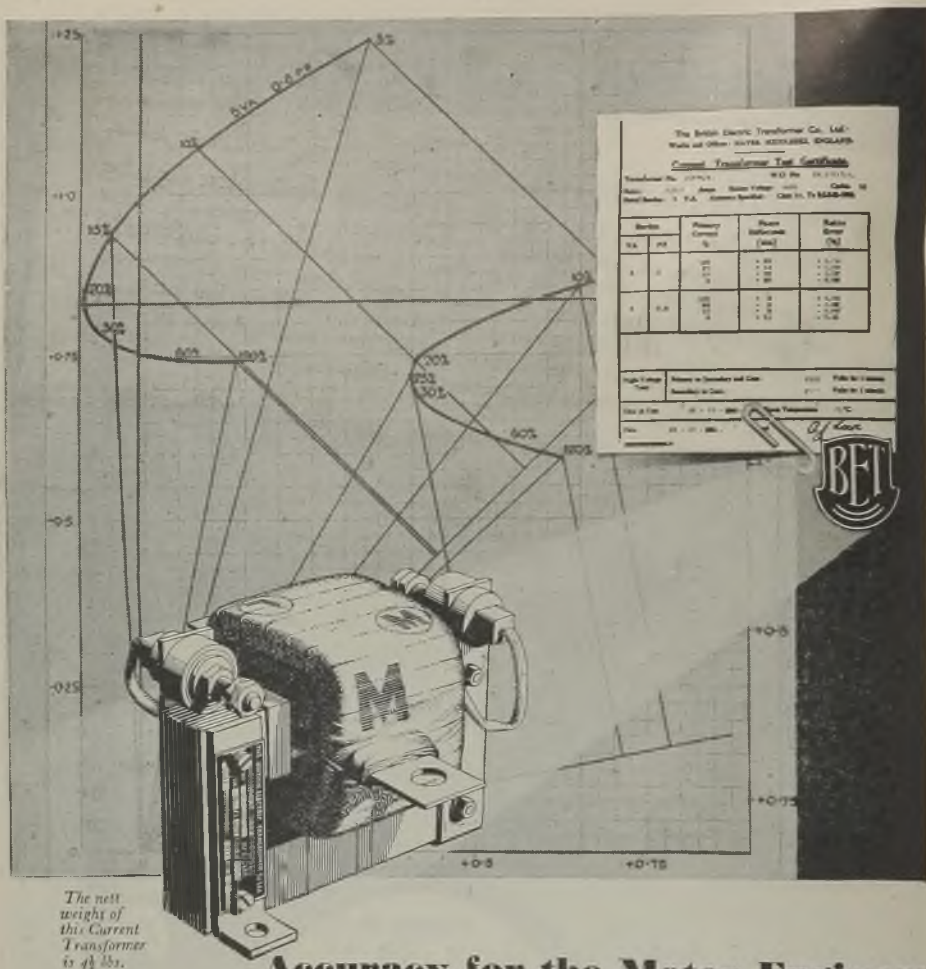
An electrostatic device giving a direct indication of the voltage to earth of the conductor being tested on systems up to 11kV.

Discriminates between —

- a. A "live" conductor connected to the system,
- b. A conductor not connected to the system, having a voltage induced in it owing to the proximity of "live" conductors; and —
- c. A "dead" conductor.



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



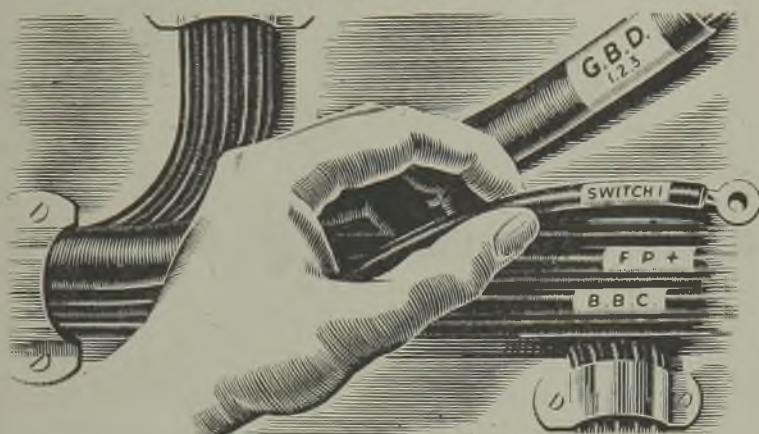
A current transformer is only as accurate as its makers know how to make it. Meter Engineers who insist on exact compliance with requirements, rely on B.E.T.'s long specialised experience and extensive production and test facilities . . .

The
British Electric Transformer
 Company Limited



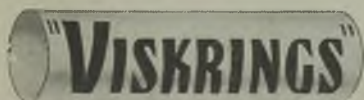
VISKRINGS CLOSE-UPS

NO.3 SERVICING...



Ask the service man which "VISKRINGS" advantage he most appreciates and he'd have a job to choose. The swift identification by colour and wording. The knowledge that being impervious to oils and petroleum they will come out in just the same condition as they went in. The fact that having originally been fitted by shrinkage the diameter of the cable is not increased. These advantages and many more, have contributed to the enormous popularity of "VISKRINGS" Cable markers.

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- INDELIBLY PRINTED
- NO RUBBER USED
- SELF FIXING BY SHRINKAGE
- IMPERISHABLE, IMPERVIOUS TO OILS AND PETROLEUM
- DO NOT INCREASE DIAMETER OF CABLE



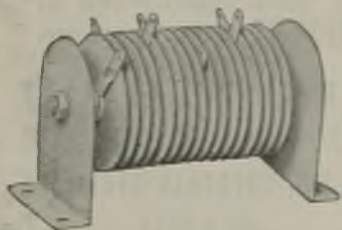
CABLE MARKERS

VISCOSE DEVELOPMENT CO. LTD.

Woldham Road, Bromley, Kent. 'Phone: Ravensbourne 2641



Serving with the ARMoured FORCES



CAN there be a more difficult test for STC Selenium Rectifiers than their service with the tanks? Imagine the conditions under which they operate — the jarring, crashing progress of the tank itself, the reverberation of its guns, the vibration of the engine, the heat and dust. But STC Selenium Rectifiers stand up to all these difficulties. In fact, wherever D.C. current is required from an A.C. source they give reliable service with complete freedom from maintenance.

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Rectifier Sales Department :
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Three Vertical Shaft
17,400 H.P. Water-
Turbine Sets

A typical example of a combined Water-Turbine and Generator Unit in which The English Electric Company specialize.



The Company's equipment has been supplied for many Public Works and other important installations throughout the world, including: Great Britain, Australia, Canada, India, Newfoundland, New Zealand, South Africa, Argentina, Brazil, Eire, Federated Malay States, Mauritius, Nepal, New Guinea, Nigeria, Portugal, Turkey.

THE ENGLISH ELECTRIC COMPANY LIMITED, STAFFORD



Messrs. Volt and Amp, Mr. and Mrs. Watt and their relatives in the Electrical family are constantly getting disgruntled because these Micanite and Insulators people will keep them in their place. Every time they try to do a bit of quiet shorting or tracking they come up against a piece of Mica or Micanite or Paxolin or Panilax or Empire tape. It's all very distressing for Messrs. Volt and Amp etc., but it's highly approved by electrical Manufacturers who must keep electricity in its place.

THE MICANITE & INSULATORS CO LTD

EMPIRE WORKS, BLACKHORSE LANE, LONDON, E.17

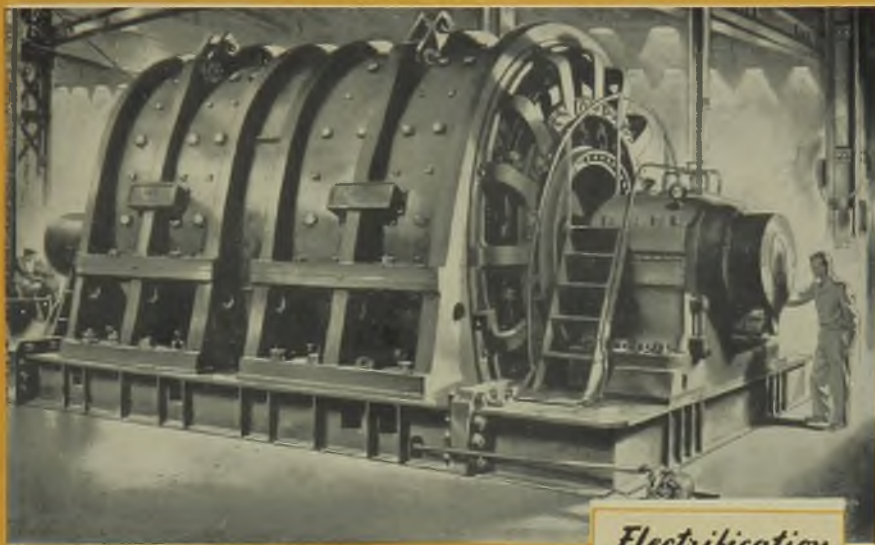


Makers of MICANITE (Built-up Mica Insulation). Fabricated and Processed MICA, PAXOLIN (Synthetic-resin bonded sheets, rods, tubes and cylinders). High Voltage Bushings and Terminals for indoor and outdoor use. Empire Varnished Insulating Cloths and Tapes and all other forms of Electrical Insulation. Suppliers of P.V.C. Extruded Tubings and Sleeveings, Vulcanised Fibre, Leatheroid, Presspahn, etc.

G.E.C.

in war — as in peace —

at the service of the Empire



Electrification Schemes

G.E.C. Electrification Schemes have been applied to all industries, including: Aircraft Factories; Chemical Works; Collieries; Food Factories; Gold Mines; Iron, Steel and Copper Works; Locomotive and Railway Carriage and Wagon Works; Motor Car Works; Ships and Shipyards; Textile Mills, etc., etc.

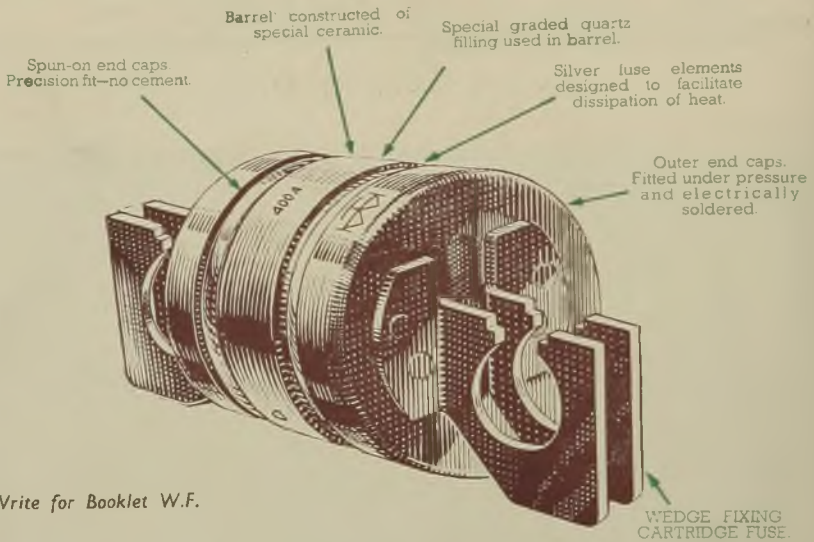
Industrial electrification schemes have required vast numbers of G.E.C. motors of all sizes—standard types, motors for individual requirements, and some of the largest motors in use for driving rolling mills and winding engines.

G.E.C. experience and resources were invaluable to the Nation when a swift expansion of industrial electrification became imperative and vital issues rested upon Britain's ability to produce munitions and supplies in ever-growing abundance. During these years when the entire resources of the G.E.C. have been devoted to the war effort the Company has made important advances in all applications of electricity, including electronics, which will be available to all concerned with electrification schemes after the war.

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Dependable H.R.C. Cartridge Fuses



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

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H.R.C. CARTRIDGE FUSES

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A man we know has worked out by means of a slide-rule and a bit of snooping that 351,429 man-hours were lost to industry on February 17th, 1944 by drilling holes with hand drills instead of Desoutter power drills. He says that the result of this immense loss of time was that when the workers came to work next day it was *really* February 18th, 1903. After a bit of a pause while our eyes stopped rolling, we said we thought there was a catch in it. We said wouldn't it be February 18th, 1985. Like British Summer Time, first you put it on and then you take it off. He said, no, it was 1903 like he said and what a terrible waste of time. He said the British were always getting ready for the previous war and this proved it. Well, we wouldn't stand for that so we slung him out and his slide-rule after him. But it's a shaking sort of a thought, isn't it? And nothing you can do about it because Desoutter Tools weren't invented in 1903.

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C.R.C. 146

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Woman's Work in
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The A.T.S.



It's a grand job of work

she's doing. Regularly getting vital convoys through. Hard work, in all hours, all weathers. When she's finally "through" perhaps she'll get her reward in a home of her own—with a Burco to help make life easier.

After hostilities, Burco's for every home will be the aim; meantime patience, please.

BURCO LTD.,
ROSE GROVE,
BURNLEY.



Burco

ELECTRIC
WASH BOILERS



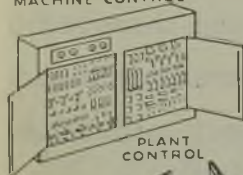
Multi-way
Multi-pole
up to 25 amps



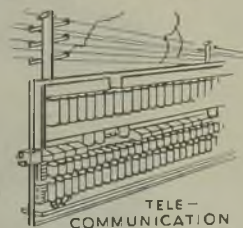
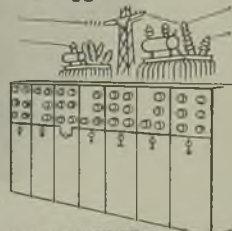
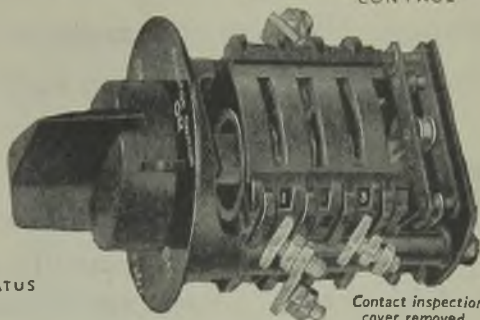
RECTIFIER CONTROL



MACHINE CONTROL



PLANT CONTROL

SCIENTIFIC APPARATUS
CONTROLTELE-
COMMUNICATIONSWITCHGEAR
CONTROLContact inspection
cover removed.

487/RS1

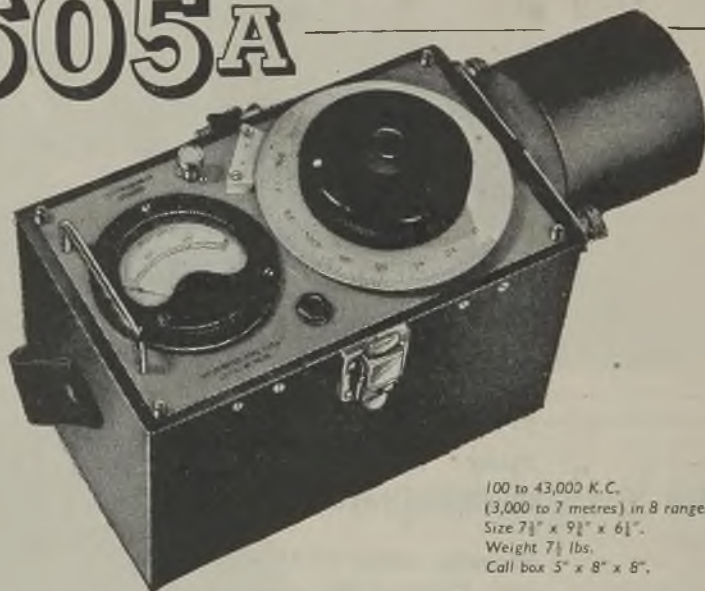
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100 to 43,000 K.C.
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Carrying box 5 " x 8 " x 6 ".

The compact, precise check on every ship and shore radio station. Used by very many senior inspectors and officers for setting and maintaining accurate frequency calibration.

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A8'43

*"The best of prophets
of the future is the
past"* —BYRON

BEHIND Alton stationary batteries stands a great tradition of painstaking effort and progressive improvement. To-day the result is reflected by the high standard of performance of Alton batteries in Power Houses, Telephone Exchanges and Broadcasting Stations. Because Alton practice is rooted in such fine tradition, to-morrow Alton batteries will be chosen for the maintenance of power supply in vital installations.

ALTON

BATTERIES OF MERIT

THE ALTON BATTERY CO. LTD.

(Sole Suppliers of FULLER Stationary Batteries)

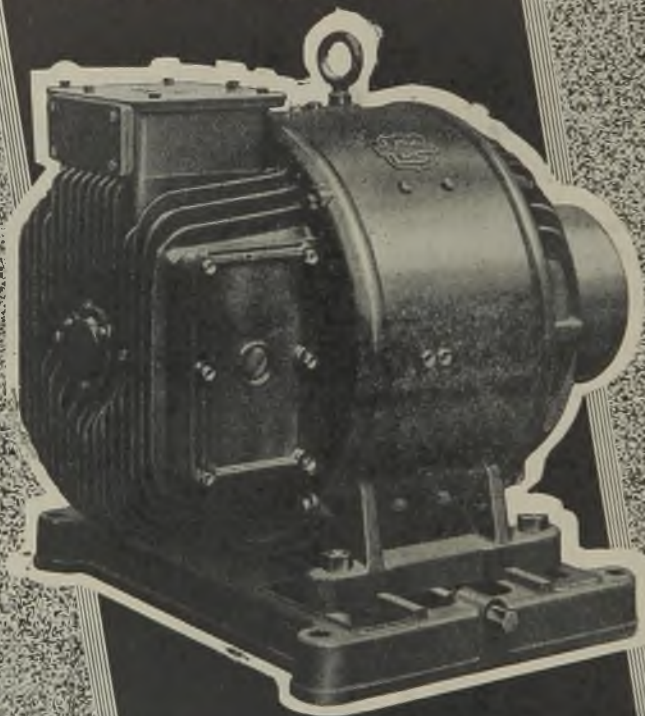
ALTON, HANTS.

Telephone: Alton 2267 and 2268
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**ABSOLUTE DUST-TIGHT
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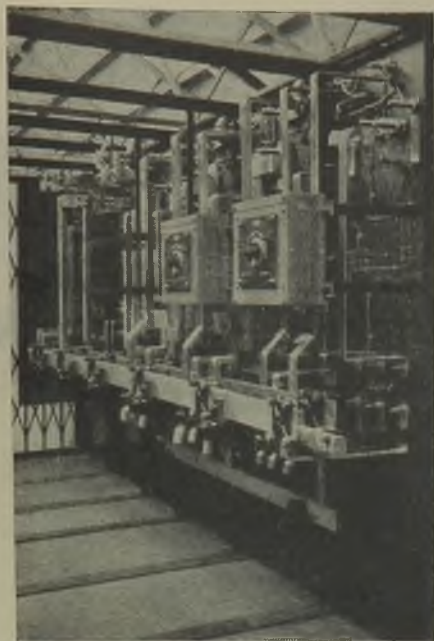
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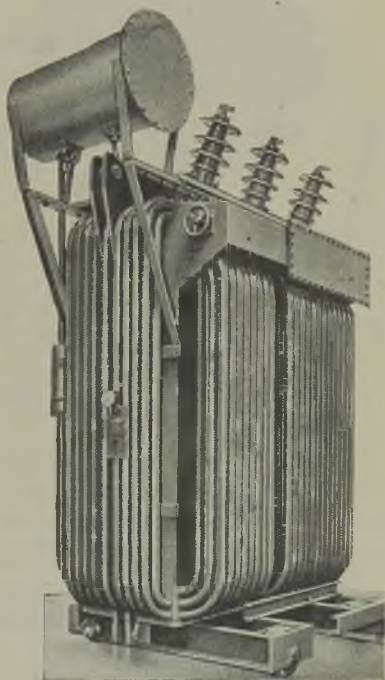
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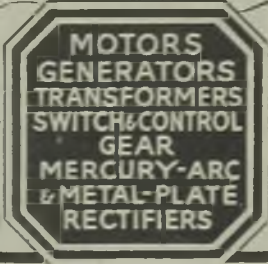
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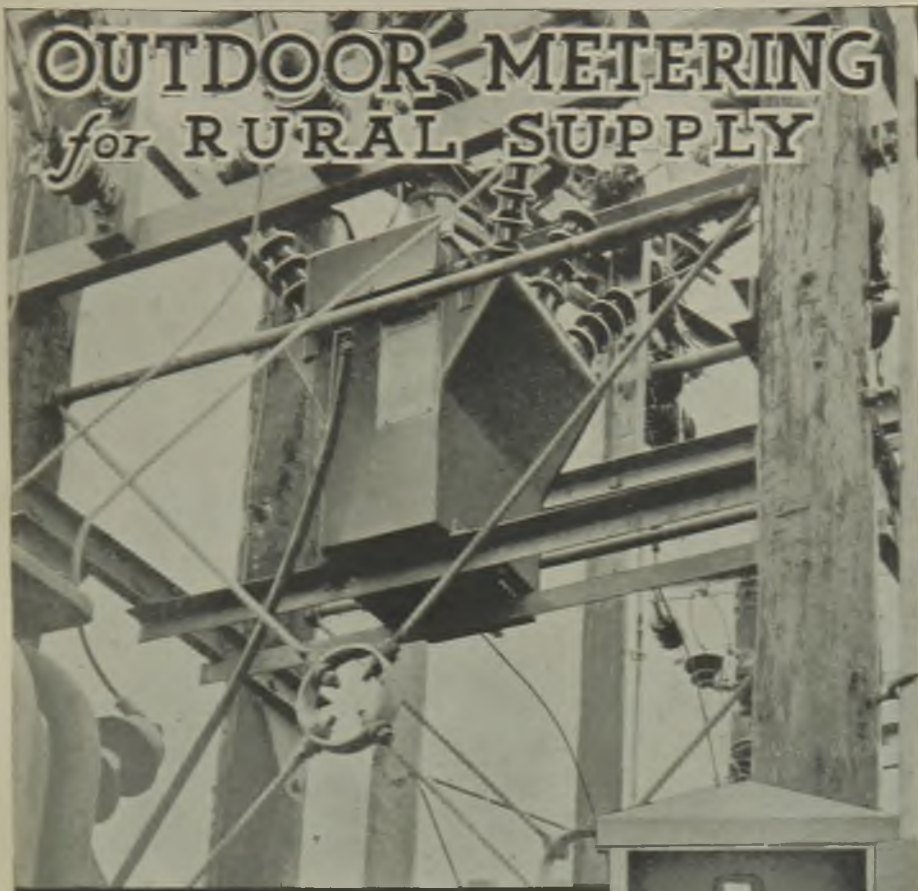
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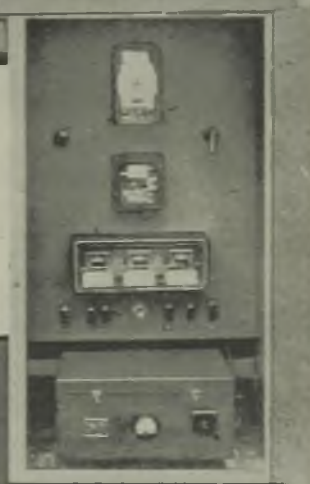


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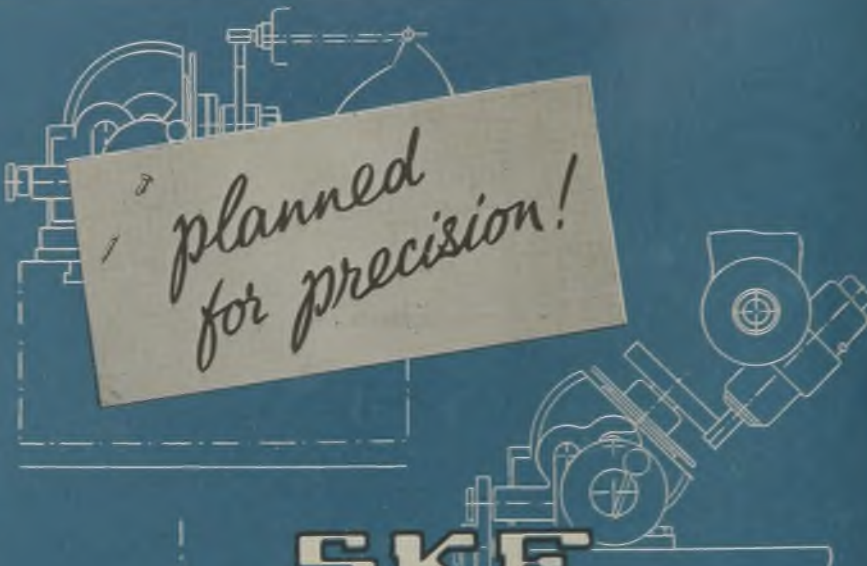
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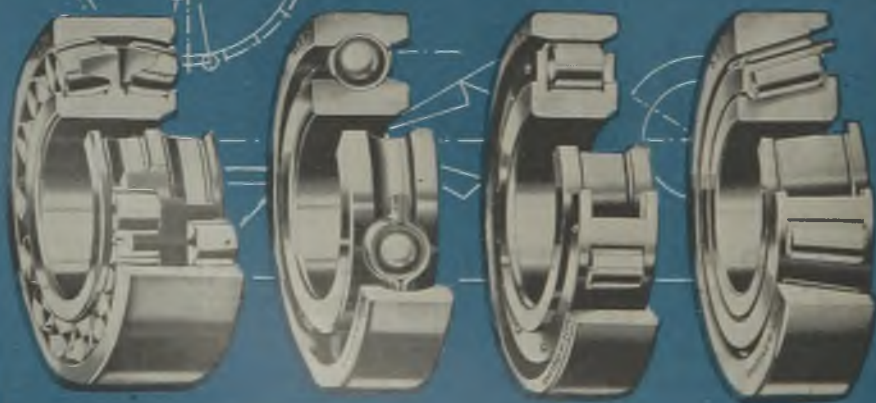
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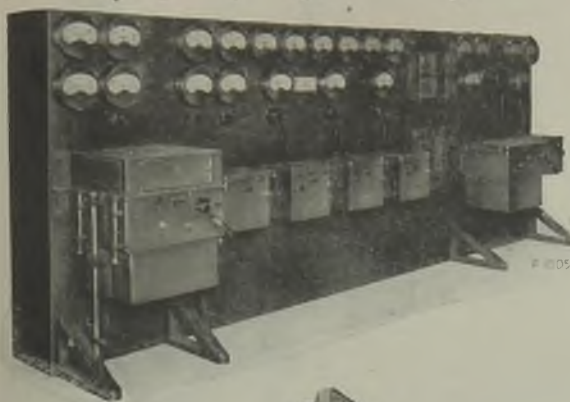
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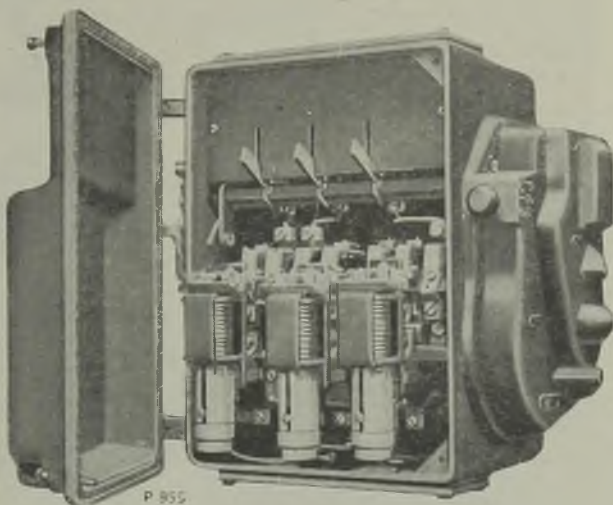


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ELECTRICAL REVIEW

June 16, 1944

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872



Vol. CXXXIV. No. 3473.

JUNE 16, 1944

9d. WEEKLY

Charges and Reserve Funds

I.M.E.A. Representations to Commissioners

EARLY in 1940 the late Captain Euan Wallace, the Minister of Transport, stated in reply to questions on the subject that he had adequate powers to control the price of electricity during the war. He did not think it necessary, however, at that time to issue any general Order or Direction under the Defence Regulations "to modify the present statutory discretion of electricity undertakers to adjust their actual tariffs within the limits of the authorised maximum prices so far as was reasonably necessary on account of the effect of war conditions upon their undertakings."

Price Control

Something over a year later, the late Sir Kingsley Wood, then Chancellor of the Exchequer, dealing with the control of prices of commodities and services, said: "The general policy of restricting increases in prices to a minimum will apply to the prices of coal and gas and also electricity charges."

Acting upon this later dictum the Electricity Commissioners have kept a firm hand upon price increases and while many undertakings were able in the first year or so of the war to put up their charges to meet altered conditions, since then many have been refused permission to do so. The Commissioners have considered that while undertakings have reserves to fall back upon they should not raise prices.

This matter has been under consideration by the Incorporated Municipal Electrical Association for some time and it is raised again in the Association's annual

report which is reviewed in this issue. Reference is made to the possible "financial embarrassment" of undertakings by the end of the war by reason of the depletion of their reserve funds. The policy of using reserves in this way is thought to be detrimental to the future well-being of electricity supply and should be "reviewed without delay." There is said to be a possibility that at the conclusion of hostilities undertakings will be faced with the necessity of raising charges and it is apparently considered better that this should be done now rather than then.

It can reasonably be held that reserves may properly be regarded as "price equalisation" funds, but this can apply only to the normal ups and downs of business. Where the trend is consistently downward it may be unwise to exhaust the reserves before endeavouring to arrest the trend.

Commissioners' Decisions

The ban upon the publication of accounts makes it impossible to obtain a complete picture and thus have at hand all the facts necessary for a proper appreciation of the position. Some undertakings have been permitted to raise their charges, but in the absence of figures it is not easy to ascertain why—and why others have not been allowed to. No doubt the Electricity Commissioners make their decisions according to certain sound principles: it would be interesting to have a statement from them on the subject.

Meanwhile we have a rather incongruous situation. Undertakings that have not

suffered (maybe have actually benefited) from war conditions are able to keep down their prices and still build up reserves, and even continue to contribute to the rates. At the same time others are "living on their fat" and are being forced to use up reserves which they may badly need after the war. It was suggested at one time that a pool should be formed into which prosperous undertakings should pay and from which those with deficits could draw. Although this may seem to be an obvious solution there are strong arguments against it, one of which is that applied to the subsidisation by urban consumers of those in rural areas. It is to be hoped that the discussion of the subject between I.M.E.A. representatives and the Commissioners will lead to an amelioration of conditions for war-affected undertakings.

ARGUMENTS on technical

Selected grounds for and against Stations the transfer of selected stations to the Central Electricity Board, as advocated in the "Brown" Memorandum of the Incorporated Municipal Electrical Association, have recently been advanced in this journal by Messrs. J. A. Sumner and J. F. Field. The authors succeeded in showing that there is much more to be said on either side than might be apparent to those without specialised experience in generation. In this issue we summarise the reasons advanced by municipal owners (to which we referred last week) in favour of maintaining the present relationship between them and the C.E.B., and against the introduction of a national standard bulk supply tariff. The two aspects are associated.

THE I.M.E.A. dissentients fear the loss of an important incentive to economy if local control

Bulk-Supply Tariffs of generation is eliminated and if any price advantages enjoyed by consumers in selected-station areas are not retained. While the professional keenness of engineers is likely to mitigate the first, there is a point about the second that has not, as far as we are aware, been raised. Selected stations are normally in industrial areas where very low prices per kWh are necessary to secure certain loads. Although the Central Electricity Board has powers under the 1935 Act to quote non-standard rates

to undertakings in respect of loads when special circumstances can be shown to exist, this proviso, as it stands, may not be flexible enough for commercial load building.

Birthday Honours

THE principal "electrical" name in last week's King's Birthday Honours is that of Mr. Frank

Forrest, whose contribution to electrical progress as head of one of the largest municipal undertakings is recognised by the award of the C.B.E. Several industrialists are included in other awards of the Order of the British Empire, notably Messrs. J. M. Dodds (Metropolitan-Vickers) and G. S. C. Lucas (British Thomson-Houston Co.), who receive the O.B.E. Among those who are appointed members of the Order are officials of a number of the principal electrical companies and it is noteworthy that research activities are given a substantial degree of recognition.

Of the several ways of Saving Coal economising the national fuel resources by the use

of electricity which were discussed by Mr. W. Wakefield Adam in his address to the Institute of Export (reported in this issue) the most promising is provided by the railways. Taken in conjunction with the great reduction in the amount of coal used and the ability to use inferior qualities, the many other advantages stated in the Weir Report make electrification commercially practicable. Mr. Adam's estimate of savings from the complete electrification of coal mines seems to be on the high side, since under certain conditions it is not permissible, and available data indicate that the potential output from water power development is likely to be considerably less than he anticipates, if—as he suggests—energy is to be produced much more cheaply than by coal.

SINCE the life of the Underground coal reserves that can be Gasification worked economically in

this country appears to be limited, attention might well be given, as Mr. Adam suggests, to Ramsey's original idea for gasifying the coal in the mines. In this way, it is said, 80 to 90 per cent. of its heat value could be utilised instead of about 60 per cent. as in present practice, and low-grade fuel and abandoned seams

could be made productive. Steps have already been taken in Russia in connection with the generation of electricity on these lines and it would be a notable contribution to lease-lend in reverse if Soviet experience were placed at the disposal of British engineers.

FURTHER investigations into the way in which **Short-Circuits and Cables** cables stand up to short-circuits in service are described in this issue by Mr. E. A. Beavis. These demonstrate the effects of sectional area of conductor and duration of fault, which would possibly warrant an increase in ratings of the larger sizes. They also have a bearing on the controversy regarding the advisability of burning faults clear on distribution networks, since the insulation of the relatively large conductors normally employed at voltages lower than those referred to in Mr. Beavis's article should suffer much less harm from heavy excess currents.

Gas Industry Inquiry **HITHERTO** the attention of the Government seems to have been devoted mainly to electricity supply although it may claim to be much better organised than the gas industry. Already that industry has produced a reorganisation plan (*Electrical Review*, November 5th, 1943, p. 605) providing for a Gas Corporation, Joint Gas Authorities and joint working arrangements between undertakings. All the same the Ministry of Fuel and Power has decided to inquire into the structure and organisation of the industry and has appointed a committee somewhat analogous to the McGowan Committee on electricity supply. It may be recalled that the gas industry's own plan gave attention to the alleged merits of gas as compared with electricity. The report was over-weighted in fact, by considerations of "co-ordination and control," as between gas and electricity. It may be taken for granted that much of the evidence presented to the new committee will be of a somewhat similar character and an eye should be kept on the proceedings.

Growing Pains? In a comment on the setting-up of the committee, *The Times* says that its report, with earlier reports, will give the Government all the material it requires "for proceeding with-

out delay to promote a progressive reorganisation of two vital service industries, one of which, electricity, is suffering chiefly from growing pains, while the other, gas, is once again, as after the last war, faced with the necessity of re-adaptation." This, at least, recognises the still-advancing nature of electricity, although the term "growing pains" again suggests that "infancy" in which the electrical industry has been (according to too many speakers) for the last thirty years. Surely we may claim by this time to have reached adolescence?

Competition and Choice **THE** article mentions the question of co-ordination of use of gas, electricity, coal and oil and admits that "the relative efficiency of gas and electricity can only be tested by allowing as wide a field of competition between the two industries as is compatible with national needs and due consideration must also be given to the preferences of the consuming public." These sentiments are now becoming platitudinous. We have to go further into the matter and decide how national needs (as variously interpreted by various "authorities") can be squared with the public's preference. There will often be considerable divergence.

Location of Industry **ONE** of the points made in the White Paper on Employment Policy was that the Government proposed to exercise a substantial influence over the location of new industrial development, as contemplated by the Barlow Report on the Distribution of the Industrial Population. Mr. Dalton, the President of the Board of Trade, said in the House of Commons last week that the Government proposed a ban on further development in certain areas and that new factories would be built only in regions where they were required to give employment. His lieutenant, Captain Waterhouse, gave an assurance that the policy of the Government was to proceed by persuasion, not coercion. The subject is one of the closest interest to the electrical industry, for much of the post-war industrial development will be electrical. The selective location of industry will be greatly facilitated by the availability of electric power in practically any part of the country, thanks to the grid.

Burn-outs in Cables

Damage Caused by Short-Circuits

IN previous articles* the author described certain peculiar faults which occurred in an 0.023 sq. in. 6.6-kV feeder resulting primarily from a short-circuit on the system caused by bomb damage. Owing to the large fault kVA capacity available at the main substation the insulation of the cable for the first 130 yd. was completely destroyed and that of the remaining section (about 560 yd.) had deteriorated owing to the high temperature to which it had been subjected. A short length of 0.05 sq. in. cable of similar type connecting the same feeder to the station bus-bar was discovered to be practically undamaged.

Another feeder of 0.1 sq. in. section from the main substation, running along the same route in close proximity to the smaller cable, was damaged at the bomb crater, but showed no general depreciation resulting from short-circuit. The investigation emphasised the potential danger of subjecting comparatively small cables to heavy short-circuits and indicated the extreme importance of the time element in the tripping of the circuit-breaker.



Fig. 1.—Fault showing twisted and broken 0.15 sq. in. conductor forced out through burst in the lead sheath

Incidentally, analysis of various samples of these cables tended to point to the ability of the conductors to attain much higher temperatures than those so far considered permissible before any damage becomes apparent in the dielectric.

The matter is of importance to supply undertakings since it implies that size of cable (particularly with small conductors) is governed by the total short-circuit current rather than by the actual load and depends upon the safe limiting temperature in conjunction with the time operation of the circuit-breaker.

More recently I have had the opportunity

of gathering further evidence on short-circuit damage to cables. In the first example, a three-core 0.15 sq. in. 11-kV s.w.a. cable was damaged by short-circuit resulting from a bomb explosion. The cable was in service at 6.6 kV and the breakdown occurred during light load at a point about 200 yd. from the supply station, which is fed from a 66-kV main through two 15,000-kVA step-down transformers. Apart from the burn-out at the crater, subsequent faults developed in the cable at other positions within 50 ft. or so of the main switchboard.

One of the supply transformers was also damaged, which apparently put the tripping gear out of action, causing the circuit-breaker to become inoperative. The fault current was ultimately broken by the cutting-out of the 66-kV bulk supply after approximately five seconds.

The sequence of events is reminiscent of that previously described in the case of the 0.023 sq. in. 6.6-kV cable—a preliminary breakdown followed by secondary faults nearer to the supply, consequent upon the excessively high temperature produced by prolongation of the short-circuit. In the present instance, however, we are concerned with a much heavier conductor but also a greatly increased time period.

The two faults examined showed somewhat similar characteristics. Conductors were discoloured and



Fig. 2.—Belt insulation cracked along the lay of the cores

oxidised, twisted and deformed with broken strands showing signs of fusing at the tips and in one case completely broken apart and partly melted. Core-insulating papers were split and badly charred and belt insulation had burst, showing burnt edges. The lead sheath was split wide open for several inches and wire armour forced apart—one fault actually had a steel wire broken.

The appearance of a fault after removing the outer protection is illustrated in Fig. 1, which shows the twisted and broken conductor of one core forced out through the burst

* *Electrical Review*, March 13th and 20th, 1942. As before, the investigations were carried out in the cable test and development department of Siemens Bros. & Co., Ltd.

in the lead sheath. These breakdowns were not electrical in character but had apparently resulted from sudden expansion and pressure generated by the exceptional heat created in the conductors.

Analysis of the sections of the cable beyond the immediate vicinity of the faults revealed that the first three papers at least over the core had been completely charred and that the next two or three had been partly burned and were very brittle. The outer-core surface was carbonised slightly along line of contact with other cores with the papers particularly loose on one core.

Belt insulating papers were split through spirally along the length of lay between two of the cores, with signs of burning on the edges of the burst, and the inner papers were dry; jute filling between cores under the split in the belt was partly charred. (See Figs. 2 and 3.)

The disintegration of the impregnated paper tapes adjacent to the conductor had generated gas under pressure. Forces were created of a magnitude sufficient to crack the envelop-

These calculated values assume a symmetrical short-circuit between conductors and are only approximate, tending to over-estimate the temperatures by neglecting fault

resistance or absorption of heat by the cable impregnating compound and insulating papers, which must occur in a period of such long duration.

There is no question however that, from the chemical and physical evidence afforded by the damaged insulation, the conductor temperature on the main run of cable has well exceeded 500 deg. C. and may possibly have reached nearly 1,000 deg. C. in the short section at the station end.

The second instance relates to faults in a three-core 0.05 sq. in. feeder d.s.t.a. cable of the fully insulated type,

with a B.o.T. copper sheath and protected with steel-tape armour which, after many years of satisfactory service at 6.6 kV had been put into operation at 11 kV. Nearly twelve months later a fault developed which was cut out, a short length of new cable being jointed in. Preliminary inspection

indicated the possibility of a dual fault, as two samples—separated by several feet of cable—showed signs of severe damage to the lead

sheathing. Further investigation, however, revealed one of these—that nearer to the supply side—to be in the nature of a small blow-out, not an electrical fault, which was undoubtedly a result of the short-circuit.

The initial breakdown evidently took place between two phases, and a large hole (about 3 in. long) was burnt in the cable sheath.



Fig. 3.—Section of cable showing cracked belt and loose core insulation

Time in sec. . .	0	0.54	0.97	1.32	1.63	1.92	2.18	3.13
Temperature rise, deg. C. . .	0	100	200	300	400	500	600	1,000
Current—A . .	17,000	16,800	16,400	16,000	15,600	15,100	14,700	13,000

ing belt of insulation, and to burst the lead sheath at certain points. At these positions the conductors were torn apart and also partially fused, showing that the copper temperature must have approached melting point in the vicinity of these blow-outs.

Allowing for the impedance of transformers and bus-bar reactor, the fault capacity available at the station was calculated to be about 220,000 kVA. Including the impedance of 200 yd. of 0.15 sq. in. cable, the short-circuit kVA at the initial breakdown was 195,000, and the instantaneous current approximately 17,000 A. Neglecting any change in circuit constants due to resistance temperature effects, this gives the rate of rise in conductor temperature as 155 deg. C. per sec.

A more accurate determination of the time/temperature relation, taking into account the increasing conductor resistance and the corresponding decrease in the value of short-circuit current is given in the table reproduced above.



Fig. 4.—Burn-out in lead sheath on 0.05 sq. in. cable

Traces of molten lead with deposits of copper (from the B.o.T. tapes) and carbon, which were present on the inner side of the sheath, gave indications that hot gases had passed along between the interstices of the copper tapes, the impressions of which were embedded deeply in the lead. At the position of the actual "short," the two conductors had at least $\frac{1}{2}$ in. of copper completely melted away and were partially fused for another inch or

to the expansion of the lead sheath. The damage to the insulation in the intervening section was severe. The belt was split through and badly carbonised, especially the inner parts, where the papers had been decomposed along a channel between two of the cores, the jute filler having completely burnt away. The core papers were also burnt on the outside layers, dry and brittle inside with at least one paper next the conductor partly charred. The inter-strand compound was blackened and presumably decomposed.

Just beyond the breakdown position the deterioration of the cable insulation was less apparent, there being only slight traces of carbonisation on the outer papers. Although the belt papers were badly cracked there was no general split throughout, and

the core papers did not appear to be affected to any appreciable extent.

Analysis of these samples indicates much more extensive damage than would normally be expected from such a type of breakdown. Evidently a quantity of gas has been generated in the vicinity of the fault by the decomposition of the impregnated paper insulation. The scorching of one or more of the papers next



Fig. 5.—Underside of lead sheath showing deep impressions of B.o.T. copper tapes with carbonaceous deposits

so, thus signifying that an extremely high local temperature must have been sustained. The external appearance of the breakdown and inside view of the sheath are shown in Figs. 4 and 5.

At the position of the subsidiary fault another and somewhat smaller hole in the sheath had been observed, and very prominent rib markings were found on the lead where it had bulged out through the gaps between adjacent turns of the lower steel tape (see Fig. 6). Similar bulges also showed up in the B.o.T. sheath, denoting that a high internal pressure had been set up. Blackening was found on the under side of the lead sheath and copper tapes due to carbonaceous deposits.

The belt insulation was split throughout the length of the sample, on the line of one of the cores, and charring of the surface had occurred. The jute fillers and outer three or four core papers were partly carbonised, but the remaining core insulation, including the first few papers next the conductors, appeared to be normal.

In the cable samples immediately adjacent to these faults, it was found that the armour tapes had cut through the jute bedding owing



Fig. 6.—Subsidiary fault, showing rib markings on lead sheath and B.o.T. tapes with small burst

the conductors over a section of the cable seems to indicate that some of the heat of the breakdown was transmitted back along the copper for several feet, raising its total temperature to the region of 300 deg. C. The hot gas traversed the cable for a distance

of some yards passing through the scores and over the belt, charring the surfaces and depositing carbonaceous matter. The very



Fig. 7.—Section of three-core 0.15 sq. in. 33-kV cable at point of breakdown

high internal pressure and temperature caused the belt to split, and expanded the sheath to such an extent as to produce a small burst at the weakest spot, whilst the bulging of the lead was most severe.

Beyond the limited range covering the particular effects described above the cable did not appear to have sustained any damage, the general condition of the insulation was considered to be quite satisfactory.

The short-circuit data are as follows. At the supply substation the total rupturing capacity is 130,000 kVA, and at the breakdown about 750 yd. away along the cable route the fault capacity was 101,000 kVA. The initial short-circuit current was approximately 5,300 A, and the time of duration 0.6 sec. before cutting out. From the circuit data the calculated time/temperature effects are as given in the following table.

It is evident, therefore, that with a short-circuit current around

5,000 A over this time period the temperature rise would not exceed 100 deg. C., and that only localised damage could have been sustained by the cable.

The third example concerns a three-core 0.15 sq. in. 33-kV "H"-type s.w.a. transmission cable which broke down owing to external damage which caused severe flattening of the section over a small circumscribed area. Except for change in shape the appearance of outer servings and armour gave no

Temp. rise deg. C.	0	10	30	50	70	90
Time in sec.	0	0.073	.21	.35	.48	.61
Short-circuit current, A	5,300	5,240	5,170	5,080	5,000	4,920

indication of the failure, but on stripping it was found that the lead sheath had melted away at one spot. The core in the immediate vicinity of this burn-out was damaged but the other two cores appeared unaffected. At the fault the insulation was badly carbonised over a section of this core right through to the conductor, which was partly fused. The paper layers were distorted and loosened, and traces of carbonisation were apparent for several inches on either side of the actual breakdown, but within a few feet the condition of the cable was quite normal.

A photograph of a styrenated section of this cable at the fault can be seen in Fig. 7. The cable was in parallel with a similar cable supplying one transformer of a large feeder

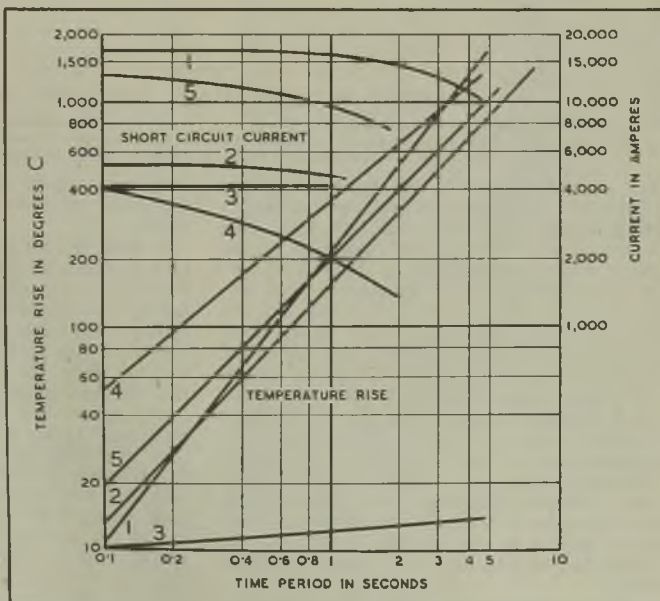


Fig. 8.—Short-circuit currents and rises in conductor temperatures

station for distribution at 6.6 kV. The short-circuit capacity of the main generating station was 660,000 kVA and at the point of breakdown the fault kVA was 340,000. The total route length between stations was 21,425 yd. and the failure occurred at a distance of 11,936 yd. from the 33-kV power board.

Both cables supplied current to the fault, the heaviest short-circuit current through the faulty cable was just over 4,000 A for 1.32 sec. Neglecting any fault resistance this current would have remained approximately constant over the time period, the temperature rise produced being little more than 12 deg. C.

The final instance is of a joint in the three-core 0.023 sq. in. 6.6-kV d.s.t.a. cable referred to in the article of March 20th, 1942. The short-circuit kVA at the station was 260,000

deg. C.—during the short-circuit, which could not have exceeded one second, had been sufficient to destroy the integrity of the joint.

The short-circuit data concerned with these various faults have been collated in the table below and plotted in Fig. 8. Examples 4 and 5 relate to the article of March 20th, 1942, but whereas No. 4 sustained damage as stated above, No. 5 escaped injury. The period of the initial failures in Nos. 1 and 4 could be only approximately deduced, as subsidiary faults developed during the short-circuit.

The various short-circuit effects which have been reviewed here cover a fairly representative range of cable sizes in common use—more particularly perhaps with respect to the smaller conductor sections. These, however,

CABLE SHORT-CIRCUITS

Type of cable	System voltage	Station short-circuit kVA	kVA at fault	Short-circuit current, amperes		Duration of fault, seconds	Conductor temperature rise, deg. C.	Damage to cable insulation
				Initial	Final			
(1) Three-core 0.15 sq. in. 11 kV, s.w.a.	6,600	220,000	195,000	17,000	10,000	5.0†	700-1000	Five papers over conductor carbonised; belt split and partially burned; gas pressure developed.
(2) Three-core 0.05 sq. in. 6.6 kV, d.s.t.a.	11,000	130,000	101,000	5,300	4,900	0.6	90	Undamaged.
(3) Three-core 0.15 sq. in. 33 kV, s.w.a.	33,000	660,000	340,000	4,150	4,150	1.32	12.4	Undamaged.
(4) Three-core 0.023 sq. in. 11 kV, d.s.t.a.*	6,600	260,000	58,000	4,900	2,150	0.9†	300	Two papers over conductor charred and next two papers discoloured and brittle. Solder melted in conductor joints.
(5) Three-core 0.1 sq. in. 6.6 kV, d.s.t.a.*	6,600	260,000	150,000	13,200	9,600	1.02	200	Undamaged.

* Examples (4) and (5) given in article of March 20th, 1942. † Subsidiary faults developed during the short-circuit, so that the actual duration of the initial failure can only be approximately deduced.

and at the fault 58,000. As regards the cable insulation, two papers nearest the conductors were charred and the next two were discoloured and brittle. The condition of the joint when examined at a later date corroborated the estimated temperature put forward at that time. This joint was cut out from a position about 218 yd. from the main substation. It was therefore subjected to the initial short-circuit of 4,900 A, but was outside the range of the subsequent faults. In appearance the joint showed little sign of damage; the lead sleeve was slightly indented and, on opening up, the black compound and rolls of insulating paper were found in good condition, although the latter were slightly slack on one end. The conductors, however, were not adhering to the jointing sockets, as the solder had melted, and were pulled out quite easily.

The temperature to which the conductors had been subjected—estimated at nearly 300

are economically the more important from the point of view of short-circuit requirements.

A great deal of experimental data is necessary in order to define, with any surety, the maximum temperature which can be attained during short-circuit before permanent deterioration of the cable takes place. This will vary no doubt with the size of copper, but may also depend upon the time period involved, so that the extent of damage sustained in any instance becomes a function of time \times temperature. It has been discovered by laboratory tests that oil-impregnated paper starts to carbonise in free air at about 250 deg. C. and becomes completely charred at 300 deg. One gramme of paper gives off about 1,000 c.c. of gas at atmosphere pressure on decomposing, losing nearly 75 per cent. of its original volume. This accounts for the high pressure developed in the confined spaces of the cable above a temperature of 300 deg.

From the limited amount of evidence available, 300 deg. C. would seem sufficient to damage the insulation in a cable of small section, whereas 200 deg. C. appears to cause no deterioration with a cable of somewhat larger size. In both cases the short-circuit period was of the order of 1 sec. and, in view of possible adverse effects of duration, it seems inadvisable to contemplate any longer periods for practical operation.

The results of inadvertently prolonging the cut-out time to several seconds can be disastrous even to a 0.15 sq. in. section, as shown by the first example. Possibly, however, deterioration or damage to the cable will not prove to be the deciding factor, but rather the risk entailed of softening the soldered con-

ductor joints. In these circumstances it is doubtful whether the limiting conductor temperature for short-circuit conditions could be permitted to exceed 200 deg. C. This limit, however, represents a fairly big increase over the present accepted maximum, but should it become allowable the short-circuit currents could be increased by more than 50 per cent. The whole question of short-circuit requirements has been under consideration for some time now by the cable authorities, as it has been recognised that the present limitations are somewhat inadequate for modern practice. Further recommendations as to the safe currents under short-circuit conditions for various conductor sizes will no doubt be put forward in the near future.

Municipal Electricity

I.M.E.A. Report for the Past Year

ALTHOUGH, as we reported last week, it has been considered desirable to postpone the annual general meeting of the Incorporated Municipal Electrical Association, which was to have been held next week, the Council's report for the year 1943-44 has been circulated to members.

Most of the Council's attention during the year has been given to consideration of plans for post-war electricity supply and the report briefly summarises its activities in this direction, special reference being made to the memorandum prepared by the Association itself and that produced jointly with other sections of the industry. In this connection reference is made to the reconstitution of the Joint Committee of Electricity Supply Organisations. This body, *inter alia*, has considered trading relations with the Central Electricity Board; flat-pin plugs and sockets; war damage to public utilities; expenditure on post-war schemes; matters relating to town and country planning; and injuries to employees.

The report says that the Association's Centres have been active during the year. Membership of the Association is now 348, representing 95 per cent. of the municipal electricity undertakings in Great Britain. The Burgh of Oban has joined the Association since the last report appeared.

Reference was made in the 1942-43 report to the serious results upon undertakings' finances of the substantial increases in coal prices coupled with the inability of authorities, in certain cases, to reimburse themselves by increasing charges. The use of reserve funds to meet the situation is regarded as a detrimental policy as it may result in undertakings being financially embarrassed at the end of the war.

In some cases the latest increase of 3s.

per ton in the price of coal has resulted in the running charge, in the case of large consumers with agreements embodying a coal clause, being in excess of the running charge for domestic consumers.

It is considered of the utmost importance that the general ban on increasing electricity charges should be removed and representatives are to discuss the matter with the Electricity Commissioners.

For many years past the Association has had under considera-

Mr. W. P. Lilwall (Fleetwood) is president of the I.M.E.A. for 1944-45



tion, intermittently, the desirability of an alternative to B.S.S. 546 for flat-pin plugs and sockets. The matter had been deferred by the British Standards Institution, but last year the Council raised it again. As the outcome of a report of the Electrical Installations Committee of the I.E.E. it suggested that for post-war installations in dwellings the standard 15-A socket was larger than necessary and that a 10-A three-pin socket with fused plug would meet all requirements. At the same time the Council contended that a flat-pin type of plug should be available and that an alternative specification should be produced. The request was supported by E.D.A. and the Joint Committee of Electricity Supply Organisations and the matter is still being considered by the B.S.I.

With regard to bulk supply charges, the report states that the Ilkley U.D.C. has

applied to the Commissioners for a determination of Section 13 terms, as provided for by the 1926 Electricity (Supply) Act. So far the outcome of the application is not known. Members of the N. W. England and South Cheshire Local Authority Electrical Undertakings Association are still negotiating with the North Wales Power Co. for an adjustment of bulk supply terms.

Last year reference was made to steps taken to reimburse to the Central Electricity Board increased costs of operation under wartime arrangements. Certain "heads of agreement" were arrived at and it was proposed to implement these by a Defence Order. It has not been possible to do this and the Council has therefore recommended members to honour the arrangement as a "gentleman's agreement."

Central Board Charges

An *ad hoc* committee representative of the various supply associations last year asked the Electricity Commissioners to investigate the existing tariffs and charges for supplies made by the Central Electricity Board. The Commissioners replied that it was not at present opportune to proceed with such an investigation until it was known what the Government proposed with regard to the post-war reorganisation of the electricity supply industry.

An agreement has been reached between the Association and the Water Tube Boiler Makers' Association establishing a formula for calculating price adjustments in contracts arising from variation of the cost of materials and labour. The formula applies to all contracts entered into since the beginning of the war.

It was mentioned in the last report that the special Joint Committee on the standardisation of meters had been revived. The Supply Section of this Committee recommends a reduction in the number of standard meters and suggests the following sizes:—40 W (5 A normal, 10 A maximum); 100 W (25 A and 50 A); 200 W (50 A and 100 A); and 400 W (100 A and 200 A). The wattage indicated is that which it is recommended the meters should record accurately within the Electricity Commissioners' requirements and is for guidance only; it will not necessarily be shown on the meters. The manufacturers are now considering these recommendations.

At the instance of the Association, the Conjoint Conference of Public Utility Associations considered the matter of a claim for compensation for abandoned mains and cables made by the Bethnal Green Electricity Department. The cables in question were in an area scheduled for redevelopment and would thereby be rendered useless. The London County Council repudiated the claim, which was made under Section 49

of the Housing Act, 1936. It was pointed out that the same position would arise in other parts of London and elsewhere and it was decided to take counsel's opinion on the matter. The Conjoint Conference also considered coal prices, demurrage on coal wagons, and mains and cables in highways.

To ensure local authority representation of Centres on the Council the Regulations for the Conduct and Management of Centres have been amended.

The publication of the Bill dealing with war damage to public utility undertakings is still awaited. It is understood that the delay is due to the intricacies involved in the preparation of this measure.

Under the draft Town and Country Planning (General Interim Development) Order, 1943, it was provided that two consents were necessary to the erection of overhead lines, etc. It was felt that this would lead to unnecessary delay and might be the means of retarding rural electrical development. At a conference the Minister of Town and Country Planning suggested that the Order might be given a six months' trial and then if difficulties had arisen he would be prepared to reconsider the matter.

After further considering the position, the I.M.E.A. Council suggested amendments and informed the Minister that local authority electricity undertakings were able to give practical assistance to planning authorities so long as such co-operation was not inimical to their future development.

Other matters dealt with during the year included minimum charges to consumers; wear and tear allowances for cooling towers, generating plant and meters; and the allocation of general administration charges. The Joint Committees with B.E.A.M.A. and E.L.M.A. continued to meet during the year. The National Gas and Electricity Committee met once but through the sub-committee continues to advise the Minister of Fuel and Power on matters appertaining to rationing. The Committee still holds the opinion that in the present circumstances rationing is unnecessary.

Colliery Mechanisation

AMERICAN mechanisation methods were discussed at the annual meeting of the Mining Institute of Scotland held in Glasgow. Reference was made to experiments which are being carried out by the Fife Coal Co. and the Lothian Coal Co.

Mr. A. M. Bryan, Shotts Iron Co., said that American practice would require many adjustments for success in Scotland. Outlook and methods of management and personnel would require some changes. Full results could not be expected at once.

Mr. John Finlay, Uddingston, was re-elected president, and Mr. Theodore Ashley, O.B.E., Edinburgh, formerly H.M. Divisional Inspector of Mines for Scotland, was installed as secretary.

Municipal Selected Stations

Observations by Owners on the I.M.E.A. Memorandum

EARLIER in the year the Incorporated Municipal Electrical Association drew up a Memorandum comprising three sections. These recommended the public ownership of distribution undertakings, the transfer of generating stations to the Central Electricity Board and a national standard bulk-supply tariff (*Electrical Review*, February 11th). An amendment submitted in March, which, while accepting the first section, proposed the deletion of the second and third sections, was defeated by 154 votes to 102.

Dissentient members have now drawn up a series of Observations, which it is intended to forward to the Minister of Fuel and Power if the I.M.E.A. takes similar action in regard to the original Memorandum. In these Observations it is contended that the voting was not truly representative of municipal opinion, since the 102 undertakings supporting the amendment produced (in 1937-38) 72.5 per cent. of the electricity sold to consumers in municipal areas, as weighted for assessing the Electricity Commissioners' levy and subscriptions to the Association.

It is pointed out that the Weir Report of 1926 expressed the view that the highest generating efficiency would be achieved if the undertakings retained ownership and management of the stations, provided the cost of electricity required by their consumers depended upon their efforts, and deprecated the separation of generation from distribution. The expectations of the Weir Committee had been realised in that the consumption per head of population (503 kWh) and average price per kWh sold (1.009d.) in 1939-40 were practically identical with the figures forecast, despite the rise in the price of coal (the Report assumed 16s. per ton, delivered).

Generating Efficiency

The average fuel consumption per kWh generated is shown to have been generally coming down to the United States level until 1937, when it fell below it. The station owners hold that the improvements achieved in generating efficiency, which grid interconnection has hastened, would be continued under present ownership and they refer to the statement made in the Weir Report that transfer to a central body might lead to stereotyped practice and check development. They point out that the powers conferred on the C.E.B. under the Defence Regulations to provide and operate generating stations merely relax conditions existing under the 1926 Act, and do not permit the Board to

operate a station unless arrangements cannot be made with the undertaking in which it is situated to undertake the responsibility on reasonable terms.

It is not disputed that central direction of generation is desirable. That is now exercised by the C.E.B., and includes the siting of new and the development of existing stations, the main features of design of which are discussed with and approved by the Board.

Difficulties Exaggerated

Great importance is attached to the protection given by Section 13 of the 1926 Act, and it is claimed that the difficulties involved in calculating the price to be charged for energy supplied to selected-station owners are exaggerated in the Memorandum. Of the total output of municipal selected stations, 94 per cent. is generated by undertakings which produce substantially the whole of their own requirements, and hypothetical costs in such cases can be readily checked against actual costs. Regarding the remaining 6 per cent., sufficient statistical data have been accumulated to provide fairly accurate results, and fewer than half-a-dozen instances have been referred to the Electricity Commissioners during the past ten years.

The application of a uniform bulk supply tariff to all supply authorities is regarded by the dissentient undertakings as likely to create new anomalies, even if it removed some existing ones, and also as antagonistic to the principle of the 1926 Act by the removal of the chief incentive to economy. Owners of selected stations usually serve densely populated areas and object to their consumers paying more for their electricity in order to subsidise supplies to consumers in other areas. They consider that the proposal that the C.E.B. should give bulk supplies at the receiving terminals of distribution undertakings and should be responsible for the necessary transmission lines would complicate matters and add to the cost of operation.

The total number of selected-station owners at the end of 1938 is given as 105, of which 80 are municipalities, 23 companies and two joint electricity authorities. The corresponding numbers of selected stations are: 138 total, 86 municipal, 47 company and five J.E.A. These municipalities had an output of 11,267 million kWh out of 21,811 million kWh produced by all selected stations. Undertakings not owning selected stations comprised 99 municipalities, 80 companies and one J.E.A. with a combined output of 1,279 million kWh.

Supervisors' Papers

A Variety of Subjects

ON Tuesday last the three winning entries in the London Branch 1943-44 papers competition were presented at a meeting of the Association of Supervising Electrical Engineers.

H.F. Induction Furnaces

The first of these is in the nature of an introduction to the high-frequency induction furnace as applied to the manufacture of steel. Its author, MR. J. S. SMITH, first points out that the term "high" is purely relative, since the furnaces his paper are concerned with usually operate at between 500 and 2,500 c/s. In outlining the fundamental principle, which is quite simple, he explains why the furnace power factor is so extremely poor, necessitating correction by means of static condensers. These are so controlled as to balance the reactances (inductive and capacitive) of the furnace, of the generator energising it and of the condensers. The last mentioned have to be switched in and out to maintain resonance in the whole circuit according to the continually changing shape and state of the charge within the furnace, the inductance of which is affected by several factors which are summarised in the paper.

The second portion of the paper describes the constructional features of the furnace and various other parts of the plant, including the motor-generator which furnishes the high-frequency AC, usually at from 1,000 to 1,500 V.

Starting Three-phase Motors

The second paper, by MR. S. H. HARDING, is a comparison of starting methods for three-phase squirrel-cage motors. The object is to indicate that mechanical shocks, excessive current increments and electrical transients can be minimised by correct selection of appropriate starters.

While it is common knowledge that squirrel-cage motors take a heavy starting current it is not always realised that, in addition, transient currents occur at "switching-on" and at "change-over" which may be very great. It is next shown how starting torque depends on the nature of the load, which is classified into four main industrial groups, illustrated with oscillograph records and current and torque curves.

This paper concludes with a comparison of seven different methods of starting motors, including circuit diagrams and tabulated summary of the features of each, indicating the kinds of drives for which they are most suitable and the reasons why.

The third paper, by MR. W. T. PARTINGTON, is concerned with static charges of electricity, which may be the cause of both mechanical difficulty and fire risk.

The author indicates that friction is not the only cause of such charges, which can be built up by pressure, impact, contact and separation, the rubbing being merely the means of bringing the two portions intimately into contact. For instance, in the case of a roll of black adhesive tape the discharge is very often apparent at the point of separation when the tape is being unrolled. Belt "static," erroneously attributed to friction, has been proved to be most powerful where the belt leaves the pulley.

Reducing Static Charges

The principle of separation can be defined by formula and it is possible to prove that the voltage is directly proportional to the separation. Charges up to 80,000 V have been recorded on ordinary flat belts. No absolutely certain cure has been recorded, but the use of electrically conducting rubber belting does in some cases reduce the generation of static charges. Belt pastes containing hygroscopic materials (e.g., glycerine) help to minimise the effect whereas pastes containing resin or fish oil generally intensify it.

Efficient earthing is a very necessary safeguard. As an example of impact generation, from 2 to 180 V has been recorded on a ball bouncing continually on a metal plate, the charge being determined more by velocity than by mass.

Static discharges are a serious hazard in many industries. Turbulent flow of hydrocarbons (petrol), particularly those containing tetraethyl, lead, or moisture, through metal pipes will produce a separation of charges, the spirit becoming negative and the pipe positive. In very long pumping circuits a state of equilibrium will be reached, the liquid carrying a certain charge per unit of volume regardless of the rate of flow.

Since hydrocarbons have a high electric breakdown strength, it is not usual for discharge to take place through the liquid, but danger arises when the liquid comes in contact with air (at pipe ends) and when the pipe is not quite full.

The neutraliser utilised in paper making consists of a row of sharp points placed over and close to the paper as it passes over the rolls. The points are connected to the secondary winding of a small transformer at about 10,000 V, alternatively made positive and negative. A corona discharge thus occurs at the points at the crest of each AC wave,

Economics of Power Utilisation

Choosing the Most Economical Motor

IN normal times at least five million pounds sterling is spent every year on the purchase of electric motors for use in works in this country. At the same time the bill for industrial power supplies from public mains amounts to some 30 million pounds a year. A large proportion of this goes to develop motive power, and there is also a large expenditure in works generation supplying electric motors which is not included in the above total. Are we getting the best possible results from all this expenditure? Apart from any questions as to the total magnitude, are the proportions right?

Obviously there must be some optimum balance between the two sorts of expenditure. Power supply might be likened to a heating installation. One does not spend £1,000 on a boiler and only £50 on radiators or there will be ample hot water with insufficient radiating surface. Conversely, if the radiators are big and the boiler small they will not get hot. Only by careful design will the best balance be obtained, and this is determined ultimately by economic considerations. Depending on the relative costs of producing hot water and of installing radiators there is a certain size ratio which will give the best results for the money.

Motive Power Costs

In the electrical case there is again a certain ratio between the expenditure on motors and the expenditure on energy which will give the cheapest motive power. It might be thought that such a ratio is established by the physics rather than the economics of the situation. The electrical input is determined roughly by the motive power required, and a given electrical input requires a given size of motor in order to handle that input without overheating or other dangerous effects. That is true, but such physical features only determine the minimum size. A bigger (or shall we say a better, i.e., more efficient) motor may handle the power with less loss and therefore less energy cost.

How very considerable is the cost of the losses as compared with the cost of the motor itself can be seen by working out almost any example of power utilisation. Consider a typical six-pole cage-type induction motor of, say, 8 HP in a small works where the tariff is £5 per kVA plus $\frac{1}{4}$ d. per kWh. Assume that it is connected during a forty-six-hour week with an average load of $5\frac{1}{2}$ HP and full load at the peak time. Some years ago such a motor cost about £11 10s. and the losses for this service and

tariff cost over £13 every year.* Is it seriously doubted that if the designer had

been allowed to spend another couple of pounds in improving his motor he would have been able to save the user many times this amount in losses over the course of years?

The answer to the question "Is the best balance being maintained between expenditure on plant and expenditure on energy?" is, of course, "No—how could it be?" This balance depends on a detailed adjustment between manufacturing costs and loss costs, the latter varying with the size and type of tariff, the hours of use and the degree of loading. Such a balance could not possibly be right for more than a very few of the possible situations, and it would be unreasonable to expect it to be so. What one has a right to ask is—"Do present designs represent a reasonable compromise? Are they correct for the majority or at least a good proportion of situations, or are they only right for the marginal ones?"

The writer believes that the answer to this question is a decided negative, and if so the conclusion is a serious one. It means that this enormous volume of expenditure is wrongly proportioned, and therefore greater than it need be. It means that the user is not getting the cheapest horse-power service that existing technical knowledge is capable of achieving for him.

With a view to amplifying and clarifying this technical knowledge, ratios have been worked out between plant expenditure and losses expenditure over a range of possible situations. The values are given in a paper read before the Institution of Electrical Engineers in December, and in the case of transformers these values were explained in an article in the June 9th issue of this journal. The present article attempts to do the same thing for the motors.

Economic Balance

To test one's balance, one takes a small step in some direction and notes the effect. To discover whether the expenditure balance is correct, therefore, one should try the effect of a small change in one element and see if the overall expenses are increased or decreased. This is the principle employed in the calculus for finding maxima or minima,

* The exact cost of the losses depends on the conditions in the rest of the factory. The above calculation assumes that this motor typifies the whole, and the cost debited to the losses is the actual cost of supply less what the cost would be if the motor had unity power factor and efficiency.

and it is the method underlying Kelvin's law for cables. Try spending a little more on the copper section and see if it saves in energy loss more than it costs in cable price. At some ideal point the change will make no overall difference, and this is the turning point of the cost curve and marks the maximum economy of the whole.

It may be objected that this is an academic and not a practical suggestion since cables (and motors) cannot be bought with just a little more copper section. They are made in certain sizes only, and one has to choose, not the ideal cross-section, but between the particular sections available. Calculus methods are useless because the electrical machine is like a piano rather than a violin, and one cannot play between the notes.

Such an objection is perfectly valid when one is considering a particular case and when helping a purchaser to make the best choice. It is no objection, however, to the use of the method in making a general survey of motive power economics.

Starting with, say, a 1 per cent. increase in the copper section of a motor or a 1 per cent. decrease in current density this gives approximately a 2 per cent. decrease in copper loss. On the other hand it means a 1 per cent. smaller output. The results must therefore be compared with a slightly smaller machine costing rather less and having less iron loss. The advantage or otherwise of such a change will therefore depend, not only upon the total cost of the losses compared with the motor purchase price, but still more upon the *proportions* of those loss costs. The same procedure can then be envisaged with reference to a postulated increase in the iron section, giving a lower iron loss and magnetising consumption. The advantage of this will depend upon the tariff magnitude, but still more on whether or not power-factor penalties are in operation.

When an overall gain results from such a step, the figures can best be expressed in the form of a ratio—value of savings in losses divided by plant cost of obtaining it. The writer has termed this the "economic advantage" ratio: if the figure is over unity this means that under-running is advantageous, if under unity then over-running is economically preferable. In the latter case, of course, technical limitations probably prevent the carrying out of the action indicated.

It will be understood that in working out such a ratio, like must be compared with like. Either the cost of the losses must be capitalised and compared with the first cost, or the motor price must be "annualised"—i.e., expressed as an annual charge for interest and depreciation. In either case, some assumptions must be made as to the life of the plant and rate of interest.

Typical results may be quoted for induction

motors connected throughout normal factory hours on a two-part tariff of £5 per kW plus 0.5d. per kWh, and having a mean load during connection of 70 per cent. In such cases there is commonly an economic advantage ratio, in favour of lowering either the current density or the flux density, of 3 to 5 or even more. When the standing charge is based on kVA rather than kW it will invariably pay to under-run the iron, and usually to over-run the copper, the ratio in favour of the former being often as high as 40 or more. In the case of DC motors there is a high ratio in favour of under-running these (except the low speed ones) in the voltage direction in all but light-duty and cheap-energy situations. Under-running the copper is only advantageous when the energy is dear or the duty heavy.

Application

The sceptical reader may be inclined at this point to murmur "So what?" Even granted the correctness of these figures, what do they prove, and (still more important) what is to be done about it? As they stand, admittedly, the figures can serve only to show designers whether they are on the right lines economically. They do not give a specific answer to the buyer as to what plant he should choose. They are, in fact, pointers rather than rules of conduct.

That granted, let us see in what direction they point. They show that the average motor is not economic for the average situation, but only for the case where the hours are short or the energy cheap. Besides showing designers in which direction they should aim, the figures also supply an index whereby the purchaser can see whether the machine that is tendered has approximately the amounts and proportions of losses that his situation justifies. If not, he should ask for an alternative tender with, say, less iron loss or less copper loss, even though at an appreciably higher price. The constants that have been worked out will then assist him to see whether the smaller losses are worth what is asked for them.

Above all, it is hoped that the results obtained will help us to adopt a new attitude towards machine losses, and a new scepticism regarding technicological improvements. Losses are too often thought of merely as something to be dissipated rather than as something to be eliminated; and the endeavour to get more out of a given frame-size (e.g., by improved cooling) is regarded as an end in itself—rather as one might put an influenza patient out into the frost in order to bring down his temperature. In machines, as in humans, temperature rise is only the symptom of the disease (known as energy loss), and its real evil is the wasting it effects in the patient, not the inconvenience it causes the doctor.

CORRESPONDENCE

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

Electricity v. Solid Fuel for Grain Drying

THE grain-drying season is near at hand and it may interest those undertakings concerned with rural electrification to know that the owner of an electrically heated grain-drying plant has received many inquiries as to the merits of electricity as against solid fuel for heating. Maltsters and millers prefer grain dried between specified narrow limits of temperature and in this respect electricity scores with a regulation of ± 1 deg. F., irrespective of ambient temperature, whilst solid fuel installations do very well if the control maintains a margin of from 10 to 20 deg. F.

Seed grain, of higher monetary value than milling or malting grain, requires a correspondingly greater care to be exercised in its drying. One case of an £800 loss due to overheating has come to my notice. This unfavourable aspect of solid fuel heating control has now convinced the loser, with the result that a conversion of his plant from coke to electric heating with a loading of 228 kW is being carried through.

It is admitted that this conversion of a plant originally designed for another fuel leaves much to be desired and a plea is made for research to be carried out (say by the Electrical Research Association) for the marketing of a purely electrical grain dryer. As Mr. Cameron Brown has recently suggested, there is also a field of use for a smaller dryer and I suggest that these would be for use on farms with an acreage of 400, with the consequent lower electrical loading which would be more easily handled by existing rural distribution. After all, the Electrical Research Association designed the very efficient, compact "Essex" mill, so why should it not now give its expert attention to a small grain dryer? Farmers are individualists, and each will require his own plant, to be used as and when he wishes rather than having to await the convenience of a neighbour.

With electrical heating, by a suitable disposition of the elements over the whole area of ducting, an even distribution of heat is attainable. With solid fuel the layers of cold air *via* the dampers is a definite disadvantage, added to which the fumes, not present with the electrical method, are disadvantageous. Again, with electricity, the heat required is practically instantaneous and conducive to economy in that it is quickly disconnected after an operation is completed. With the solid fuel method there are gaseous

by-products to attack metal-work or cause distortion with a consequent shortening of the life of the equipment—not present with the electrically operated gear.

Bedford.

H. G. T. WILD,
Consumers' Engineer,
Corporation Electricity Department.

[The electrically heated grain-drying plant referred to was described in our issue of November 5th, 1943, page 597.—Editors, *Electrical Review*.]

Compulsory Registration

ON page 742 of your issue of May 26th there appears a letter under the above heading signed "Consumer." While it is interesting to see expression of all shades of opinion upon any subject such opinions generally carry more conviction when the writer discloses his identity.

In his criticism of your comment on your review of Mr. Penwill's paper, and the National Committee, your correspondent appears to have overlooked or ignored most of the main points which form the background of the present move towards compulsory registration. Your footnote to his letter adequately corrects the first point, but I feel that the second should not pass unchallenged. It may surprise your correspondent to learn that the National Committee when formed under Mr. S. B. Donkin consisted of representatives of a dozen interested bodies and although four of these subsequently withdrew they took the opportunity to express their willingness to help at any time. These were the manufacturers, wholesalers and the B.S.I., whose interests were not directly affected. The Committee then consisted of the parties most closely concerned, the contractors' and operatives' organisations, together with the A.S.E.E., the Conference of J.E.A.'s, the E.A.W. and the I.M.E.A. Surely such a committee could be accurately described as "national."

The noticeable exception was the I.E.E. whose attitude to the subject has for years been difficult to understand and has been aptly described as "the curious attitude of one who, believing things to be not so bad after all, is uninterested in making them any better."

Any responsible installation engineer knows that it is quite unnecessary to over-emphasise the dangerous conditions which can and do arise from shoddy installation work carried out by unqualified persons. The voluntary system of registration which has been the best that the I.E.E. could see its way to support, while excellent in principle, has

proved after twenty years little more than a tragic farce. As Mr. Penwill clearly shows, it is equally optional to stay out as it is to be registered and by stating that a man is not qualified for registration the N.R.E.I.C. achieves precisely nothing so far as preventing that man carrying out installations is concerned.

After all, the National Committee in its proposals is suggesting no more than the Dominions and other well-organised countries have considered it wise to do long ago. If such a scheme saves one life or one serious accident per annum then the argument for it is sound. The consumer is generally interested in an adequate supply at an economic price and safe to use. The first two points are the province of the supply undertakings, but the third is exactly what the National Committee seeks to ensure. The view expressed by "Consumer" is therefore equally difficult to understand.

Hereford.

J. P. INGLIS.

IN reply to Mr. Milne's questions, it is obviously possible to over-emphasise dangers, electrical or otherwise. A considerable number of people are killed each year by falling out of bed (more, in fact, than are killed by electricity) but it would be over-emphasising the danger to say that we should all sleep on the floor.

As to the second question, I did not say that the I.E.E. was unconcerned. I said it had issued a report which was disinterested, i.e., impartial, free from self-interest, not influenced or dictated by private advantages, which is what we should expect.

The protagonists of compulsory registration attempt to make our flesh creep with the dangers of electricity. The I.E.E. has done a public service by its careful and impartial examination of the facts. It confirms, what the man in the street already thought, that there is no great danger in using electricity and that the number of accidents is small. Such accidents as do happen are, moreover, confined largely to appliances and to flexibles and there are very few due to failures of the fixed part of the installation. Logically, therefore, registration would not allow the public to do anything except insert plugs and use switches and a registered practitioner would have to be called in to renew a fuse, plug or flexible or to alter the position of a light.

Flexibility and adaptability are among the great advantages of electricity and almost every householder does small alterations and repairs. The risks of doing so are obviously very small and to forbid the practice by law would merely bring the law into ridicule and into disrepute. Far better to educate the public as to how they may safely do these things themselves, a process which has, of course, been going on for years as more and

more people gain experience in schools, workshops and the Forces.

The fact is that there is nothing particularly complex or difficult in any of the wiring of ordinary domestic premises and with one or two simple do's and don'ts, any person intelligent enough to use a ration book can safely be trusted to do running repairs and small alterations.

There are no stronger grounds for the present proposal than there are for suggesting that only registered cooks shall fry bacon or registered gardeners dig for victory. It might be good for the registered cooks and the registered gardeners, but would unduly restrict the liberty of the subject.

London, S.E.1.

CONSUMER.

Power Point Positions

I WAS unable to attend the meeting of the E.A.W. at which Major Lloyd George discussed power point positions, otherwise I certainly would have had something to say against the suggestion to put power points 30 in. from the floor. The advantage of this suggestion is outweighed by the disadvantage of having flexibles "decorating" the home and by the risk of tripping over them. Mr. Milne had previously discussed this matter with myself and others and, although I very often do not agree with Mr. Milne, I am obliged to admit that in this instance his viewpoint is correct.

Glasgow.

(MRS.) A. MILNE.

Water Power

THE report in your issue of May 26th of the lecture by Mr. W. A. Hatch on tunnelling from El Alamein to the Qattara Depression recalls a similar scheme about a hundred years ago, which was described by a naval engineer in a report to the United States Government. The account came to me from a representative in Constantinople of a British bank who was interned from 1914 to 1918 with nothing to read but that seventy-five-year-old report. As told me in Palestine after the armistice, the report stated that the Dead Sea evaporated on an average 5 tons per sec., and its level was about 1,300 ft. below the Mediterranean; a 30-mile tunnel was estimated to cost too much. In a later scheme it was proposed to take water from the Gulf of Akaba, but a similar tunnel would have been necessary.

The power at Aswan Dam was mentioned in your report as capable of development "at comparatively small expense." The late Sir Edward Mackay Edgar initiated a project to utilise Aswan Dam power to produce carbide and nitrate fertilisers. At that time Egypt imported 60,000 tons per annum of Chilean nitrate. Complete plans were made but the unused Muscle Shoals plant in Tennessee Valley, not finished in time to

supply explosives for the 1914-1918 war, was put on the market at so low a price that Aswan, which had a minimum flow of 500 cu. ft. per sec. with a head of 10 ft. during half the year rising to 85 ft. then (now to 100 ft.) and high atmospheric temperature to contend with, could not compete.

When Sir Murdoch Macdonald, who had charge of the construction of Aswan Dam, saw in the Royal Academy a perspective by Carey of the proposed power house he wrote "You and your artist have caught the tone of Egypt." That perspective was published in the *Sphere*, December 18th, 1920, and in the *Architect*, October 14th, 1921, from the drawings by D. A. Beveridge, architect, Liverpool.

In 1919 a 600-HP steam plant was erected at the Delta barrage to pump the used water from the drains (five canals). This took Nile water from above the barrage for irrigating the million acres of the Delta, return drains bringing the used water back at a low level, whence it was pumped to waste down stream below the barrage; nevertheless one of the five canals could have supplied a minimum of 1,500 water HP.

Herne Bay.

THEODORE STEVENS.

Plugs and Sockets

AS we must combine efficiency with economy, I am wondering what all the arguments re plugs and sockets are leading to. British Standards for these accessories have, very rightly, eliminated manufacturers' varying gauges, but a standard type of plug and socket (one size) would, in my opinion, be a retrograde step. The fact that such a plug would contain two cartridge fuses does not recommend it, because, when cartridges were not available, the handyman or housewife would simply put in bits of No. 18 or 20 SWG copper wire or, indeed, anything they could find handy.

Why not adhere to British Standards and connect all outlets to a distribution fuseboard, as most reputable contractors do at present and, of course, include an interlocked switch at each point. With the foregoing arrangement the chances of burns by short-circuited flexibles are remote, whereas with the fused plug and socket there is no telling what may happen. By all means let us do everything possible to popularise the use of electricity after the war, but let us do it properly, in a workmanlike manner, for the benefit of all concerned.

Glasgow.

ALEX. MILNE.

TWENTY-SIX years' experience prompts me to protest against the views of Mr. Illingworth on 13-A and 2-A fuses. Because a 2-A fuse may permit a fault loading of 700 W (Mr. Illingworth's figures) this is surely not a sound reason for using a fuse which may permit a fault loading of 4,600 W.

I would not permit an electric clock to be protected by any fuse having a higher rating than $\frac{1}{2}$ A.

I do not believe it is a matter of protecting the flexibles, but of limiting the energy released at the fault. Faults, short-circuits, "earths," etc., rarely have good and solid contact, so that spluttering of molten metal usually results. The amount of molten metal will depend upon the energy available to melt it, and that will be limited by the size of the fuse. I recently had to investigate a case of a girl's leg being singed by a flame emitted from an $\frac{1}{2}$ -HP motor. A steel bolt head had cut into one of the internal leads of the motor. The energy released at this point had disintegrated a substantial portion of the bolt head. The motor was protected (?) by a 30-A fuse. I cannot believe the bolt head would have been melted to such a degree if the fuse had been 5-A. Has Mr. Illingworth never seen a badly burnt wrist resulting from a frayed flex on a domestic iron used on a 15-A circuit?

Oldham.

E. H. K. PALMER.

Water Power Undertakings

Proposed Rate Relief

HYDRO-ELECTRIC undertakings in Scotland should be relieved of part of the heavy burden of local rates which they bear under the present system. This is the main recommendation of the Committee appointed by the Secretary of State to inquire into certain aspects of the Scottish rating and valuation system. It is made in a first report on "The Valuation and Rating of Hydro-Electric Undertakings in Scotland" (Stationery Office, price 4d.).

Relief, it is proposed, should be obtained by adopting one of three methods, namely: The deduction of an additional 25 per cent. from the gross annual value of the generation works of the undertaking in arriving at their annual and rateable value; the deduction from the undertaking's gross revenue, in calculating its gross annual value, of a sum equal to $3\frac{1}{2}$ per cent. of the capital expended on its generation works in excess of £30 per kilowatt installed; or an adjustment of the valuation of the generation works in accordance with the proportion which £30 per kilowatt installed at the generating stations bears to the actual construction cost per kilowatt installed.

After considering the methods by which undertakings may be valued, the report concludes that there is no satisfactory alternative to the "revenue principle," by which valuation is based on the revenue resulting from the occupation of the property. The effect of the revenue (or profits) principle, the report recognises, is to bring out a higher valuation for the hydro undertaking in comparison with steam generation.

Finally, the Committee proposes that any relief which is now given should be subject to periodical revision by the Secretary of State after consultation with the Electricity Commissioners.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IN addition to the awards which we reported in our last issue, King's Birthday Honours have been conferred on the following:—**Dr. M. F. Lindley**, Comptroller-General, Patent Office, receives a knighthood. **Mr. Frank Forrest**, until recently city electrical engineer, Birmingham, is made a C.B.E., as are **Dr. J. D. Cockcroft**, at present chief superintendent,



Mr. F. Forrest

Air Defence Research and Development Establishment, Ministry of Supply, and the Hon. **J. K. Weir**, director, **J. G. Weir, Ltd.** **Mr. H. M. Mathews**, electrical commissioner, India, and **Mr. Ahmed Shah Bokhari**, director-general, All-India Radio, are appointed C.I.E. **Mr. D. Lusk**, chief telecommunication engineer, Posts and Telegraphs Department, Ceylon, is made a C.B.E., and the O.B.E. is awarded to **Lt.-Col. C. R. Cooke**, director, line construction, Posts and Telegraphs, New Delhi, and **Mr. A. Patterson**, general manager, Bombay Suburban Electric Supply, Ltd.

Among those appointed O.B.E.'s are the following:—**Mr. C. Crampton**, superintending scientist, and **Dr. S. E. A. Landale**, superintending experimental officer, Admiralty Signal Establishment; **Mr. J. M. Dodds**, head of Research Department, Metropolitan-Vickers Electrical Co., Ltd.; **Mr. G. S. C. Lucas**, head of Electrical Development Section, British Thomson-Houston Co., Ltd.; **Mr. R. F. Newman**, general manager, John I. Thornycroft & Co., Ltd.; **Mr. A. E. Ryland**, telephone manager, Newcastle-on-Tyne, G.P.O.; and **Mr. D. R. Serpell**, temporary principal, Ministry of Fuel and Power.

The list of those awarded the M.B.E. includes the names of **Lt. Cdr. J. G. Adamson**, R.N. (Ret.), production manager, **J. & E. Hall, Ltd.**; **Mr. E. S. Blanch**, superintendent, Welding & Fabricating Department, **A. Reyrolle & Co., Ltd.**; **Mr. A. B. Cape**, engineering test superintendent, General Electric Co., Ltd.; **Mr. R. E. Cox**, liaison officer, General Electric Co., Ltd.; **Mr. G. W. Giffin**, works manager, Siemens Bros. & Co., Ltd.; **Mr. R. H. Hacker**, managing director, Dynatron Radio, Ltd.; **Mr. F. Hall**, works manager, Superheater Co., Ltd.; **Mr. G. H. Halton**, assistant to managing director, Steatite & Porcelain Products, Ltd.; **Mr. R. G. P. Helbing**, works manager, Standard Telephones & Cables, Ltd.; **Mr. A. G. Howe**, chief Diesel engineer, Davey, Paxman & Co., Ltd.; **Mr. H. Hymas**, departmental manager, Hoffman Manufacturing Co., Ltd.; **Mr. C. J. Jones**, materials officer, Electrical Industry Export Groups; **Mr. E. J. H. Jones**, works manager, Associated Equipment Co., Ltd.; **Mr. T. H. Kinnman**, head of radio section, Research Laboratory, British Thomson-Houston Co., Ltd.; **Mr. M. I. Lipman**, manager, E. K. Cole, Ltd.; **Mr. H. L. Oura**, assistant superintendent,

Designs & Development Dept., Gramophone Co., Ltd.; **Mr. F. E. Procter**, assistant to Regional Controller, London Region, Ministry of Fuel & Power; **Mr. F. C. Robinson**, manager A.C. Cossor, Ltd.; **Mr. F. Scott**, A.R.P. officer, North Eastern Electric Supply Co.; **Mr. W. C. Tingey**, general manager, Dispersal Factories, Dubilier Condenser Co. (1925), Ltd.; and **Mr. S. S. West**, development physicist, Cinema-Television, Ltd.

Mr. E. B. Wedmore, C.B.E., M.I.E.E., F.Inst.P., who has been Director of the British Electrical and Allied Industries Research Association for twenty-four years—covering the whole period of its activities—is retiring at the end of this year on account of ill-health. Owing to the war situation no permanent appointment in his place has been made by the E.R.A. Council. As from January 1st next **Dr. S. Whitehead**, assistant director of the laboratories, will take up the duties of Acting Director of the Association *pro tem*, and **Mr. R. A. McMahon**, assistant secretary, will from July 1st take the position of secretary and will be in general charge of the business side of the organisation under the Director.

Mr. Wedmore has seen the Association grow from the smallest beginnings, with a staff of two, to its present stage with a personnel numbering 175 and an annual income of £100,000. The great increase in the Association's influence and importance has been due in large measure to his exceptional administrative ability and thorough scientific and practical knowledge which have enabled him to keep a guiding hand on 22 research committees with over 80 sub-committees.

A native of Bristol, **Mr. Wedmore** received his education at private schools and at University College in that city. In 1895 he joined the Corporation Electricity Department there as junior assistant and the following year became a lecturer and demonstrator at Finsbury Technical College. In 1899 he took up an appointment as designing engineer with the British Thomson-Houston Co., Ltd., with whom he remained until, in 1919, he commenced his work with the Electrical Research Committee, predecessor of E.R.A., as technical officer. The Electrical Research Association was registered in September, 1920, and since 1921 **Mr. Wedmore** has held the dual positions of Director and secretary.

He is a member of the Council of the Institution of Electrical Engineers and has been the recipient of many Institution premiums. Besides his work in connection with E.R.A. publications he is the author of "Switchgear for Electric Power Control" and—indicating the diversity of his interests—"A Manual of



Mr. E. B. Wedmore

beekeeping." As an inventor and patentee he has over 60 worked inventions to his credit.

Lord Portal, Minister of Works, was the guest of honour at a private dinner of leading members of the electrical industry which took place last night at the Savoy Hotel. Mr. Clarence Parker presided, and others present included: Sir George Bailey, Mr. J. R. Beard, Mr. R. Birt, Mr. W. K. Brasher, Mr. V. W. Dale, Captain J. M. Donaldson, Miss Caroline Haslett, Mr. E. E. Hoadley, Mr. Harold Hobson, Mr. P. V. Hunter, Sir John Kennedy, Alderman H. Leese, Sir George Nelson, Mr. F. Newey, Sir Harry Railing, Mr. H. J. Randall, Mr. O. A. Sherrard, Mr. H. N. Sporgborg and Mr. V. Watlington.

Consequent on the election of Mr. Charles W. Bridgen to the board of directors the following appointments have been made on the Ferranti sales staff:—Mr. O. M. Robson takes up the position of general sales manager, Mr. G. B. Proctor becomes transformer sales manager and Mr. A. E. Prophet, meter sales manager. Mr. Robson was educated at Clifton and Gonville and Caius College, Cambridge, where he graduated in the Mechanical Sciences in 1925, since when he has been a member of the Ferranti staff. Mr. Proctor joined the staff of the Ferranti transformer department in 1929 upon his graduation B.Sc. Tech. (Hons.) at Manchester College of Technology. Mr. Prophet had sea-going experience before he joined Ferranti in 1920.

Capt. W. O. Lane, R.A. (Indian Army), the elder son of Mr. W. E. Lane, London manager and secretary of the Adelaide Electric Supply Co., Ltd., has been awarded the Military Cross for gallant and distinguished services on the Burma front. Mr. Lane's younger son, Major R. A. S. Lane, is also in the Indian Army and on active service in Burma.

Mr. George H. Buchanan has joined Craven Brothers (Manchester), Ltd., as engineer representative in Scotland. Until the company re-opens its Glasgow office shortly he will work from his home address at 19, Kingsburgh Drive, Paisley (telephone: Paisley 4762).

Manchester Electricity Committee has congratulated Lieut. J. G. Allen, R.E., a member of its staff, on receiving the George Medal, "for gallantry in carrying out hazardous work."

Mr. C. Hales Downing and Mr. H. A. O'Brien have been appointed to the board of British Electric Meters, Ltd.

Mr. J. H. Butler, M.I.Mech.E., A.M.I.E.E., has resigned his position as chief engineer of the Barrow Hematite Steel Co., Ltd., to take up that of chief engineer of the Consett Iron Co., Ltd.

Mr. E. H. Vyse, a member of the drawing office staff of the English Electric Co.'s Rugby works, retired on June 2nd, at the age of seventy-four, after fifty-nine years' service with the

company and its predecessors, Willans & Robinson, Ltd. In recognition of this exceptional achievement, Mr. Vyse was presented by Sir George H. Nelson, chairman and managing director of the company, with a framed illuminated certificate expressing the appreciation and gratitude of the management and directors. A few weeks earlier, on the occasion of his golden wedding, Mr. Vyse was presented with a cheque subscribed for by friends and colleagues.

Mr. T. H. Relton, editor of "B.T.H. Activities" since its inception, and of other B.T.H. publications, retired at the end of last month after thirty-three years' service with the British Thomson-Houston Co., Ltd. Mr. Relton has been succeeded by Mr. G. W. P. Page.

Mr. J. E. Edgecombe, M.I.E.E., M.I.Mech.E., the first borough electrical engineer of Kingston-on-Thames, one of the founders of the Incorporated Municipal Electrical Association and a past director (1918-1924) of the Electric



Mr. O. M. Robson



Mr. G. B. Proctor



Mr. A. E. Prophet

Lamp Manufacturers' Association, celebrated his golden wedding on June 6th. He served at Kingston as chief engineer from 1893 to 1918 and was president of the I.M.E.A. in 1905 and 1912, being hon. secretary for two and hon. treasurer for eleven years. He also held the first presidency of the Diesel Engine Users' Association. He left Kingston to join E.L.M.A., resigning this position when the Stearn Electric Co., of which he is still a director, was formed.

Mr. J. T. Becklake, who recently retired from the position of Director of the South African Mint, began his electrical career at the Finsbury Technical College under the late Prof. Sylvanus Thompson. A brief period followed in connection with the power supply to the L.C.C. tramways, but his excellent qualifications stood him in good stead in 1907 when he joined the British Civil Service by way of competitive examination for a technical post in the Royal Mint in connection with a development of the electrical plant there.

Close absorption with the technical side of British and Dominion coinage matters did not lessen his interest in electrical affairs. He was an associate member of the I.E.E. and occasionally contributed to the pages of the *Electrical Review*. In 1918 he was appointed to a branch of the Royal Mint set up in Bombay, for special duties, and in the following year resumed his work in London until in 1922 he was appointed Deputy Master of the Pretoria Branch of the Royal Mint. In 1937 the Union Government erected a small arms ammunition

factory and the erection of buildings and the purchasing of plant fell largely into his hands.

In 1938 Mr. Becklake was appointed by the British Treasury to succeed his chief as Deputy Master of the Royal Mint and in 1941 he became first Director of the South African Mint.

In the *Public Servant* (the official organ published in Pretoria) a lengthy tribute is paid to his vast and varied public interests. At the farewell gathering at which presentations were made to Mr. and Mrs. Becklake expression was given to the high appreciation with which the Government and the Department regarded his services. Among those present was the Hon. J. H. Hofmeyer, Acting Prime Minister and Minister of Finance. One of the presentations consisted of an engraved silver salver manufactured entirely in the Mint, and bearing the coat of arms of the Royal Mint and the South African Mint. Mr. Becklake will continue to reside in Pretoria and is still carrying on his War Supplies Committee work and the

duties of liaison officer on the ammunition side of the Mint.

The accounts and administrative sections of Philips Lamps, Ltd., which have been at Oxted, Surrey, since the beginning of the war, have recently formed a Dramatic and Operatic Society. For their first performance they presented "Merrie England" and revealed a high level of acting and singing. The British Red Cross Fund benefited to the extent of £31.

In our announcement on June 2nd of appointments made by Richard Johnson & Nephew, Ltd., we should have stated that Mr. H. Moore had been made home sales manager of the non-ferrous department.

The Minister of Works has appointed Mr. H. M. Fairweather to be chairman of the Codes of Practice Committee for Civil Engineering, Public Works Building and Constructional Work, in succession to the late Sir Clement Hindley.

Post-war Sink Unit

TO harmonise with a contemplated post-war series of electric cookers, refrigerators, drying cabinets and other kitchen equipment, the Hotpoint Electric Appliance Co., Ltd., in conjunction with Hurtons (Heating & Sanitary Appliances), Ltd., has just completed the prototype of a self-contained sink unit incorporating a 20-gal. water heater and a washing machine. Measuring 3 ft. high and 2 ft. 1 in. deep from front to back, the unit is 6 ft. long, divided into three sections of 2 ft. That on the left houses the water heater, the centre one the sink, and the right-hand section the washing machine.

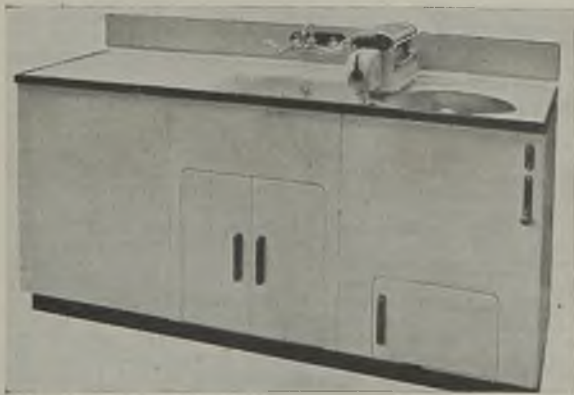
Following the most up-to-date ideas, the water heater is equipped with two thermostatically controlled elements, the smaller ($\frac{1}{2}$ kWh) being fixed near the top of the tank so as to give 3-4 gals. of hot water immediately

minimised by the shortness of the pipe leading from the top of the tank to the mixer fitting over the sink. In the finished product this mixer, which has a swivel serving the washing machine as well as the sink, will be housed in a porcelain pressed steel container exhibiting hot and cold operating levers only. In all probability the water heater will be available as a separate unit. Under the sink is a cupboard to accommodate buckets, etc., and a swivel arm tap connected to the mixer enables buckets to be filled at floor level. A cock is provided to empty water from the washing machine.

The washing machine, which has a circular cover as well as the draining board top, is of the agitator type, and the tub will be of pressed aluminium alloy. Five different operating positions are provided for the wringer, which has an exceptionally simple and efficient safety release device. When not in use the wringer is lifted off and stored in a cupboard underneath. In addition to an on/off switch there is a clutch to allow the washer and wringer, which are driven by the same $\frac{1}{2}$ -HP motor, to be used separately. A double-pole switch-fuse inside the unit will form the main control for the water heater as well as the washing machine.

Having rounded corners with no protrusions or dirt collecting crevices, the unit is easily kept clean, while for inspection of the mechanism the entire top is removable by means of instantaneous release pins. The prototype model is finished in primrose coloured vitreous enamel with black "trimmings," but a whole range of attractive colour schemes is visualised. Installation by the

builders, who are likely to be particularly interested in the units, is very simple, the wiring being taken to a single point in the base and the water pipes (copper) to the left-hand corner.



Hotpoint self-contained sink unit

for washing up, etc., while the larger element ($2\frac{1}{2}$ kWh) fitted lower down can be switched on separately on washing days or for baths. The tank has 2 in. of lagging around the sides and 3 in. on top, and heat loss is further

COMMERCE and INDUSTRY

Barrow Award. Transformer Order Revoked.

Power Engineers' Claim Succeeds

At a sitting of the National Arbitration Tribunal a claim was heard from members of the Electrical Power Engineers' Association employed by the Barrow-in-Furness Corporation, who asked that the Corporation should give effect to the decision of the District Joint Board in regard to the regrading of a member of the staff. It was contended on behalf of the Corporation that the case presented in its name to the D.J.B. did not, in fact, represent its views and that it regarded the employee in question as being adequately paid having regard to the duties which he performed. The D.J.B. had decided that the employee should be placed in Class F, Grade 3 of the schedule as from March 1st, 1943. In its award (No. 569) now published the Tribunal has decided that the Council shall give effect to the decision of the District Joint Board.

Transformer Restrictions Removed

The Board of Trade, by an Order dated June 2nd (S.R. & O. 1944 No. 643, Stationery Office, 1d. net), has revoked the Electrical Transformers Order, 1943. The latter Order imposed restrictions upon the manufacture of a number of types of power transformers from 5 to 7,500 kVA three-phase and from 5 to 2,500 kVA single-phase and mining transformers from 10 to 300 kVA and 10 to 50 kVA respectively. It stipulated that only certain ratings were to be made, specified tapping arrangements, laid down minimum flux density and iron and copper losses, and confined fittings to certain specified types.

Changes in Industry

In his presidential address at the annual conference of the Amalgamated Engineering Union on Monday, Mr. Jack Tanner drew attention to the vast changes in the industrial structure brought about by the war, especially the great increase in productivity resulting from the employment of new materials and techniques.

Training Post Office Engineers

A plea for the encouragement of a more general education, stressing the dangers of a system of training of which the sole aim is to provide a sufficiency of highly skilled technicians, is contained in a memorandum submitted to the Post Office Training Committee by the Post Office Engineering Union, which represents over 47,000 workers in the minor non-clerical grades of the engineering, stores and factories departments of the Post Office.

It is pointed out that rapid revolutionary advances in telecommunications in recent years have created a demand for an entrant with a higher standard of general education than hitherto, and the Union emphasises the need for continued technical education side by side with practical experience. Existing conditions of recruitment and training are criticised, and

complaint is made that the training is too intensive. The Union proposes the establishment of a Departmental Training Committee to operate a new scheme of training under the following categories: Continued general education, basic technical training, specialised technical training, training in administration, refresher and correspondence courses and further education. The pro-

J. & P.
Second Front
poster



posed Committee would also be charged with the framing of the welfare policy of the Department which should supervise the physical welfare of its staff up to the age of twenty.

Invasion Poster

The poster illustrated was displayed throughout the Johnson & Phillips works immediately the landing of Allied troops on the French coast was announced. Printed in three colours, it was adapted by the company's publicity department from those supplied by the Ministry of Supply, by the addition of "From the Second Front," "We're off" and "Come on J. & P. Let's work like hell!" The posters were prepared some time ago and saved up for the psychological moment.

Hazel Grove Investigation

The Hazel Grove and Bramhall Urban District Council has disclosed the findings of an investigation into the affairs of the Electricity Department following an increase in the electricity charges. The technical investigation was undertaken by Preece, Cardew and Ryder and the financial side by Cash, Stone & Co. It has been decided that in future the clerk, the treasurer and the chief electrical engineer and manager shall co-operate fully to ensure the efficient progress of the electricity undertaking.

Gas Industry Inquiry

A Committee of Inquiry into the Gas Industry has been appointed by the Minister of Fuel and Power: "To review the structure and organisation of the gas industry, to advise what changes have now become necessary in order to develop and cheapen gas supplies to all types of consumers, and to make recommendations."

The members of the Committee are Mr. G. Heyworth (chairman), Mr. Stuart Cooper, Sir Jonathan Davidson, Mr. Gavin Martin and Professor D. M. Newitt. The secretary is Mr. A. F. James and communications should be addressed to him at the Gas and Electricity Division, Ministry of Fuel and Power, New Oxford House, Bloomsbury Way, W.C.1.

Battery Shunting Locomotive

The battery-driven locomotive continues to gain favour for shunting work in industry. The unit illustrated is the second supplied to the English Steel Corporation, Ltd., by the Metropolitan-Vickers Electrical Co., Ltd. Both locomotives have been designed to handle trains of 150 tons at 5 MPH on level track of 4 ft. 8½ in. gauge. The drive consists of two axle-mounted tramway type motors with single-reduction helical gearing of 13/76 ratio on a



One of two "Metrovick" battery shunting locomotives supplied to the English Steel Corporation

driving wheel diameter of 37 in. The nominal rating of the locomotive on the average battery voltage of 180 V is 30 HP. The controller is of the drum type giving two economical speeds by series and parallel connections of the motors and three resistance notching speeds in both combinations. Both mechanical and rheostatic braking in seven notches are available. The batteries, which consist of 90 "Exide" cells, type TL11, with a rated capacity of 240 Ah, are housed in a removable chamber and plugged into the locomotive circuit. By employing duplicate chambers and batteries the locomotives are kept in continuous service.

Their duty is mainly to haul wagons carrying hot ingots or other material in process of manufacture in the armament industry. A sand chamber, seen on the left, acts both as a heat screen and as ballast to bring the total locomotive weight up to 14 tons 12 cwt. (the first locomotive was sand ballasted up to 13 tons 16 cwt. only). This second locomotive also has access openings cut in the main frame to facilitate inspection and maintenance without the necessity for an inspection pit. The mechanical parts were constructed to Metrovick designs by the Drewry Car Co.

Model Kitchen Unit

A kitchen unit (Bradford model) was on exhibition at the Morley Corporation Electricity Showrooms from May 15th to 29th, and several hundred people inspected it. Mr. N. Hunter,

the borough electrical engineer, says that it was very apparent that the public was keenly interested in this important matter, and the lay-out of this particular unit appeared to meet the requirements of most of the public.

Several suggestions and criticisms were received, and these have been tabulated and sent to E.D.A. for consideration, but Mr. Hunter states that they were really of a minor character and could be introduced without materially affecting the unit. Many of the people were disappointed when they realised that they would have to wait until after the war before they could secure this type of kitchen.

British Synchronous Clock Conference

The British Synchronous Clock Conference has been established many years and, by the collaboration thus afforded, it has been possible to maintain fair trading conditions and a properly organised system of distribution.

War-time conditions have, of course, greatly reduced manufacturing possibilities temporarily, but the Conference has continued to be active in the general desire to maintain equilibrium in the market with the reduced supplies that have been available during the past two or three years. Fruitful discussions have also taken place, from time to time, with the spring-wound clock industry for the advancement of the clock industry generally and, in common with other associations the Conference is devoting considerable attention to post-war rehabilitation needs.

At the recent annual meeting of the Conference Mr. H. M. Harris (T.M.C.-Harwell (Sales), Ltd.) was re-elected chairman with Mr. D. W. Barrett (Smith's English Clocks, Ltd.) as vice-chairman. The members of the Conference are the British Vacuum Cleaner & Engineering Co., Ltd. (Magna Time Co., Ltd.); Ferranti, Ltd.; the General Electric Co., Ltd.; Smith's English Clocks, Ltd.; Synchronome Co., Ltd.; and T.M.C.-Harwell (Sales), Ltd. The secretary is Mr. Felix A. Rogers, 36, Kingsway, London, W.C.2.

Change of Address

The address of H.M. Electrical Inspector of Factories at Cardiff has been changed to Westminster House, 97, St. Mary Street.

Bedford Meter Display

In the week before the Bedford "Salute the Soldier" campaign, when everyone's mind was on targets, an opportunity was taken to stage a "read your own meter" exhibition in the electricity showroom window. The centre-piece consisted of a large target (3 ft. by 3 ft.), painted with red, white and blue roundels, set approximately 1 ft. from the window, with a cardboard tube (2 in. diam.), painted white, projecting from the bull's-eye on the target to the window-pane. Inside the cardboard tube was inserted the bridge of a "Radiovisor" equipment (valve type), and connected to its circuit was what looked like an ordinary house-service meter, with no visible connection between it and the target. The meter, in fact, had a 200-RPM synchronous motor geared to the

dial train in such a manner that when a hand was placed over the bull's-eye, thus shading the light from the "Radiovisor" bridge, the motor circuit was made alive, and the motor, in driving the meter train, moved the dial pointers approximately 200 kWh per minute. Nearby there were concise instructions telling the spectators how to operate the apparatus and encouragement to read their own meters so as to keep within their fuel target. As a side-show there was a poster giving full instructions on how to read a meter, together with actual meters and their respective meter readings attached.

Woking "Salute the Soldier" Exhibition

During the Woking "Salute the Soldier" week, which ended on June 5th, the Woking Electric Supply Co., Ltd., staged an impressive display of military equipment in its Chobham Road showrooms. This included a 2-lb. anti-tank gun and a 6-lb. field gun; half of a "Valentine" tank, namely engine, reduction gear, tracks, etc., and a tank operated gun turret; a predictor with all its instruments; numerous scientific apparatus for gun and aircraft location; a large selection of ancient weapons; and field and tank wireless apparatus. A number of moving side-shows made by the company's staff were the means of raising a considerable sum of money, which will be handed over to Army charities. Many thousands of people visited the exhibition and expressed appreciation. Several other concerns are making use of the company's apparatus for their "Salute the Soldier" weeks.

A.R.P. Communications Van

To facilitate the work of the Civil Defence organisation the inhabitants of Spensborough have been presented with an A.R.P. communications van and trailer, which will provide a complete miniature telephone exchange system, communication by portable telephones wired for point to point working, intercommunication with the telephone system, medium- and long-wave broadcast reception, short-wave transmission and reception, and loudspeaker amplification of music or speech. The electrical installation was executed under the direction of Mr. Clifford Booth, the Urban District Council's electrical engineer and manager, at the electricity works.

Training in Telecommunications

In order to quicken the training period of telegraph and telephone operators so that they can take their places in the wartime organisation in the shortest possible time, special aids have been devised by the L.N.E.R. Clerks attending the training centres in the southern area have at their disposal single-needle telegraph instruments at which students, working in pairs, can communicate in morse. Special individual training instruments are also available on loan.

Advice on learning to "read" the telegraph, when an instrument is not handy, is given in a special text-book which also presents, in a brightly written manner, full information on the procedure to be followed in the sending and receiving of messages. A companion booklet contains information necessary in the training of switchboard operators. Arrangements are in hand for the inauguration of special training

courses during which operators of switchboards, whatever the size, will have the opportunity of attending main L.N.E.R. telephone exchanges. By co-operation with the Post Office telephone authorities, members of the existing L.N.E.R. telephone staff have been trained as instructors.

"Telcom" with Forces

A new non-combatant force is about to join the Empire's forces in overseas theatres of war for the assault on Europe and the Far East. Known as "Telcom," it will consist of men and women from the United Kingdom on the staff of Cable & Wireless, Ltd., serving in certain operational zones. Their task will be to carry the cable-heads and advanced wireless stations of the Empire's telecommunications network into enemy occupied territory. "Telcom" men will go forward with the troops and their places will be taken in the backward areas by "Telcom" girls. The first contingent of the girls will leave Britain shortly.

Trade Announcement

The Taylor Stoker Co., Ltd., has vacated its offices at Hemingford Grey, Huntingdon, and is now permanently at its London office at 189-191, Drummond Street, Euston, N.W.1.

Change of Name

Ellison Insulations, Ltd., have changed their title to Tufnol, Ltd.

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be made within a month from June 7th:—

RT (design). No. 627,424, Class 9. Scientific, electrical, signalling, controlling and indicating apparatus and instruments, etc.—Ronald Trist & Co., Ltd., Bath Road, Slough.

CEMDU and LATRALOK. Nos. 627,962 and 627,963 respectively, Class 9. Electrical instruments or apparatus not included in other classes.—Carlisle Electrical Manufacturing Co., Ltd., Bentcliffe Works, Salters Lane, Eccles, Lancs.

PLASTALUX. No. 627,829, Class 11. Electric lamps and lamp fittings.—E. K. Cole, Ltd., Green Park Hotel, Aston Clinton, Bucks.

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 makers of the following:—

WATERBURY electric washing machines.

PARLIAMENTARY NEWS

By Our Special Reporter

Cut in Supplies

IN the House of Commons on June 6th Commander Locker-Lampson asked the Minister of Fuel and Power whether the recent cut of 10 per cent. in electricity and 25 per cent. in gas applied to publications and their printing, and why printers of Government papers and city circulars bore this burden alone.

Major Lloyd George said that cuts in industrial consumption of electricity and gas were not being applied to the printing of newspapers. They were being applied to all other printing but, on application by the firms concerned, were relaxed to such extent as to enable the production of periodicals to be substantially maintained, and to safeguard essential Government printing.

New Houses

Sir Waldron Smithers asked the Minister of Fuel and Power why electricity for domestic purposes, and especially for the new houses, was not being made available to all at reasonable cost.

Major Lloyd George replied that electricity charges in the case of new houses could not be considered apart from charges to domestic consumers generally. Revision of such domestic tariffs raised important questions affecting the finances and organisation of the whole of the electricity supply industry and could only be undertaken as part of a reorganisation of the industry after the war. The question of how far such reorganisation was necessary was at present before the Government.

Hydro-electricity and Industry

Mr. Leslie asked the Secretary of State for Scotland whether, in view of the urgent need for Scottish light industries and new housing materials, he would set up an experimental research station in Scotland for studying the processing and utilisation of local raw materials, such as seaweed, peat, clays, shales, dolomite, felspar and diatomite, and the use of hydro-electricity for raw material development.

Mr. Westwood said the Government was fully aware of the importance of industrial research and, so far as the development of Scottish natural resources was concerned, the Scottish Council on Industry was in close touch with the Department of Scientific and Industrial Research and other research and commercial establishments. The Council was also in consultation with the North of Scotland Hydro-Electric Board and had appointed a special committee to investigate to what extent capacity existed, or could be developed, in Scotland to produce the materials and fittings required for the post-war building programme in Scotland. In addition, the Council had recently appointed a panel of experts to advise on scientific and technical questions generally.

Director of Industrial Electrical Equipment

On June 7th Sir Herbert Williams asked the Minister of Supply whether Mr. S. F. Steward, the Director of Industrial Electrical Equipment,

was resigning that position in view of his appointment as a director of E. R. & F. Turner, Ltd.

Sir Andrew Duncan said he was not. Mr. Steward's connection with E. R. & F. Turner, Ltd., was not incompatible with his official duties, and he was glad to say that the Ministry would continue to have his full-time services.

Publication of Accounts

Mr. Edwards asked the Minister of Fuel and Power whether he would remove the ban on the publication of accounts of electricity and gas companies, and if not, what were the reasons for continuing the ban.

Major Lloyd George stated that the ban on the publication of the accounts of gas and electricity undertakings was imposed for reasons of security which he was advised still existed.

Electricity in India

On June 8th Wing-Commander Grant-Ferris asked the Secretary of State for India what practical steps the Government of India was taking to encourage the electricity supply industry in India now, and what long-term plans were envisaged.

Mr. Amery replied that additional capacity amounting to 200 MW had been supplied to India since the outbreak of war and a further 150 MW of plant was on order. The Government of India had the development of electricity supply in the forefront of its post-war reconstruction plans. It had already scheduled generating plant requirements for the addition of 560 MW to the existing capacity of public utilities and had further requirements under consideration. In addition, Provincial and State Governments were considering a number of important projects, and the Government of India proposed to set up a Technical Power Board to scrutinise and co-ordinate all schemes.

Anti-Rust Protection

WHAT appears to be an unusual means of rendering things impervious to moisture has been announced by the General Electric Co. of America. According to the *Newcastle Journal*, samples of the chemical have been flown to this country for trial by a few selected manufacturers, including the British Thomson-Houston Co., Ltd., as it is considered to be of importance to the war effort. The precise nature of the chemical has not been revealed; it is a colourless liquid and objects that have been subjected to its vapour, or fumes, become impervious to damp. Thus the liability of metal to rust is minimised and the risk of ice forming in cold weather is lessened. It is claimed that Army equipment can be prevented from becoming unserviceable through the action of mud and water, while the need for de-icing devices on aircraft may be reduced. Clothing and boots treated with this liquid are said to remain quite dry when passing through downpours of rain.

Coal Utilisation

Possibilities of Substantial Savings

ADDRESSING members of the Institute of Export on June 6th, Mr. W. WAKEFIELD ADAM discussed means of prolonging the economic life of British coalfields. Of the total known coal resources of 138,000 million tons, by far the greater proportion was, he said, unworkable at a reasonable cost. Quoting the late O. E. Forster Brown, he gave the remaining life of existing coal seams at forty years; other seams workable with less economy would be exhausted in a further thirty years. In Germany the limit for economic working was about 180 years

Suburban services of Rio de Janeiro have been increased three-and-a-half times by electrification. The six-coach train shown carries 650 passengers

and in the United States considerably more.

In 1938 total coal production was 227 million tons, but this figure could have been approximately halved by savings (in millions

of tons) as follows:—Export of derivatives instead of raw coal, 40; use of smokeless fuel in domestic stoves of 75 per cent. efficiency instead of open fires (now 45 million tons) at 15 per cent. efficiency, 25; use of smokeless fuel and improved wall insulation for factories, 25 (of 55 at present consumed); railway electrification, 9.75; coal-mine electrification, 8; hydro-electric power from barrage schemes, 8; underground gasification of coal from abandoned or difficult mines with trial installation producing one million kWh continuously, 1½; Total 117.

Since 1913 exports had declined by 18 per cent. The pit-head price of coal had increased from 13s. per ton in 1930 to 20s. in 1938 and from 30s. to 40s. in 1940. Prices probable after the war would be too high for export and would also handicap home industries. There were, however, between 2,000 and 3,000 derivatives from coal. The value of processed coal was much more than double that at the pit-head; thus, a ton of coal would make ½ ton of petrol priced at £8 4s. 4d. or 500 lb. of rubber priced at £62.

In Mr. Adam's view, the gas industry should process the coal received from the mines, delivering gas and coke to the power

stations and other crude derivatives to the chemical industries. This would be done under the guidance (not control) of the Ministry of Fuel and Power. He estimated annual national savings at £272 million, made up of £40 million by removal of subsidy, £132 million by 88 million tons of coal derivatives (in addition to the present 39 million), £50 million as wages in new or enlarged industries and £50 million due



to reduced damage to buildings from smoke.

Experience on the Southern Railway had confirmed the findings of the Weir Report in 1931 in favour of main-line electrification on a large scale, which was estimated to save £17.5 million per annum net in operating costs and 9.75 million tons of coal. The thermal efficiency of steam locomotives was only from 2½ to 3 per cent. as compared with more than 13 per cent. for electric locomotives after allowing for all losses. Steam traction was prohibited in and around New York and Warsaw. Suburban services in Rio de Janeiro had increased by 3½ times as a result of electrification. Without electrification the London Passenger Transport Board could not cope with 473 million journeys per annum (1938-39). Similar advantages applied to long-distance main lines, on which traffic could be doubled in some cases without additional tracks, thus enabling railways to handle all heavy and fast road traffic and so reduce the number of casualties and obviate expense on providing motor roads.

The Rome-Milan journey (400 miles) had taken ten hours with steam trains and now took six hours, without discomfort to (and even on some occasions asphyxiation of) passengers when passing through tunnels.

The service had been accelerated by 35 per cent. and increased by 80 per cent. through electrification. In similar fashion the journey time between Rome and Naples had been reduced by 43 per cent. and the services increased by 114 per cent. For out-of-the-way branch lines light rail cars using oil from coal could advantageously replace trains each consisting of a steam locomotive and three carriages with a dead weight of about 120 tons. Great Britain had 48 rail cars, France normally had 2,000 and Italy over 1,000.

In conclusion, Mr. Adam considered that first priority should be given to plans for

the reorganisation of the coal industry and its collaboration with the gas, electrical and chemical industries, as suggested, arrangements being made for the complete utilisation of all derivatives from coal produced. The conservation of Britain's reserves of "workable" coal should be attended to without delay, by carrying out the suggestions mentioned. Surveys should be made of the Mersey, Dee, Humber, Wash, etc., in order to be able to start work immediately after the war on the construction of tidal barrage schemes. Immediately after the war, the electrification of the railways and coal-mining equipments should be carried out.

Transfer of Machinery

Use of Battery-driven Heavy-duty Trucks

A LARGE munition-making concern was recently faced with the problem of moving the complete equipment of a machine shop to a new building which had been erected some 200 to 250 yd. distant. As both day and night shifts were working continuously there was no spare time in which to make the change and because of the urgent need of the utmost production, it was imperative that any interruption should be reduced to the minimum. To prepare for removal the lay-out of the new building was completely planned and the wiring for independent motors, or overhead

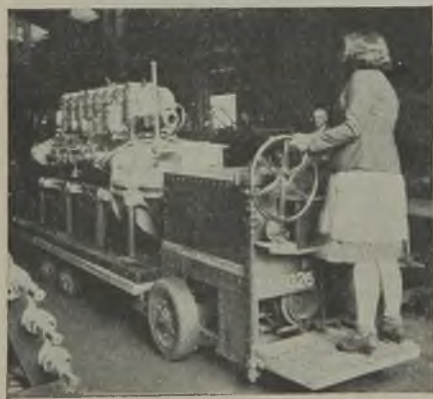
particular machine. The machines involved in the transfer included lathes, milling machines, shapers and radial drills, weighing up to 5 tons.

One of the most interesting tasks was the movement of an overhead travelling crane which had been unloaded some 150 yd. from its site. This measured 42 ft. long by 12 ft. wide, and comprised, in one piece, the complete crane, without cab and travelling wheels, and weighing between 4 and 5 tons. It had to be moved round three right-angle bends, part of the journey being along the highway. Two 5-ton trucks were used, one at each end.

Other pieces of equipment at the same works which have been moved by "Electricar" trucks as necessity has arisen have included a new cylindrical fuel storage tank measuring 18 ft. long by 9 ft. diam. with domed ends and weighing 5 tons. This was moved by a single 5-ton truck after being partially upended on the truck platform so as to shift the centre of gravity towards one end. Another was an electric furnace measuring 7 ft. by 9 ft. and over 12 ft. high. The interior was removed so as to reduce the weight to within the capacity of one 5-ton truck. Very considerable manœuvring was necessary to negotiate the entrance as the load had to be brought in dead square, there being only about $\frac{1}{2}$ in. clearance. Other outside items included an oil separator tank measuring 18 ft. long by 12 ft. wide; a cooling tank measuring 20 ft. long by 6 ft. wide; and a sand mill for the foundry measuring 10 ft. by 8 ft. and 10 ft. high.

The lengthy loads were usually dealt with by two trucks, one at each end. Generally speaking, only one was power operated, but although the second truck was to all intents and purposes acting as a trailer, its four-wheel steering enabled the load to be very accurately placed without undue manœuvring. This practice avoided the difficulty of synchronising the driving controls of both trucks, and the possibility of damage resulting.

For the general duties of this factory which covers 15 acres of ground and employs 2,800 workers, some thirty "Electricar" trucks of varied design and tonnage are employed. They have superseded the previously existing narrow-gauge railway with its petrol locomotive, wagons, turntables and crossings.



"Electricar" 5-ton low-deck platform truck moving Diesel engines

shafting was installed in advance, all the necessary sites being made ready for the machines, some 200 of which were successfully transferred in a period of three weeks by "Electricar" battery-driven heavy duty trucks.

The overhead crane was first erected, and it was then a simple matter to pick up a machine in the old shop, move it by truck and, receiving it by the overhead crane at the other end, place it exactly in position. As a result of this method, each operator only discontinued work during the time of the actual transport of his

Portsmouth's Jubilee

Fifty Years of Progress

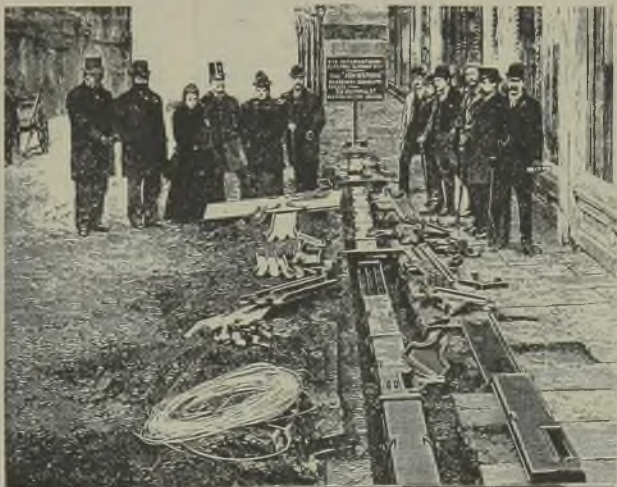
FIFTY years ago on June 6th Portsmouth's electricity supply system was officially inaugurated. The decision which made this possible was taken in 1889 when the (then) Town Council unanimously decided to apply for a Provisional Order. This having been obtained, the first Electricity Committee was appointed in September, 1890, and proceeded with great thoroughness to consult experts and to visit Bradford, Brighton, St. Pancras and, for some reason not very clear, Scotland Yard. After first deciding in favour of a l.v. system of generation the Council changed its mind and adopted a h.v. supply. By this choice the troublesome change of system which was needed in those towns which adopted a low-voltage DC supply was avoided.

To take advantage of the availability of sea water for steam condensing a site for the generating station was chosen in St. Mary Street (now Highbury Street), the foundation stone being laid on October 27th, 1892. The plant installed consisted of two 200-kW alternators coupled direct to low-speed engines (the first of that type installed in a public generating station) and one of the first turbo-alternators to be installed in this country. The steam was provided by five Lancashire boilers, each having a steaming capacity of 5,000 lb. per hour.

The enterprise was such an immediate success that only three months later the Council approved the installation of an additional 200-kW set. Progress continued apace and by 1914 the capacity of the station stood at 3,300 kW. After the last war the rapid increase in the demand for electricity and the number of consumers made further extensions imperative and it was decided to reconstruct the station, this work being completed early in 1923. A new control room and switch house was erected in 1932 and further extensions brought the capacity at the outbreak of the war to 92,500 kW, the normal steaming capacity of the fourteen water-tube boilers being 1,056,000 lb. per

hour. The station has been "selected" since 1935.

Modernisation of the system of distribution mains was begun in 1921. The first substation was erected in 1923 and at the same time work on the change-over of the voltage from 100 V was started, old mains being gradually renewed. As a result there are at present 176 substations and kiosks and approximately 1,000 miles of



Reproduction of a woodcut showing one of the first Portsmouth cables being inspected in 1894

mains. The first extension of the area came with the extension of the city boundaries in 1904 and again in 1920 when a supply was given to Cosham. This was followed by a supply to Havant and Emsworth in December, 1923, the first supply beyond the city boundary. An Order was obtained in 1925 to supply a further area of Hampshire and West Sussex, and another Order in 1930 approved the extension of the mains to Hambledon. The undertaking of the Gosport & Alverstoke Electric Lighting Co. was taken over in 1935; this necessitated a complete reorganisation of the supply in that area and the change-over of the system from DC. In addition to the 192 sq. miles now supplied directly by the undertaking, bulk supplies are given to the Chichester, Petersfield, Midhurst, Fareham and Bognor areas.

Two other milestones were the adoption

of the domestic tariff and the hire of cookers in 1924. Following this entry into the domestic field, the domestic apparatus on hire and hire-purchase at the outbreak of war included 13,394 cookers, 13,028 water heaters, 2,964 wash boilers, 2,762 radiators and 380 refrigerators. An assisted wiring scheme adopted in 1929 had resulted in 12,770 consumers taking advantage of the facilities by 1939. The number of kWh

sold in one year now is greater than the total in the first thirty-four years of the undertaking's history.

Three engineers and managers can claim a share in this remarkable story of progress. Mr. E. Price, who joined the undertaking at its inception, was in control until 1903, when Mr. W. S. Foale succeeded him. Mr. B. Handley, the present engineer, has been in office since 1920.

ELECTRICITY SUPPLY

Drastic Cuts in Eire. Bournemouth Traction Power.

Berwick (Northumberland).—REVOCATION OF ORDER OPPOSED.—After hearing the views of a representative of the Scottish Southern Electric Supply Co. Ltd., the Town Council has reiterated its opposition to the company's application for the revocation of the Berwick Electric Lighting Order, 1900. The company's representative explained that when the Scottish Border Order of 1934 was promoted a special clause was included permitting the company to acquire the undertaking in Berwick. If the Minister of Fuel and Power revoked the 1900 Order, the area of supply under the Berwick Order would then be amalgamated and form part of the area of supply under the Scottish Border Order. The company added that the scheme proposed would save clerical work for the company and would be advantageous in other directions. The application for revoking the Order must have the approval of the Council, and the Council would have to renounce any rights of purchase which it might have. The Council decided that, pending publication of the Government's plans for the electricity industry, the application for the revocation of the Order should be opposed.

Birkenhead. — SUPPLY TO DAIRY. — At a meeting of the Electricity Committee the borough electrical engineer (Mr. F. W. Brecknell) reported that an improved supply was needed at the Co-operative Society dairy at Swan Hill, Prenton, which would involve an outlay of £1,327. It was decided to ask the Society to contribute £780 towards the cost.

STREET LIGHTING POLICY.—The Watch Committee has considered post-war street lighting and has had reports on the subject from Mr. P. J. Robinson and Mr. J. N. Waite. Having interviewed the electrical and gas engineers, both of whom spoke of the need for placing early orders for materials, the Committee decided to make preparations for the re-instatement of gas and electric lighting on a pre-war basis as soon as opportunity permits. The question of a long-term post-war street lighting policy was deferred.

Bolton. — MILKING MACHINE. — The Corporation is to install an electric milking machine at the Lostock open-air school farm.

Brighouse. — HIPPERHOLME SUPPLY. — The Borough Council at its last meeting did not uphold a recommendation of the Electricity Committee with regard to the Hipperholme undertaking. The Committee had resolved not to give two years' notice this month to re-

purchase the undertaking, but to consider the question next January. At the Council meeting an amendment was carried that two years' notice should be given. Councillor G. H. Hey, who moved it, said that he would also like the undertakings covering the Southwram and Clifton areas to be repurchased, but the Hipperholme option came first and full advantage should be taken of it.

Cardiff. — GRIT EMISSION.—Complaints have been received by the Electricity Committee concerning the discharge of flue grit from the power station. The city electrical engineer stated that the nuisance was caused by the inferior quality of coal now being used. He was taking steps to minimise the trouble as far as possible.

SUPPLY TO COLLEGE.—A three-phase supply is to be provided to the University College, Cathays Park, at a cost of £370.

Coventry. — LOAN.—The Electricity Committee is seeking sanction to borrow £2,900 for plant to be installed at Longford power station.

Edinburgh. — STREET LIGHTING.—The Corporation Streets and Buildings Committee at its last meeting discussed the need for some modified system of street lighting and it was proposed that consideration should be given to the early installation of a system in selected parts of the city on the lines of the Liverpool experiment.

Glasgow. — ELECTRICAL WORKSHOPS. — The general manager reported to the Electricity Committee that there was a deficit of £1,072 on the operations of the central electrical workshops for the ten months ended March 31st. He recommended that the charges prescribed at the inception of the scheme for labour, materials, and electrical appliances should be increased by 2½ per cent. to meet the deficit. This was approved.

Hove. — FIVE-YEAR PLAN.—The Electricity Committee has prepared a five-year development plan estimated to cost £247,825, involving the completion of the change-over to AC throughout the borough and standardising the voltage.

Lichfield. — PROGRAMME OF EXTENSIONS.—The Electricity Committee has prepared a five-year extension scheme involving an expenditure of £134,417.

London. — SUBSTATION.—Sanction has been received by the Hackney Borough Council to borrow the sum of £1,750 for the erection of a transformer substation.

Lostwithiel.—**FARM ELECTRIFICATION.**—Concern regarding electricity supplies to farms was expressed at a meeting of the Lostwithiel Branch of the National Farmers' Union. Following remarks from some of the members the county secretary, Mr. F. M. Jesty, agreed that if the companies did not move faster than at present the N.F.U. must try to get further action. Electricity for farms, he said, should be in the forefront of post-war development. On the motion of Mr. D. Couch it was decided to ask the Executive Committee to press the matter.

South Shields.—**PURCHASE RIGHTS.**—The Town Council has decided to adjourn for twelve months the question of applying for an extension of the time under the South Shields Rural Electric Lighting Order, 1903, by which the Council has the right to acquire the electricity undertaking in its area.

Stalybridge.—**WELDING AND LIGHTING CHARGES.**—The Stalybridge, Hyde, Mossley and Dukinfield Joint Transport and Electricity Board has approved new tariff rates for welder service charges and an alternative tariff has been made available to meet the coming demand for increased lighting for mills and factories in view of Factory Act requirements.

Overseas

Eire.—**CRITICAL POSITION.**—The Minister of Supplies (Mr. Lemass), in a broadcast statement last week, announced the restriction of domestic consumption of electricity to one fifth of the 1941 consumption, the elimination of water heating by electricity and a cut of 50 per cent. in the consumption of electricity for cooking. The electric tram system would be suspended. He said that the next few months would be the most critical Eire would have to face until peace came. The Electricity Supply Board's coal supply was stopped and it was impossible to say if and when it would be resumed. This came at the worst possible period of the year, and when they had been experiencing the greatest drought for seventy years. For essential industries there was at present no fuel in sight. They would have to depend on turf exclusively. The Government was appealing to all employers to maintain the employment and remuneration of their workers for the maximum period that their resources would permit.

Canada.—**WATER-POWER RESOURCES.**—The Dominion Water and Power Bureau, Surveys and Engineering Branch, Department of Mines and Resources of Canada, has issued its annual review of the water-power resources of Canada. This review supplies information in condensed form on the total available and developed water power in each province, the provincial distribution of water power, and progress in its development and utilisation in the wartime and ordinary industrial activities of the Dominion. The review also gives information in regard to the growth of water-power development in Canada, the capital invested in industry (\$2,025 million), the coal equivalent of developed water power, and the resultant saving in coal consumption (approximately 26 million tons).

The present recorded water-power resources of the Dominion amount to 25,438,400 HP under conditions of ordinary minimum flow and

39,511,700 HP ordinarily available for six months of the year, which corresponds to a potential turbine installation of more than 51,350,000 HP. These power estimates have been substantially increased since the last issue of the review in consequence of a very complete revision of the figures for British Columbia to incorporate the results of protracted field investigations in that province. The total turbine installation, as at January 1st, 1944, was 10,214,513 HP. It is thus apparent that a large proportion of the water power of Canada still awaits development.

Portugal.—**CABINET DISCUSSES ELECTRIFICATION.**—A *Reuter* report from Lisbon states that Dr. Antonio Salazar, the Prime Minister, summoned his cabinet for a long session on Saturday for the fourth time during last week. An official announcement said the matter discussed was the "plan for electrification of the country."

TRANSPORT

Bournemouth.—**PURCHASE OF GENERATING PLANT.**—At a recent meeting of the Transport Committee reference was made to comments by the chairman of the Bournemouth and Poole Electricity Supply Co., Ltd., regarding the purchase of plant for the generating station. The Committee placed on record its rejection of the statements, pointing out that the purchase of the plant for the tramways generating station was not made without careful consideration.

A number of factors contributed to the decision, one of the most important being that in wartime it was highly desirable to have an alternative to the grid, which was heavily burdened and had, of course, not been immune from breakdown. The appropriate Government departments had approved and, indeed, urged, the retention of every available power supply to relieve the load on the grid and as a stand-by, and the purchase of the plant received the approval of the Ministers of Supply, Transport and Fuel and Power, and the Electricity Commissioners.

The Corporation had had regard to the respective interests of the ratepayers and the travelling public and the Committee was satisfied that the reliability of the service and the financial results achieved together demonstrated the wisdom of the policy which had so far been pursued. The electricity supply problem was constantly under review and if at some future time the Committee considered that it would be wise to take all or more power from the grid, it would without hesitation recommend the Council to do so.

I.E.E. Meeting

A FORMAL ordinary meeting of the Institution of Electrical Engineers will be held in the Lecture Theatre on Thursday, June 22nd, at 2.30 p.m., when a list of candidates for election and transfer, approved by the Council for ballot, will be submitted for suspension in the Hall. A further formal ordinary meeting will be held on Thursday, July 6th, at 2.30 p.m., for the purpose of carrying out a ballot in respect of the candidates whose names are to be suspended. Only corporate members and associates are eligible to participate in the ballot.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The British Electric Traction Co., Ltd., reports a revenue for the year ended March 31st last of £767,962, as compared with £760,293 for the previous year. After deducting £59,365 (£59,865) for general expenses, etc., and £312,677 (£311,032) for income tax, and after charging £79,479 (same) for debenture stock interest, there is a balance of £316,441 (£309,915) available. It is proposed to pay final dividends of 5 per cent. on the participating preference stock, making 8 per cent. for the year; 4 per cent. on the preferred ordinary stock, making 8 per cent.; and 30 per cent. on the deferred ordinary stock, making 45 per cent.; leaving £56,961 (£50,435) to be transferred to undivided profits account. A sum of £10,000 has been set aside out of profits accumulated from sales of investments for the purposes of the staff benevolent fund. Investments now stand at £6,795,102, of which £4,995,034 is in respect of holdings in subsidiary and associated companies. The amount standing to the credit of reserve account remains at £520,000. The amount standing at the credit of undivided profits account is £2,261,208.

The National Electric Construction Co., Ltd., reports a net profit of £25,246 for 1943, as compared with £33,732 in 1942. This figure was arrived at after setting aside £26,500 (£16,399) for taxation. A dividend of 10 per cent. (same) is to be paid, leaving £15,996 (£15,232) to be transferred to the undivided profits account, making the total £184,906 (£168,910).

Walsall Conduits, Ltd., shows a net profit of £200,123 for 1943 before providing for taxation. This compares with £202,745 in the preceding year. Tax provision requires £126,526 (£133,612) and £20,000 (same) is allocated to general reserve. The ordinary dividend is maintained at 55 per cent. by a final distribution of 35 per cent. and £93,542 (£86,195) is carried forward.

The Plessey Co., Ltd., records a trading profit of £276,816 for the past year, as compared with £299,714 in the previous twelve months. Interest £2,324 (£3,629) and interest on tax certificates £7,008 (nil) bring the total available to £286,148 (£303,343). Directors' fees absorb £1,250 (same), depreciation £78,584 (£80,391), income tax £127,000 (£138,000), transfer to general reserve £50,000 (same), preference dividend £6,875 (same) and first and second interim dividends of 10 per cent. each on the ordinary shares £25,000 (same). It is not intended to pay a final dividend and £35,538 (£38,099) is carried forward.

Herbert Terry & Sons, Ltd., record a net profit of £45,648 for 1943, after providing for taxation and depreciation. The corresponding figure for 1942 was £35,090. A final dividend of 1s. a share brings the total to 30 per cent. for the year (same), and the allocation to the contingencies reserve is increased from £10,000 to £15,000. The carry forward is advanced from £24,938 to £27,711.

Hopkinsons, Ltd., report a net profit for the year ended January 31st last of £74,043, as

compared with £62,598 for the preceding year. It is stated that the higher profit is in a measure due to standard profit for E.P.T. being higher by reason of additional capital employed, and to a clarification of the taxation position. The ordinary dividend for the year is maintained at 17½ per cent. by a final distribution of 12½ per cent., and £124,151 is carried forward as compared with £92,983 brought in.

The Skefko Ball Bearing Co., Ltd., reports a profit for 1943, after providing for depreciation and taxation, of £178,082 (against £176,195), to which is added £137,047 (£150,852) brought in. A final dividend of 6½d. per 5s. stock unit is declared, making 10½d., free of tax (same). A sum of £20,000 (nil) is transferred to general reserve and £10,000 (£50,000) to pension schemes, leaving £145,129 to be carried forward.

Callender's Cable & Construction Co., Ltd., reports a net profit after providing for taxation, of £465,115 for 1943, as against £451,031 for 1942. The dividend and bonus remain unchanged at 20 per cent.

Cable & Wireless (Holding), Ltd., is paying the usual yearly dividend of 4 per cent. on the ordinary stock.

Cable & Wireless, Ltd., announces a final dividend of 2½ per cent. (same), making 4 per cent. for the year.

Marconi's Wireless Telegraph Co., Ltd., proposes to pay a final dividend of 3½ per cent., again making 7 per cent. for the year.

Keith Blackman, Ltd., report an increase in net profit from £149,601 for 1942-43 to £192,451 last year. The dividend is being maintained at 20 per cent.

The Electric & General Investment Co., Ltd., is paying a final dividend of 7 per cent., making 10 per cent. for the year, as compared with 9 per cent. in 1942.

Ruston & Hornsby, Ltd., are again to pay a dividend of 12½ per cent. on the ordinary stock.

New Companies

Gaydon (Worthing), Ltd.—Private company. Registered May 31st. Capital, £2,000. Objects: To acquire the business of a manufacturer of, and dealer in, wireless and electrical apparatus, refrigerating and domestic appliances, etc., carried on by Albert B. Gaydon, as Gaydons, at 21, High Street and 68, Montague Street, Worthing, Broadwater Street, West Worthing, and Church Street, Storrington. Directors: A. B. Gaydon (permanent), 21, High Street, Worthing; and V. B. Mitchelmore, C.A., 1, High Street, West Wickham, Kent.

Electric Panels, Ltd.—Private company. Registered May 30th. Capital, £10,000. Objects: To carry on the business of electrical, mechanical, civil and heating engineers, etc. Directors: D. W. Aldridge, Rainhill Mount, Rainhill, Liverpool; and F. Waive, Becholme, Grosvenor Road, St. Helens, Lancs. Solicitors: Hill, Dickenson & Co., Liverpool, 2.

Efficient

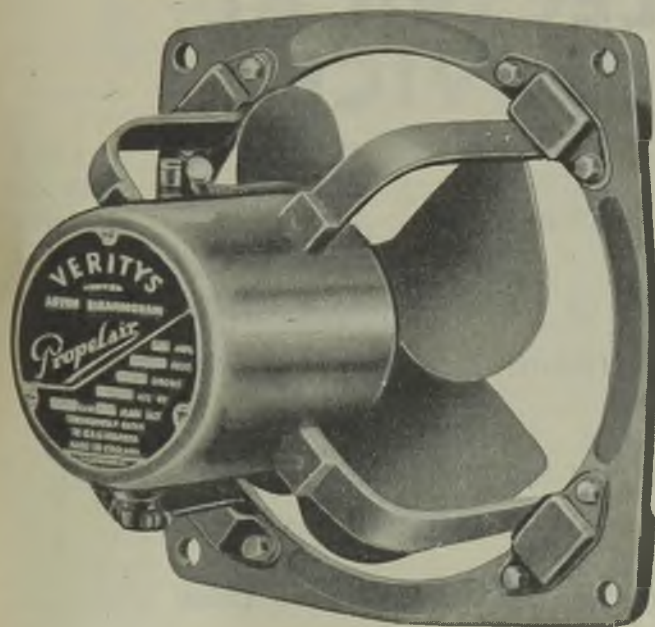
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	DESIGNS	ROTORS	TRANSFORMER	TYPES

I NSTALLATIONS OF POWER AND LIGHTING SYSTEMS
I NSPECTION AND MAINTENANCE CONTRACTS

B REAKDOWNS OF ELECTRICAL MACHINERY
 A SPECIAL SKILLED TEAM AVAILABLE

NOTHING TOO SMALL—NOTHING TOO LARGE

THE **RIB** BROUGHT LIFE TO EVE
BURDETTE'S BRINGS LIFE TO ELECTRICAL PLANT

ALL ENQUIRIES TO :—

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Lloyd, Davidson & Co., Ltd.—Private company. Registered June 1st. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical and other domestic appliances, wireless sets, electric lamps and fittings, etc. Directors: W. C. Lloyd, 18, St. James Street, Nottingham; E. Davidson, 89, Gladstone Street, Mansfield; and A. Davidson, 5, Grove Terrace, Mansfield. Registered office: 18, St. James Street, Nottingham.

Foregate Engineering & Electrical Co., Ltd.—Private company. Registered May 19th. Capital, £1,000. Objects: To carry on the business of electrical, textile, radio and general engineers, etc. Directors: J. G. Hughes, 5, Norton Drive, Irby, Wirral, Ches.; and three others. Registered office: 14a, Seller Street, Chester.

Electro Medical Equipment Laboratory Co., Ltd.—Private company. Registered May 18th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electro-medical, dental and scientific equipment, etc. R. Sproull, 28, Great Queen Street, W.C.2, is the first director. Registered office: 2, Gayton Road, Harrow, Middlesex.

Philip Salter & Son, Ltd.—Private company. Registered May 25th. Capital, £1,000. Objects: To acquire the business of a manufacturer of, and dealer in, lampshades, batteries, electrical apparatus, etc., carried on by Rose G. Salter at Egyptian Mills, Wellington Street, Bury, as "Philip Salter." Rose G. Salter, 27, Rowley Road, St. Annes-on-Sea, is a permanent director. Registered office: 26, Cross Street, Manchester.

Hiduminium Applications, Ltd.—Private company. Registered May 23rd. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, light metals and alloys and products thereof, plastic manufacturers, mechanical, electrical, motor and general engineers, etc. Directors: W. C. Devereux, Meads, Stoke Poges; H. G. Herrington, Clevehurst, Stoke Poges; S. Sanders, Farnham Common; E. A. Reynolds, Longbridge Manor, near Warwick; A. J. S. Aston, Tamworth-in-Arden; and J. H. Catling, Edgbaston. Registered office: 95, Farnham Road, Slough.

Companies' Returns Statements of Capital

Rangoon Electric Tramway & Supply Co., Ltd.—Capital, £1,000,000 in £1 shares (250,000 preference, 550,000 ordinary and 200,000 unissued). Return dated January 13th. 250,000 preference and 550,000 ordinary shares taken up. £735,000 paid. £65,000 considered as paid. Mortgages and charges: £200,000.

Lucas Batteries, Ltd.—Capital, £20,000 in £1 shares. Return dated December 13th. All shares taken up. £20,000 paid. Mortgages and charges: Nil.

T. C. Gilbert & Co., Ltd. (In voluntary liquidation).—Capital, £5,000 in 5,000 shares of £1 each. Return dated January 14th. 3,200 shares taken up. £2,300 paid. £900 considered as paid. Mortgages and charges: Nil.

J. & F. Stone Lighting & Radio, Ltd.—Capital, £600,000 in 200,000 preference shares of £1 and 1,600,000 ordinary shares of 5s. each. Return

dated December 21st, 1943 (filed January 20th, 1944). 1,600,000 ordinary and 159,870 preference shares issued and fully paid up. Mortgages and charges: Nil.

Willans & Robinson, Ltd.—Capital, £100 in £1 shares. Return dated January 12th. 2 shares taken up. £2 paid. Mortgages and charges: Nil.

Wycombe Electrical Supplies, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st (filed March 3rd). All shares taken up. £2 paid. £998 considered as paid. Mortgages and charges: £600.

Cressall Manufacturing Co., Ltd.—Capital, £15,000 in £1 shares. Return dated February 22nd. 9,000 shares taken up. £9,000 considered as paid. Mortgages and charges: Nil.

Increases of Capital

Coldair, Ltd.—The nominal capital has been increased by the addition of £49,500 in £1 ordinary shares beyond the registered capital of £500.

Craven Brown, 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

W. H. Raynor & Sons, Ltd.—Satisfaction in full on (1) April 21st of second mortgage dated December 29th, 1933, and registered January 3rd, 1934, securing £1,200, and (2) on April 22nd, 1944, of mortgage dated July 29th, 1920, and registered August 23rd, 1920, securing £1,000.

Electrical Finance & Securities Co., Ltd.—Satisfaction in full on May 11th of trust deeds dated July 29th, 1927, July 6th, 1928, April 26th, 1930, and January 29th, 1932, and registered July 29th, 1927, July 10th, 1928, April 24th, 1930, and February 1st, 1932.

W. J. Godsland & Son, Ltd.—Satisfaction on December 31st, 1943, to the extent of £500, of series of £1,600 debentures authorised May 12th and registered May 22nd, 1943. (Notice filed June 5th, 1944.)

Simon Electric Floor Scrubbers, Ltd.—Assignment on May 23rd of proceeds of contract, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Saltman Engineering Co., Ltd.—Satisfaction in full on May 23rd, 1944, of £1,000 debenture dated March 6th, and registered March 24th, 1944.

Receiver Appointed

Argonaut Engineering Co., Ltd.—J. T. Morgan, 11, Argyl Street, W.I., was appointed receiver and manager on May 16th, under powers contained in instrument dated March 10th, 1940.

Bankruptcies

H. C. Casselden, radio and electrical dealer, trading as Edwards & Son, 67, London Road, Brighton.—Proofs for dividend by June 20th to the trustee, Mr. A. E. Everard, 6 & 7, Old Steine, Brighton.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange markets, having recovered from the first effects of the Invasion news, are pursuing a steadiness of course which indicates as clearly as anything else can do the confidence of the public in the ultimate issue of the war. Even on the day when the Government announcement was made, prices held their previous levels with notable firmness. Only in those shares which, from the speculative position built up in them, had become vulnerable to anticipated selling by speculators, was there any indication of weakness. On the other hand, Imperial Continental Gas, which was standing at 76 at the end of last March, rose to 98 as a direct result of the post-Invasion possibilities. For a similar reason, Great Northern Telegraphs advanced 2 points to 23½. Domestic industrial stocks and shares remain consistently firm.

Gilt-edged Ordinary

British Insulated ordinary, ½ up at 3 ⅞, yield about 3s. per cent. less than Henley's and Callender's. These three may be regarded as the most important trio in their own class. The dividend paid by each of them is 20 per cent. General Electric, on their 17½ per cent. dividend, return £3 13s. 9d. per cent. Tube Investments, another 20 per cent dividend-payer, can be bought at 97s. to return £4 2s. 4d. per cent. The dividend of 20 per cent. on Ericssons Telephones 5s. shares is free of tax, equivalent, of course, to 40 per cent. calculating tax at 10s. in the £, and giving a yield of 1½ per cent. net, 3½ per cent. gross, at 56s. 3d.

Price Fluctuations

Associated Electric ordinary and preference are 1s. better at 55s. and 40s. 6d. respectively. Metal Industries "B" shares are similarly firmer at 49s. 6d. Crompton Parkinsons hardened to 51s. 3d. Most of the line of Johnson & Phillips shares which were on offer has now been placed, and the price is 6d. to the good at 74s. 6d. Siemens strengthened to 33s. 6d. upon publication of the year's figures. A good many Brush ordinary shares have been bought, and this is reflected in a rise of 9d., to 9s. 9d., in the 5s. shares. English Electric moved up to 52s. 6d. and Enfield Cables are a good market at 57s. At 49s. ex dividend, Walsall Conduits are a few pence better. Hall Telephones, 6d. down at 28s., show the solitary fall in this department.

Cable & Wireless ordinary is 10s. lower, at 82½, the dividend of 4 per cent. for the full year being in accord with anticipation. The 5½ per cent. preference stock has also receded 10s., to 113½. At these prices the yield is the same on both stocks, £4 17s. per

cent. Globe Telegraphs are unchanged. Marconi Wireless has again declared a dividend making 7 per cent. for the year. The price of the 10s. shares is 16s. middle.

Invasion news has slowed down the pace of bullishness in the radio group. E.M.I. shares hold all their last week's gain of 3s., and this in spite of fairly considerable taking of profits by people who got in lower down. Cossors are steady at 25s. 6d. Pye deferred, at 28s. 6d., have added the pence, and E. K. Cole, at 33s. 6d., are up 1s.

Miscellaneous Matters

A rise of 60 points lifted British Electric Traction deferred stock to 1265, which must make pleasant reading for the many investors who have recently been picking up the stock. The 8 per cent. preferred is sympathetically higher, by 5 points, at 180. Good prices continue to rule in the market for home electricity supply shares. Electrical Finance & Securities, at 56s. 6d. ex dividend, have responded to the increased dividend. City "Lights" and County of London are 6d. higher. Electric Supply Corporation, at 47s., also show a sixpenny gain. Amongst overseas shares. Perak Hydro Electrics hardened to half a guinea in sympathy with the rises in Middle-East rubber and tin shares. Canadian utilities have advanced, Montreal Light & Power at 25 being 1½ up. International "Tel. & Tel." at 18 are 2 points higher.

Calcutta Trams

Calcutta Tramways ordinary have risen 5s. in anticipation of an official announcement from the Corporation of Calcutta in regard to the Corporation's likely wish to purchase the tramway's undertaking. The Corporation had the right, which it did not exercise, to purchase in 1931 and again in 1938; the next date at which this right can be exercised is January 1st, 1945. Notice in respect of the latter has to be given by the end of the present month. The price of the shares at the beginning of this year stood at 36s. During the past few days it has been up to 46s., from which there was a slight reaction.

Ultra Electric

Amongst the shares which have come to the front within the past week or so are the 5s. ordinary in Ultra Electric (Holdings), Ltd. The company came out some nine years ago, having acquired the issued share capital of Ultra Electric, Ltd., founded in 1925. The year ends with June, and the report comes out towards the end of July. This time last year a dividend, the first since 1937, was declared of 10 per cent. per annum, out of earnings of 11 per cent. The price

(Continued on page 864)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend		Middle Price June 13	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price June 13	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/-	+6d.	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	115	..	4 7 0
City of London ..	7	5½	28/6	+6d.	3 17 2	1951-73 ..	4½	4½	107	..	4 4 1
Clyde Valley ..	8	8	41/6	..	3 17 0	1963-93 ..	3½	3½	103½	..	3 7 8
County of London ..	8	8	41/6	+6d.	3 17 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. Yorksh. ..	9	9	45/6	..	3 19 6	B	5	5	121½	..	4 2 4
Elec. Fin. and Securities	12½	13½	56/6xd	+1/6	4 15 5	C	3	3½	72	..	4 10 3
Elec. Supply Corporation	10	10	47/-	+6d.	4 5 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.: Pref.	6	6	120½	..	4 19 7
Llanely Elec. ..	6	6	26/-	..	4 12 4	Def.	1½	1½	31	..	4 16 9
London Assoc. Electric ..	3	4	23/6	..	3 8 1	Anglo-Portuguese ..	8	8	26/-	..	6 3 1
London Electric ..	6	6	28/-	..	4 5 9	Cable & Wireless: 5½ Pref.	5½	5½	113½	-½	4 17 0
London Power Red. Deb.	5	5	104½	..	4 14 7	Ord.	4	4	82½	-½	4 17 0
Metropolitan E.S. ..	8	8	40/-	..	4 0 0	Canadian Marconi \$1 Nil	4cts.	9/3	..	—	
Midland Counties ..	8	8	40/6	..	3 19 0	Globe Tel. & Tel.: Ord.	8½*	5*	39/6	..	2 10 8
Mid. Elec. Power ..	9	9	44/-	..	4 1 9	Pref.	6	6	30/-	..	4 0 0
Newcastle Elec. ..	7	7	30/6	..	4 12 0	Great Northern Tel. (£10)	Nil	Nil	23½	+2	—
North Eastern Elec.: Ordinary	7	7	33/6	..	4 3 7	Inter. Tel. & Tel. ..	Nil	Nil	18	+2	—
7% Pref.	7	7	35/-	..	4 0 0	Marconi-Marine ..	7½	7½	33/6	..	4 9 7
Northampton ..	10	10	48/-	..	4 3 4	Oriental Tel. Ord. 16	10	10	47/-	+6d.	—
Notting Hill 6% Pref. (£10) ..	6	Nil	11	..	—	Telephone Props. 6	Nil	17/-	..	—	
Northmet Power: Ordinary	7	7	39/-	..	3 11 9	Tele. Rentals (5/-) 10	10	10	12/-	..	4 3 4
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	..	—
Southern Areas ..	5	5	23/-	..	4 7 0	Brit. Elec. Traction: Def. Ord.	45	45	1265	+60	3 11 2
South London ..	7	7	28/-	..	5 0 0	Pref. Ord.	8	8	180	+5	4 9 0
West Devon ..	5	5	23/6	..	4 5 1	Bristol Trams ..	10	10	56/6	..	3 10 10
West Glos. ..	4½	3½	24/6	..	2 17 4	Brazil Traction ..	\$1	\$12	28	+½	6 5 0
Yorkshire Elec. ..	8	8	43/-	..	3 14 5	Calcutta Trams. ..	5½	6½	45/6	+5/-	2 17 2
Overseas Electricity Companies						Cape Elec. Trams 5	6	26/-	..	4 12 4	
Atlas Elec. ..	Nil	Nil	7/9	+3d.	—	Lancs. Transport 10	10	45/6	..	4 8 0	
Calcutta Elec. ..	6*	6*	40/-	+2/-	3 0 0	Mexican Light: 1st Bonds ..	5	5	103½	..	4 16 7
Cawnpore Elec. ..	10	10	35/6	+6d.	5 12 8	Rio 5% Bonds ..	5	5	105½	..	4 14 9
East African Power ..	7	7	33/6	+6d.	4 3 7	Southern Ry.: 5% Prefd. ..	5	5	79½	-½	6 5 9
Jerusalem Elec. ..	5	5	28/6	..	3 10 2	5% Pref.	5	5	118½	+1	4 4 9
Kalgoorlie (10/-) ..	5	5	10/-	..	5 0 0	T. Tilling ..	10	10	59/6	..	3 7 3
Madras Elec. ..	4*	Nil	23/-	..	—	West Riding ..	10	10	44/6	..	4 10 0
Montreal Power ..	1½	1½	25	+1½	6 0 0	(Continued on next page)					
Palestine Elec. "A" ..	4*	5*	41/-	..	2 8 9						
Perak Hydro-elec. 6	7	10/6	+6d.	—	—						
Shawinigan Power 83cts.	90cts.	16½	+½	—	—						
Tokyo Elec. 6% 6	6	18	+3	—	—						
Victoria Falls Power 15	15	4½	..	3 12 7							
Whitehall Inv. Pref. —	6	24/-	..	5 0 0							

* Dividends are paid free of Income Tax.

Company	Dividend		Middle Price June 13	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price June 13	Rise or Fall	Yield p.c.		£	s.	d.
	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	43/3	..	6 18 10				
Ord.	10	10	55/-	+1/-	3 12 9	Hall Telephone (10/-)	12½	12½	28/-	-6d.	4 9 3				
Pref.	8	8	40/6	+1/-	3 19 0	Henley's (5/-)	20	20	26/9	..	3 14 9				
Automatic Tel. & Tel.	12½	12½	66/-	..	5 15 9	4½% Pref.	4½	4½	24/-	..	3 15 0				
Babcock & Wilcox	11	11	51/-	+6d.	4 6 3	Hopkinson's	15	17½	65/-	..	5 7 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	5 16	+½	3 11 9	Intl. Combustion	30	30	6½	..	4 12 4				
British Thermostat						Johnson & Phillips	15	15	74/6	+6d.	4 0 6				
(5/-)	18½	18½	21/-	..	4 8 1	Lancashire Dynamo	22½	22½	97/-	..	4 12 9				
British Vac. Cleaner						Laurence, Scott (5/-)	12½	12½	13/-	..	4 16 2				
(5/-)	15	30	30/-	..	5 0 0	London Elec. Wire	7½	7½	39/-	..	3 17 0				
Brush Ord. (5/-)	8	9	9/9*	+9d.	4 12 4	Mather & Platt	10	10	52/6	..	3 16 4				
Burco (5/-)	15	17½	16/-	..	5 9 5	Metal Industries (B)	5	8	49/6	+1/-	3 4 9				
Callender's	15	20	5½	..	3 14 8	Met. Elec. Cable Pref.	5½	5½	21/3	..	3 3 8				
Chloride Elec. Storage	15	15	82/6	..	3 12 10	Murex	20	20	105/9	..	3 15 6				
Cole, E. K. (5/-)	10	15	33/6	+1/-	2 4 9	Pye Deferred (5/-)	25	25	28/6	+6d.	4 2 3				
Consolidated Signal	24	27½	6½	..	4 4 6	Revo (10/-)	17½	17½	42/6	..	4 2 4				
Cossor, A. C. (5/-)	7½*	10*	25/6	..	1 19 6	Reyrolle	12½	12½	70/6	..	3 11 5				
Crabtree (10/-)	17½	17½	38/9	..	4 10 1	Siemens Ord.	7½	7½	33/6	+6d.	4 9 6				
Crompton Parkinson						Strand Elec. (5/-)	7½	10	7/9	..	6 9 0				
Ord. (5/-)	20	22½	31/3	+9d.	3 12 2	Switchgear & Cow-									
E.M.I. (10/-)	6	8	34/-	..	2 7 1	ans (5/-)	20	20	18/6	..	5 8 1				
Elec. Construction	10	12½	52/-	..	4 16 2	T.C.C. (10/-)	5	7½	22/6	..	3 6 8				
Enfield Cable Ord.	12½	12½	57/-	+6d.	4 7 9	T.C. & M.	10	10	55/-	..	3 12 6				
English Electric	10	10	52/6	+6d.	3 16 0	Telephone Mfg. (5/-)	9	9	11/9	..	3 16 8				
Ensign Lamps (5/-)	25	15	21/3	..	3 10 8	Thorn Elec. (5/-)	20	20	25/-	..	4 0 0				
Ericsson Tel. (5/-)	22*	20*	56/3	..	1 15 7	Tube Investments	20	20	97/-	..	4 2 4				
Ever Ready (5/-)	40	40	43/3	..	4 12 7	Vactric (5/-)	Nil	Nil	14/6	..	—				
Falk Stadelmann	7½	7½	33/6	..	4 9 7	Veritys (5/-)	7½	7½	7/9	..	4 16 9				
Ferranti Pref. . .	7	7	30/-	..	4 13 4	Walsall Conduits (4/-)	55	55	49/-xd	+3d.	4 9 7				
G.E.C. :						Ward & Goldstone									
Pref.	6½	6½	34/-	..	3 16 6	(5/-)	20	20	27/3	..	3 13 6				
Ord.	17½	17½	95/-	..	3 13 9	Westinghouse Brake	12½	14	75/-	..	3 14 9				
						West, Allen (5/-)	7½	7½	7/3	..	5 3 5				

* Dividends are paid free of Income Tax.

Stocks and Shares (Continued from page 862)

of the shares fell to 6d. shortly before the outbreak of war. The present price of 9s. 9d. is the highest for several years.

Imperial Continental

The Imperial Continental Gas Company's most profitable interests at the present time lie, not in gas, but in electricity. The Association has an important interest in Edmundsons, in addition to its stake in many gas and electricity companies on the Continent. Its chief source of income comes from the shareholding in Edmundsons. No dividend has been paid since 1940. The year ends with March. The company's capital is £5,600,000; it has reserves amounting to nearly £4,000,000, and the income for last year of £131,000 was drawn mainly from the dividend on the company's shares in Edmundsons.

Price Discrepancies

A Harrogate reader of these notes writes to ask for an explanation of the wide difference which exists between prices of shares in

Home electricity companies and those of the manufacturing companies. "Why" he asks "should Richmond (Surrey) be standing at 25s. 6d., whereas Edmundsons are quoted 29s. ? Both companies pay 6 per cent. dividend."

In the circumstances above quoted, one reason for the difference lies in the fact that there is a much freer market in Edmundsons shares, owing to the considerably greater capital of the Edmundsons Company. Ready marketability usually strengthens the prices of shares. Another reason is the fact that Edmundsons is interested in a widely spread and diversified group of interests, whereas the Richmond (Surrey) Company operates in a narrower area and is, to that extent, more liable to possible war damage. Richmonds are not nearly so well known as Edmundsons, and this makes a third reason for the difference in the prices. A column could be filled with suggestions which would at all events partially (if not always satisfactorily) account for price discrepancies, but such differences always have existed and, in all probability, will continue as long as the Stock Exchange remains.

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.

W. S. GRAFF-BAKER.—"Electric motor control systems." 7831. June 8th, 1942. (561545.)

British Thomson-Houston Co., Ltd.—"Voltage regulators of the transformer tap-changing types." 16323/42. November 25th, 1941. (561531.) "Electron lenses." 13873/42. October 3rd, 1941. (561554.) "Means for mounting auxiliary compartments in the walls of refrigerator cabinets." 31/43. January 8th, 1942. (561603.)

Cambridge Instrument Co., Ltd., W. H. Apthorpe and G. S. Rayner.—"Self-balancing electrical apparatus, e.g., recorders." 16558/9. November 23rd, 1942. (561631/2.)

English Electric Co., Ltd., and M. A. B. Landers.—"Fusible cut-outs." 555. January 12th, 1943. (561578.)

General Electric Co., Ltd., W. Manchester and R. A. Adams.—"Electric lampholders, adaptors and connectors." Cognate applications 502/43 and 503/43. January 11th, 1943. (561577.)

General Electric Co., Ltd., E. R. Rowley and A. Moss.—"Machines for sorting cylindrical objects." 13144. September 17th, 1942. (561515.)

Harland Engineering Co., Ltd., and L. Greenwood.—"Fan-cooled dynamo-electric machines of the totally enclosed type." 11937. August 25th, 1942. (561552.)

W. T. Henley's Telegraph Works Co., Ltd., H. W. Breeze and H. C. Hoban.—"Electric cartridge fuses." 18067. December 19th, 1942. (561635.)

Holophane, Ltd.—"Luminaires." 2114/42. November 27th, 1940. (561540.) "Luminaires." 2115/42. January 11th, 1941. (561541.)

G. H. Lancaster and Sterling Engineering Co., Ltd.—"Electric torches." 18034. December 18th, 1942. (561575.)

A. Love.—"Electrical measuring instrument." 15597. November 5th, 1942. (561523.)

Marconi's Wireless Telegraph Co., Ltd., and J. H. Moon.—"Device for measuring angles." 16567. November 23rd, 1942. (561633.)

A. F. Merry.—"Electric immersion heaters." 15409/42. October 28th, 1943. (561558.)

Philco Radio & Television Corporation.—"Sound-recording apparatus." 16447/42. December 4th, 1941. (561591.)

Pirelli-General Cable Works, Ltd., and H. Barron.—"Electrically insulating coating compositions and wires coated therewith." 12920. September 14th, 1942. (561514.)

A. Reyrolle & Co., Ltd., and J. W. Bayles.—"Air-brake electric circuit-breakers." 12449. September 3rd, 1943. (561512.)

A. Reyrolle & Co., Ltd., and J. Small.—"Operating means for electric switchgear." 16435. November 20th, 1942. (561590.)

P. Robinson and J. H. Runbaken.—"Means for supplying electric current to low-voltage

lamps or other devices from the usual lighting circuit." 460. January 9th, 1943. (561610.)

T. Ryder & Sons, Ltd., R. D. G. Ryder and H. Myers.—"Reverse plugging switch for controlling electric motors." 801. January 15th, 1943. (561615.)

Standard Telephones & Cables, Ltd.—"Filamentary cathodes for electric-discharge tubes." 17053/42. March 3rd, 1942. (561594.) "Methods and means for sealing electron-discharge tubes." 17653/42. February 6th, 1942. (561599.)

Standard Telephones & Cables, Ltd., and F. Gray.—"Manufacture of electric current rectifier discs." 16319. November 18th, 1942. (561530.)

Standard Telephones & Cables, Ltd., and E. A. Richards.—"Manufacture of electric current rectifier discs." 16318. November 18th, 1942. (561529.)

S. D. Sullam.—"Electric battery torch lamps and the like." 867. January 18th, 1943. (561616.)

A. A. Thornton (Philco Radio & Television Corporation).—"Pick-ups for talking machines." 10990. August 6th, 1942. (561501.)

Westinghouse Brake & Signal Co., Ltd., and A. H. B. Walker.—"Systems for the rectification of alternating electric currents." 16308/9. November 18th, 1942. (561527/8.)

Amended Specification

Standard Telephones & Cables, Ltd.—"High-current electric dry rectifier assembly." (557062.)

Forthcoming Events

Saturday, June 17th.—London.—Bonnington Hotel, Southampton Row, W.C.1, 2.45 p.m. Institution of Factory Managers, South Eastern (London) Branch. Discussion on "Current and Future Problems in Factory Management."

Wakefield.—At Wakefield Technical College, 3 p.m. Association of Mining Electrical and Mechanical Engineers (Yorkshire and North-West Branch). "Colliery Cables—Their Manufacture, Maintenance and Performance," by Messrs. R. F. D. Milner and J. R. Cox.

Monday, June 19th.—Birmingham.—Grand Hotel, 6 p.m. Birmingham Electric Club. "Modern Applications of Mercury Arc Rectifiers," by Mr. J. C. Milne.

London.—At Institution of Mechanical Engineers, Storey's Gate, S.W.1, 7.15 p.m. Association of Austrian Engineers, Chemists and Scientific Workers in Great Britain. "Planning and Education for Technical Research," by Prof. P. Gross.

Thursday, June 22nd.—Exeter.—Royal Clarence Hotel, Cathedral Yard, 3 p.m. Institution of Electrical Engineers, Devon and Cornwall Sub-Centre. "Standardisation of Motor Dimensions," by Mr. H. Marryat.

Saturday, June 24th.—London.—46 Frederick's Place, Old Jewry, E.C.2. Half-yearly court of governors of the Commercial Travellers' Benevolent Institution.

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.

Dumfries.—June 20th. Town Council. Various works, including electrical installation, at scarlet fever pavilion, Parkhead Hospital. Forms, etc., from burgh surveyor; tenders to town clerk.

Dundee.—June 19th. Corporation Emergency Committee. Inspection lamps complete with cables. Particulars from the A.R.P. Equipment Officer, Friarfield House, Barrack Street.

June 19th. Electric lighting installation at Maryfield tram depot cleansing unit. Particulars from city quantity surveyor, 21, City Square; tenders to town clerk.

Dunfermline.—June 19th. Town Council. Various works, including electrical, at 20 additional houses at Brucefield Housing Scheme, Schedules, etc., from C. R. Douglas & Son, 15, East Port.

Manchester.—June 23rd. Electricity Department. 33-kV and auxiliary pilot and telephone cables. (June 9th.)

Salford.—June 30th. Electricity Department. Mercury arc rectifiers. (See this issue.)

Stornoway.—June 26th. Town Council. Various works, including electrical, at 38 houses. Schedules from T. O. W. Gratton, architect, 216, West Regent Street, Glasgow, C.2; tenders to town clerk.

Orders Placed

Cardiff.—Emergency Committee. Accepted. 300 electric torches (£50).—Blumel, Ltd.

Electricity Committee. Covering boilers (£450).—W. Kenyon & Sons.

London.—POP.LAR.—General Purposes Committee. Accepted. Amplifying equipment for open spaces (£306).—E.M.I. Services (in place of G. R. Fountain).

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.

Barrow-in-Furness.—Extensions, Risedale Maternity Hospital (£2,000); borough engineer. Prefabricated ward, North Lonsdale Hospital, School Street; governors.

Bolton.—Works additions, Blackburn Road; Snowfecta Manufacturing Co.

Additions, Soho Ironworks, Crook Street; Hick, Hargreaves & Co., Ltd.

Brighton.—Nursery class at Moulscombe (£2,650); J. G. Drew, town clerk, Town Hall.

Carmarthenshire.—Erection of school canteen at Llandovery Council School, county architect, County Offices, Carmarthen.

Cheltenham.—Extensions, Churchill Rd.; Sunshine Laundry, Ltd.

Chester.—Erection of junior technical college, site in Queen's Park Road; borough engineer, Municipal Offices, Town Hall.

Dunston-on-Tyne.—Canteen at the trading estate; H. E. Pitt, Ltd., Leopold Street, Millfield, Sunderland.

Durham.—Central kitchen at Sacriston; F. Willey, architect, 34, Old Elvet, Durham.

Glasgow.—New classroom accommodation at school damaged by fire (£4,850); city architect.

Hailsham.—Agricultural cottages for U.D.C.; Young & Porter, Ltd., builders, Northumberland Alley, Fenchurch Street, London, E.C.3.

Hampshire.—Adaptations at old law courts, Winchester, for third Court of Assize (£2,500); county architect, The Castle, Winchester.

Hastings.—Extensions, Priory School; borough engineer.

Horsforth.—Carpet cleaning works, office, etc.; Horsforth Steam Laundry Co., Ltd., Horsforth, near Leeds.

Isle of Wight.—Building school, Osborne Road, East Cowes (£2,005); county architect.

Keswick.—Maternity home accommodation; Keswick Hospital Management Committee.

Leeds.—Re-erection and completion of premises at Fairfield Crescent, Westfield estate; R. A. H. Livett, housing director, Priestley House, Quarry Hill, Leeds, 9.

Manchester.—Extensions, Orphan School, Cheadle Hulme; secretary, Manchester Warehousemen and Clerks' Orphan School, 24, Mosley Street.

Houses (12); J. Mendleson, 207, Heywood Street, Cheetham.

Mansfield.—School kitchens, Carter Lane and Broomhill Council Schools; borough engineer.

Newcastle (Staffs.).—Cinema, Penkhull Street; Associated British Cinemas, Ltd., London, W.1.

Cinema, Merrial Street, for Gaumont-British Cinemas, Ltd.; W. R. Davidge & Partner, architects, 5, Victoria Street, London, S.W.1.

Newcastle-on-Tyne.—Electric lighting and hot water installations in the School of Building, Bath Lane; Architect's Department, Education Offices, Northumberland Road.

Oakham.—Fire station; Area Officer, N.F.S. Headquarters, "Glenco," Ratcliffe Road, Leicester.

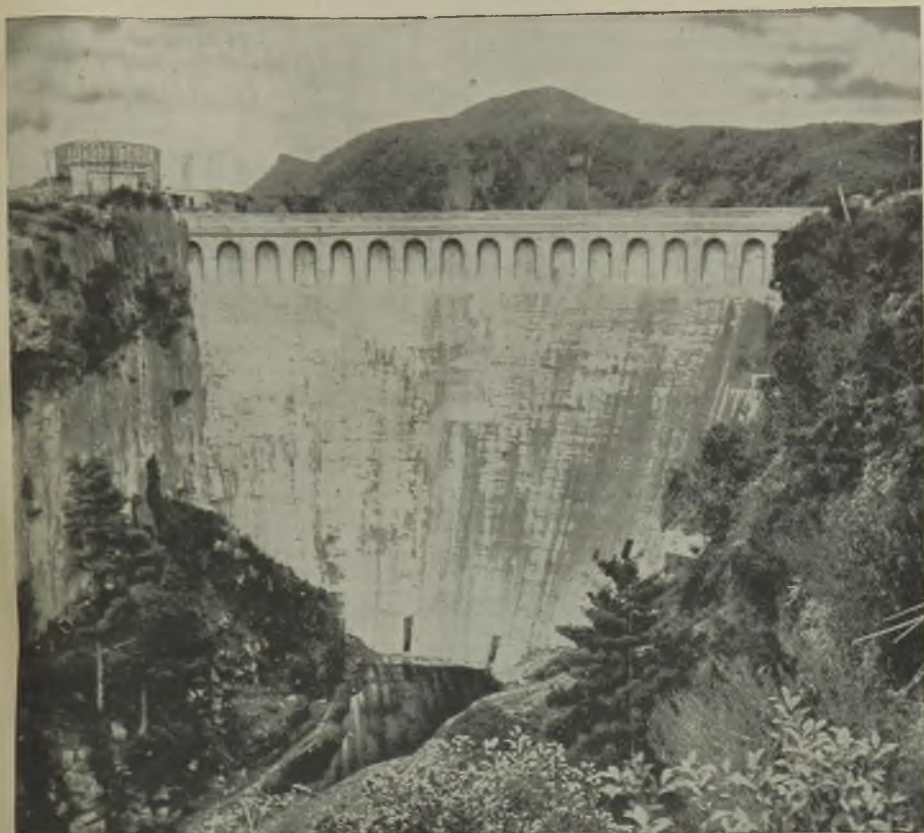
Oldham.—School kitchen, Waterloo, for Education Committee; borough engineer.

South Shields.—Reconstruction of Queen's Theatre, Mile End Road; W. Stockdale, architect, 73, Howard Street, North Shields.

Stockton.—Extensions, Robson Maternity Home; borough engineer, Town Hall.

Southport.—Buildings, Balmoral Drive; Brookhouse Engineering, Ltd.

York.—Technical and youth Colleges, Ashfield Estate, for Education Committee; city engineer.



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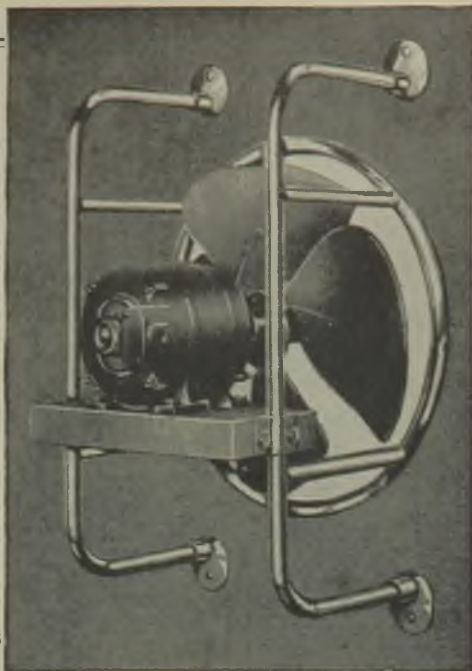
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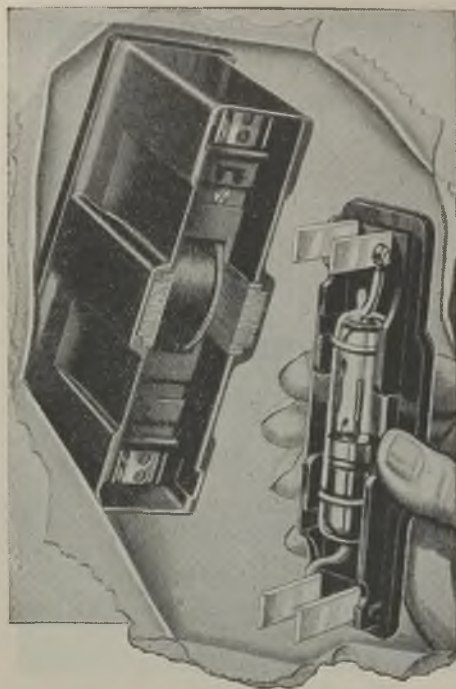
TAPPING. Any recognised hand or machine arrangement is suitable for tapping holes drilled in the face of Tufnol

sheet. Countersinking on either side eliminates the possibility of "lifting". To tap edge of sheet drill slightly oversize and clamp Tufnol in vice or other fixture whilst tapping. Use Tufnol bar in preference to sheet when tapped holes are required on both face and edge. Drill blind holes for tapping slightly oversize to give clearance for the tap and remove all swarf. A little oil on the tap will be beneficial.

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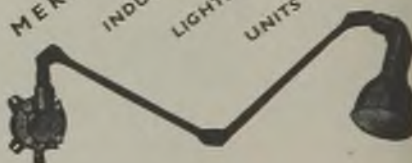
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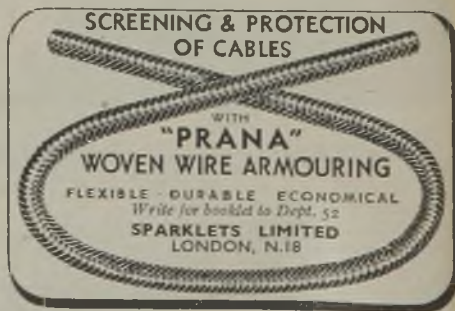
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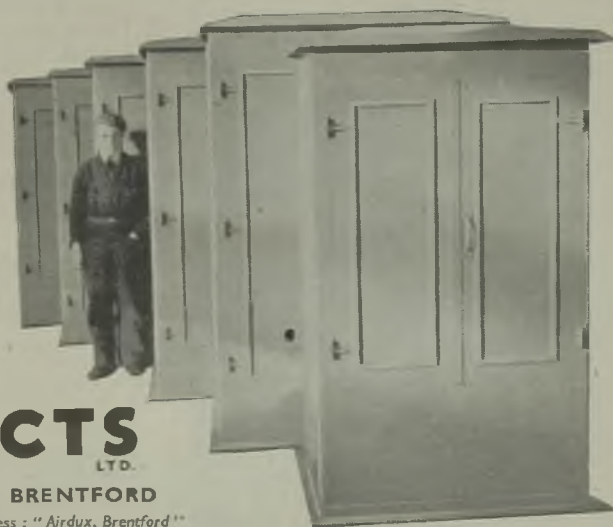
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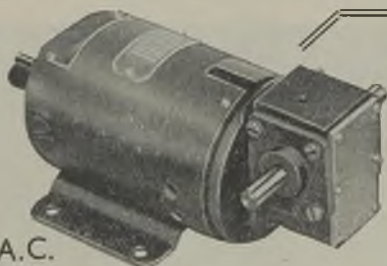
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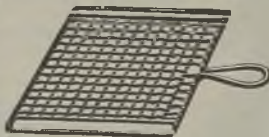
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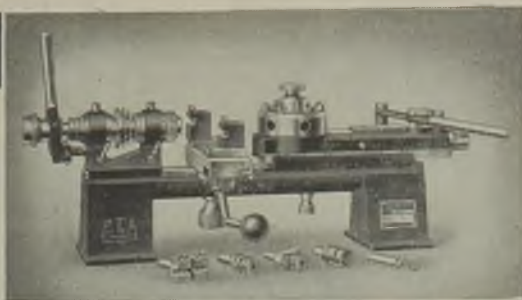
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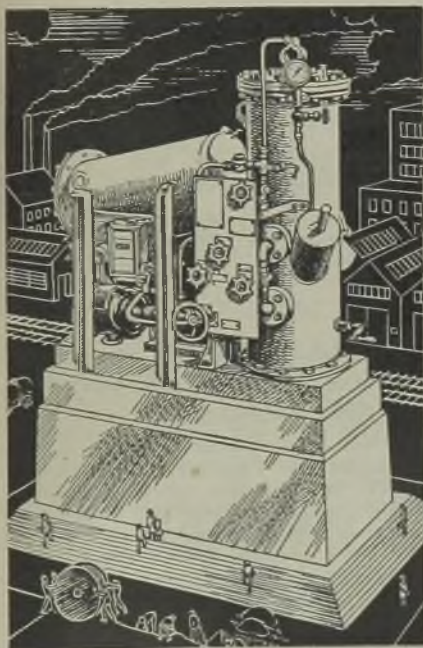
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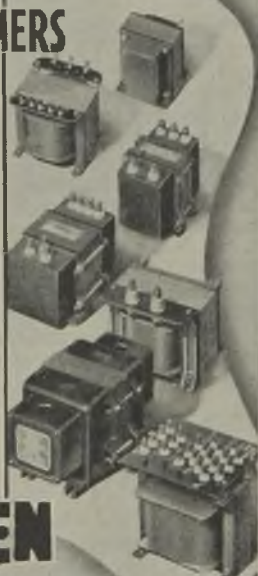
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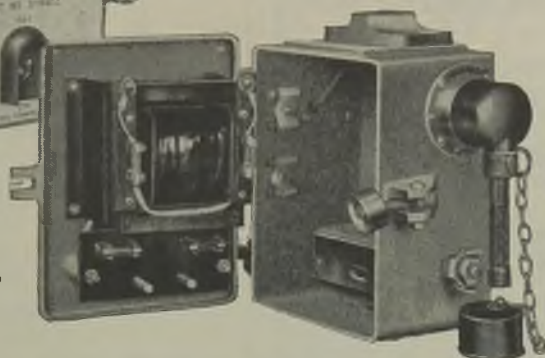
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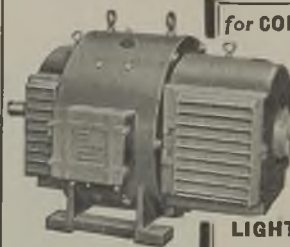
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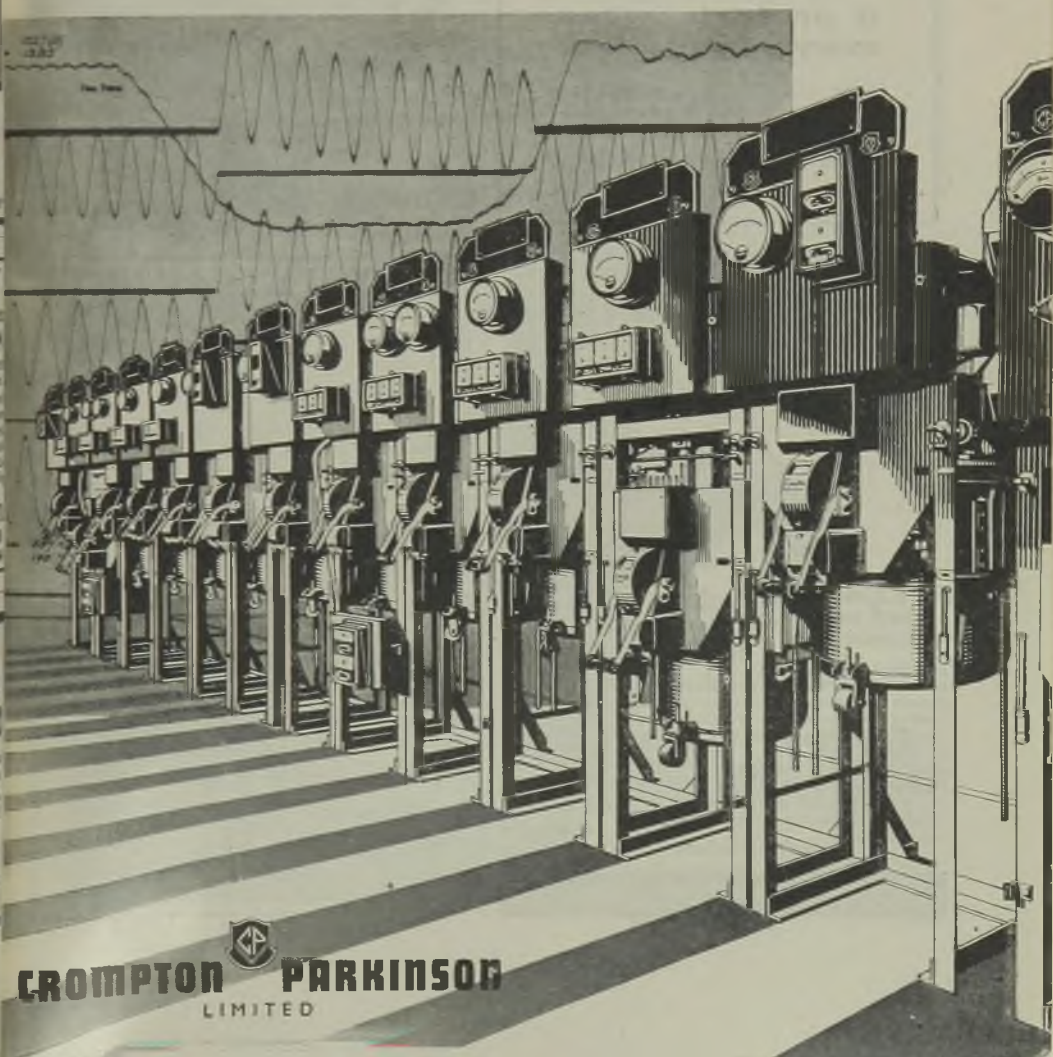
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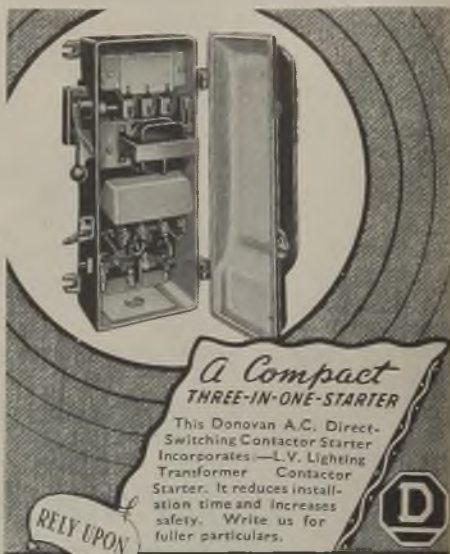
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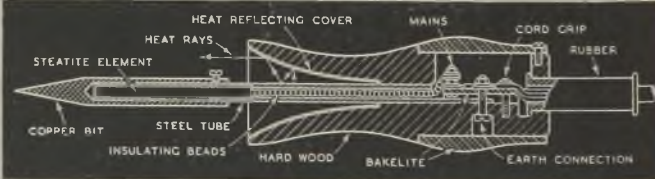
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H. H. TOMSON,

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APPLICATIONS are invited for the post of Lecturer in Electrical Machinery in the Department of Electrical Engineering. Salary from £500 per annum, according to qualifications and experience. Further particulars may be obtained from the undersigned, to whom four copies of applications, together with the names of not more than three persons to whom reference may be made, should be sent not later than Saturday, 24th June, 1944.

G. R. HANSON,

Registrar of King's College.

249

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

ELECTRICAL Wholesalers require Representative (S.E. London) with knowledge of electrical material and previous experience. Permanent progressive position for keen man. Salary, commission and expenses.—Box 159, c/o The Electrical Review.

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MANAGER required by Electrical Department of Midland company, preferably one with designing ability, theoretical and technical, who has specialised in domestic refrigeration. Write in confidence, stating full particulars of qualifications, experience and salary required. Our own staff have been notified of the vacancy.—Box 250, c/o The Electrical Review.

OVERSEAS Employment: Sudan Government Railways require the services of a Signal and Tablet Inspector, preferably unmarried. Candidates should have had workshop and outdoor experience in the maintenance and renewal of signalling installations, tablet, telephone and telegraph instruments. They should also have some knowledge of train control apparatus and be able to prepare signal diagrams, interlocking table and working charts. The candidate, on appointment, will be required to take charge of a district and Sudanese staff under him. He must possess personality and tact and aptitude for control of staff. Starting rate of pay £E324-360 per annum (£E1 = £1 (s. 6d.)) according to age and qualifications, with increases in accordance with Government Scales, viz., £E324-360-396-432-480-540-600-720-780, increases being biennial up to £E660 and thereafter triennial. First increase subject to passing Arabic examination. Successful candidate will be appointed on Probationary Contract for two years with a view to permanent pensionable service and will subscribe to the Provident Fund during the probationary period, after which, if accepted to serve towards pension, his contributions will be transferred to the Pension Fund. Free passage on appointment. Strict medical examination. At present there is no income tax in the Sudan. Written applications (no interviews), giving full details of age, National and Armed Forces Registration numbers, qualifications, experience and name and address of present employers, should be sent to the Secretary, Overseas Manpower Committee (Ref. 957), Ministry of Labour and National Service, Alexandra House, Kingsway, London, W.C.2. Applications will NOT be formally acknowledged.

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SALES Representative wanted to join company making plans for post war trade with public utility undertakings, London and Southern Counties.—Write Box 453, Aldridge, 1, Whitelands St., London, E.C.4.

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THE North of Scotland Hydro-Electric Board invite applications for the post of Chief Draughtsman. Applicants should preferably have experience of the plans and particulars required by local and other authorities in connection with the construction of transmission lines. Applications should be made in writing to The Secretary, North of Scotland Hydro-Electric Board, 16, Rothersey Terrace, Edinburgh. The final date for the receipt of applications is 28th June, 1944.

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WHOLESALE Distributing Agents for well-known makes of cables and flexibles, electric lamps, plastic light fittings, etc., require part-time Representatives in London and Home Counties. Apply, stating experience and area covered.—Box 268, c/o The Electrical Review.

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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.

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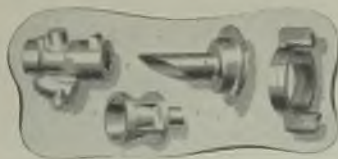
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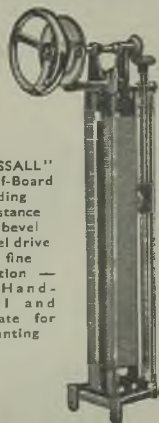
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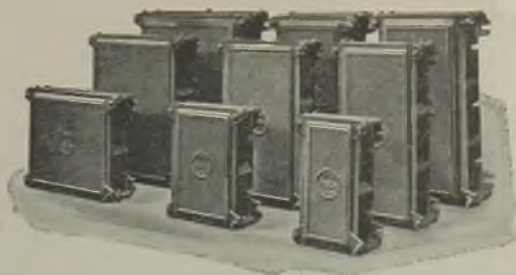
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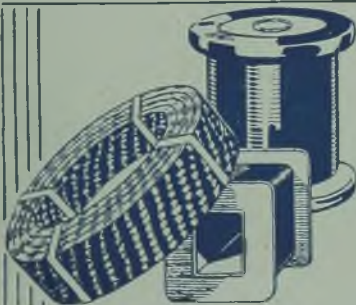


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