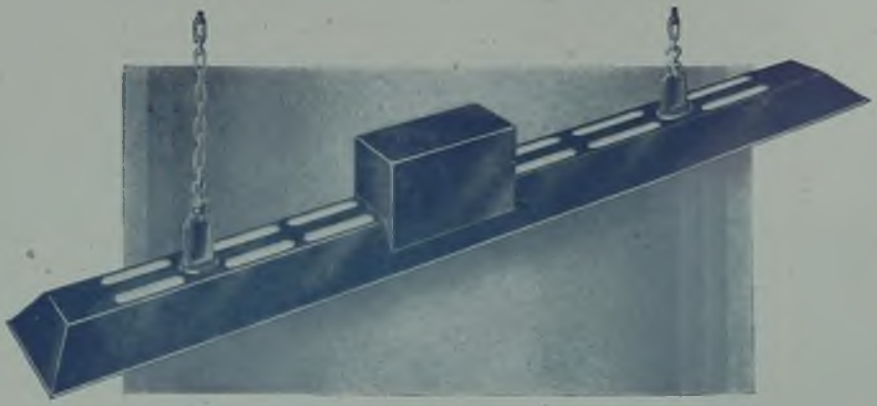
ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXVI. No. 3519 MAY 4, 1945 9d. WEEKLY

THORLUX REFLECTORS FOR 80 WATT TUBULAR FLUORESCENT LAMPS



WITH SLOTS FOR UPWARD ILLUMINATION

1748	1 Lamp with Box	£3	0	0	+	25%
1749	1 Lamp without Box	2	7	6	+	25%

WITHOUT UPWARD ILLUMINATION

1764	1 Lamp with Box	£3	0	0	+	25%
1762	1 Lamp without Box	2	7	6	+	25%

Prices include Hooks and Patent easy wiring box on top of trough.
Fixings arranged for any make of control gear.

F·W·THORPE LTD. WELBY ROAD HALL GREEN BIRMINGHAM 28
Telegrams THORLUX, B'HAM 28 Telephone: SPRINGFIELD 3318-9

Stop a minute!

What are you spending on Electric Lamps?

FREE ADVISORY SERVICE

We shall be pleased to arrange for one of our Illuminating Engineers to visit your Factory or Offices to advise on how to get the best lighting at the least cost.

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

ATLAS LAMPS

Nothing better has come to light

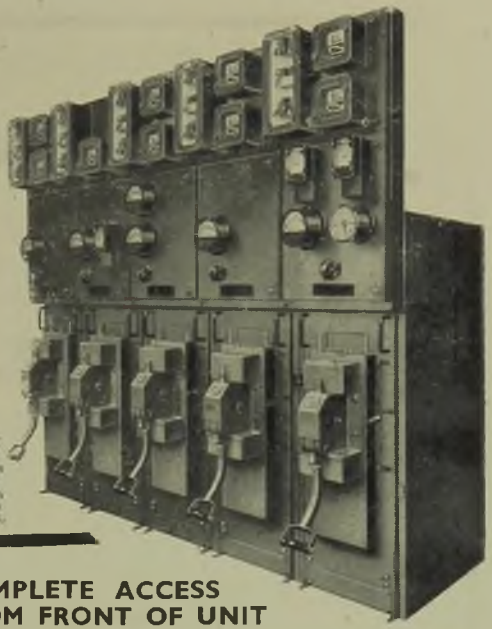
THORN ELECTRICAL INDUSTRIES LTD., 105-109, JUDD ST., LONDON, W.C.1. 'Phone: Euston 1183
Northern Branch: 55 Blossom Street, Manchester. 'Phone: Central 7461
N.E. Depot: 46 Sandhill, Newcastle-on-Tyne, 1. 'Phone: Newcastle 24068

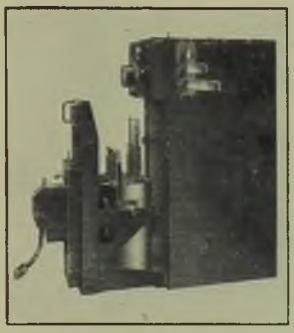
T/13

Metal-clad Switchgear for Restricted Spaces

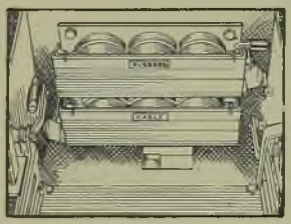
AIR-INSULATED H.V. UNIT

Type AG





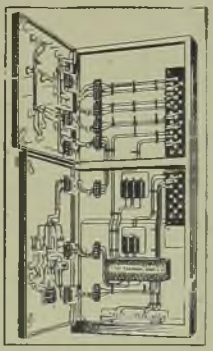
CABLE EARTHING DEVICE FITTED



SHUTTERS PADLOCK INDEPENDENTLY

- **COMPLETE ACCESS FROM FRONT OF UNIT**
- **FULL COMPLEMENT OF INTERLOCKS**
- **CABLE EARTHING VIA O.C.B.**
- **Safe Access to C.T. and Cable Box compartment while Busbars are alive.**
- **Busbar and Feeder shutters padlock independently.**
- **Circuit checking and re-connecting facilitated by clean wiring system.**
- **Operating Handle gives max. effort at contact "make."**
- **Easily distinguishable On-Off indicators.**
- **A.S.T.A. Certified O.C.B.**

250 MVA at 11 kV Cert. No. 644
150 MVA „ 11 kV „ „ 547 & 550
150 MVA „ 6·6 kV „ „ 551
75 MVA „ 3·3 kV „ „ 548



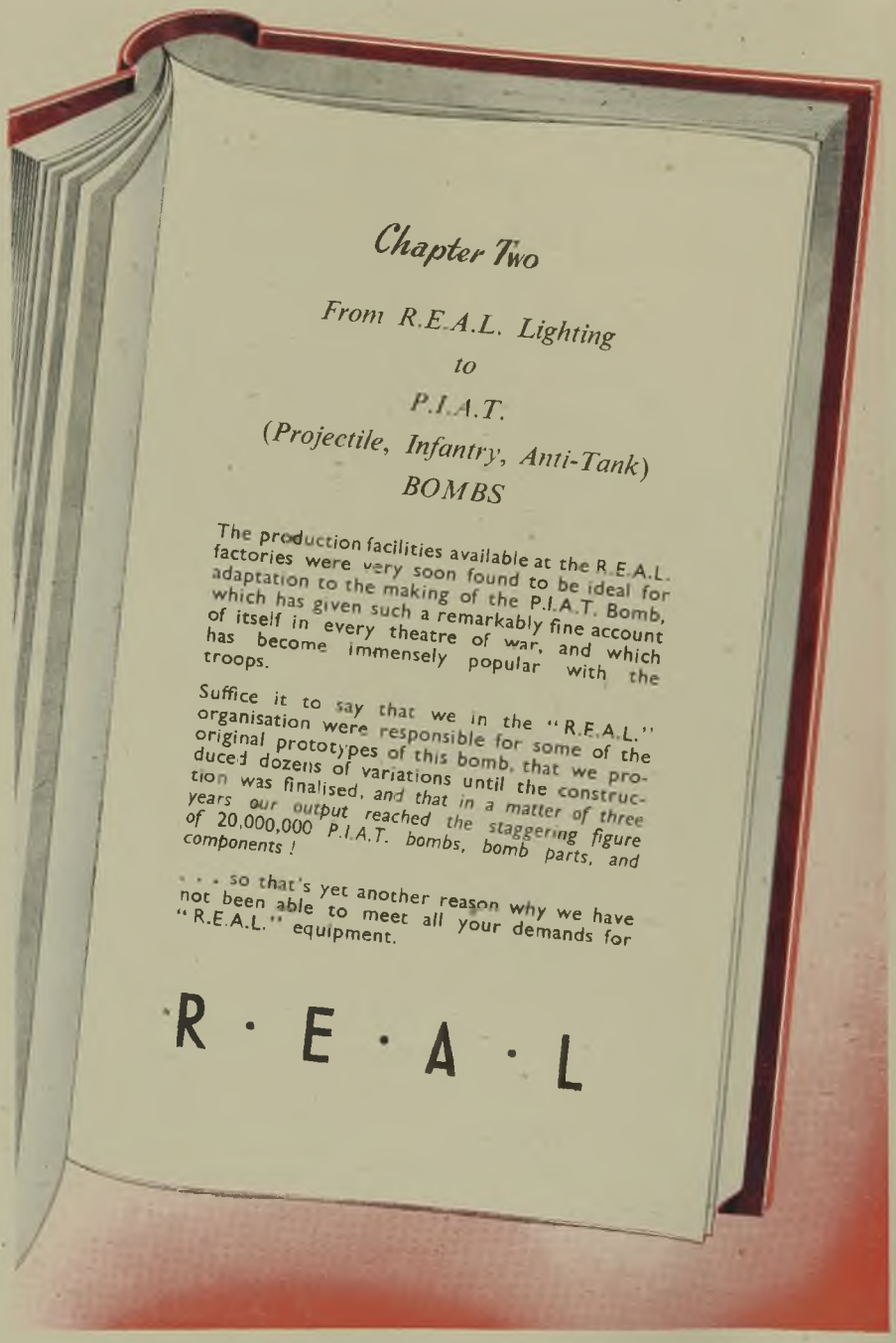
EXCEPTIONALLY CLEAN WIRING

JOHNSON & PHILLIPS LTD.

CHARLTON, LONDON, S.E.7

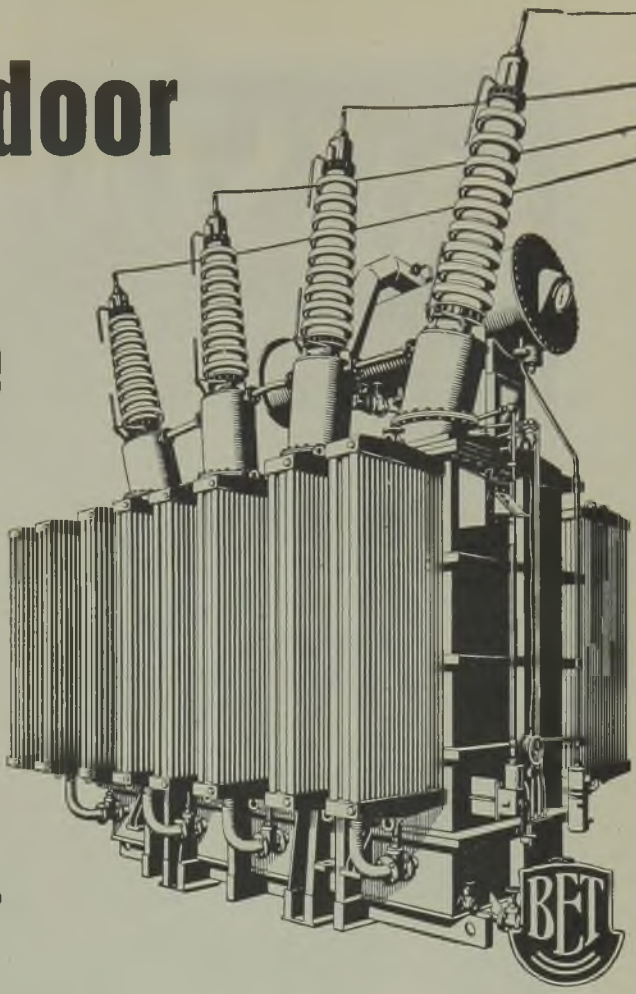
Telephone : Greenwich 3244 (13 lines) *Telegrams :* "Juno," Charlton, Kent

The mark that means that "little more" in quality



Rowlands Electrical Accessories Ltd., R.E.A.L. Works, Birmingham 18.

For outdoor service in Russia.



The working conditions of this B.E.T. 10,000 kVA Transformer will be rigorous. But B.E.T. have built transformers for every condition and clime. During more than 40 years they have learned how best to meet the requirements of every kind of duty — an invaluable asset to be remembered when you are placing *your* transformer contracts.

The
British Electric Transformer
Company Limited
In association with CROMPTON PARKINSON LIMITED

ELECTRA HOUSE, VICTORIA EMBANKMENT, LONDON, W.C.2

Peace — or War

X.5073/SR FILLS A VITAL NEED

BAKELITE Moulding Powder X.5073/SR is a medium shock-resisting moulding which is relatively easy to mould. The intricate example shown on the left—the motor housing on the famous Hoover Vacuum Cleaner—is typical of its pre-war uses. The qualities which made X.5073/SR so suitable for vacuum cleaners make it equally suitable for instrument cases and other aircraft components. Today in this new form it flies in many types of aircraft. It is but one of many grades of Bakelite Moulding Material produced and tested for specific purposes.

TREFOIL

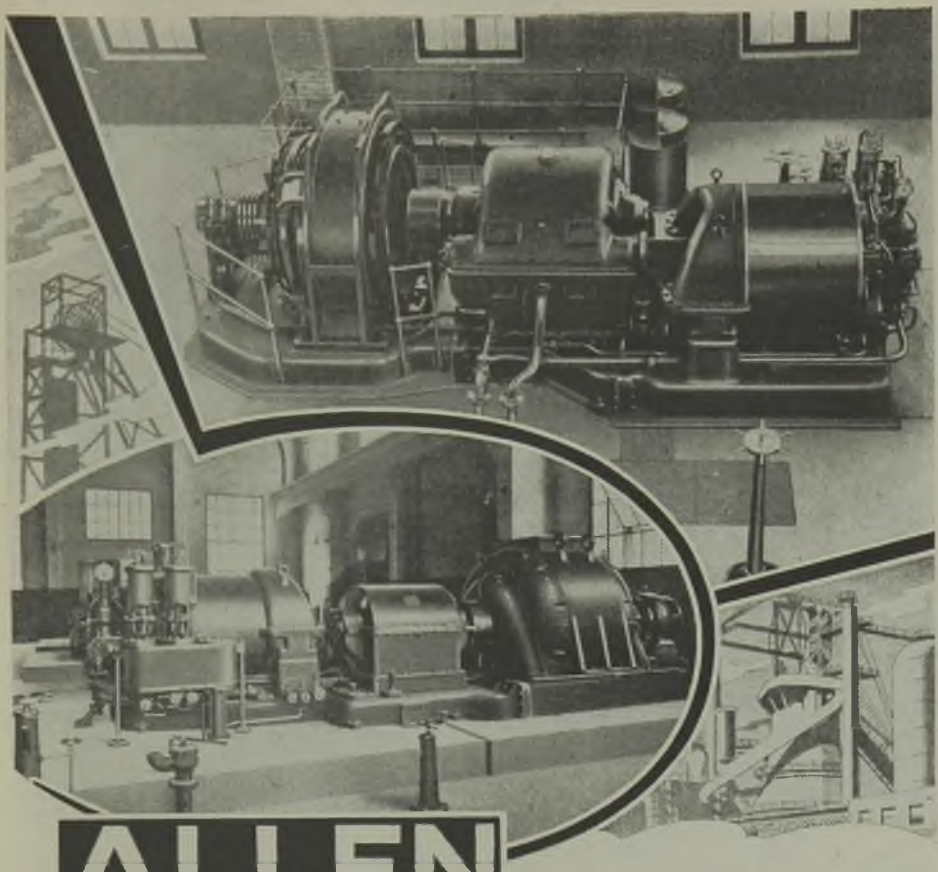
BAKELITE PLASTICS

REGD. TRADE MARKS

Pioneers in the Plastics World

BAKELITE LIMITED · 18 GROSVENOR GARDENS · LONDON SW1

T28



ALLEN

TURBO PLANT

for INDUSTRIAL ... POWER ...

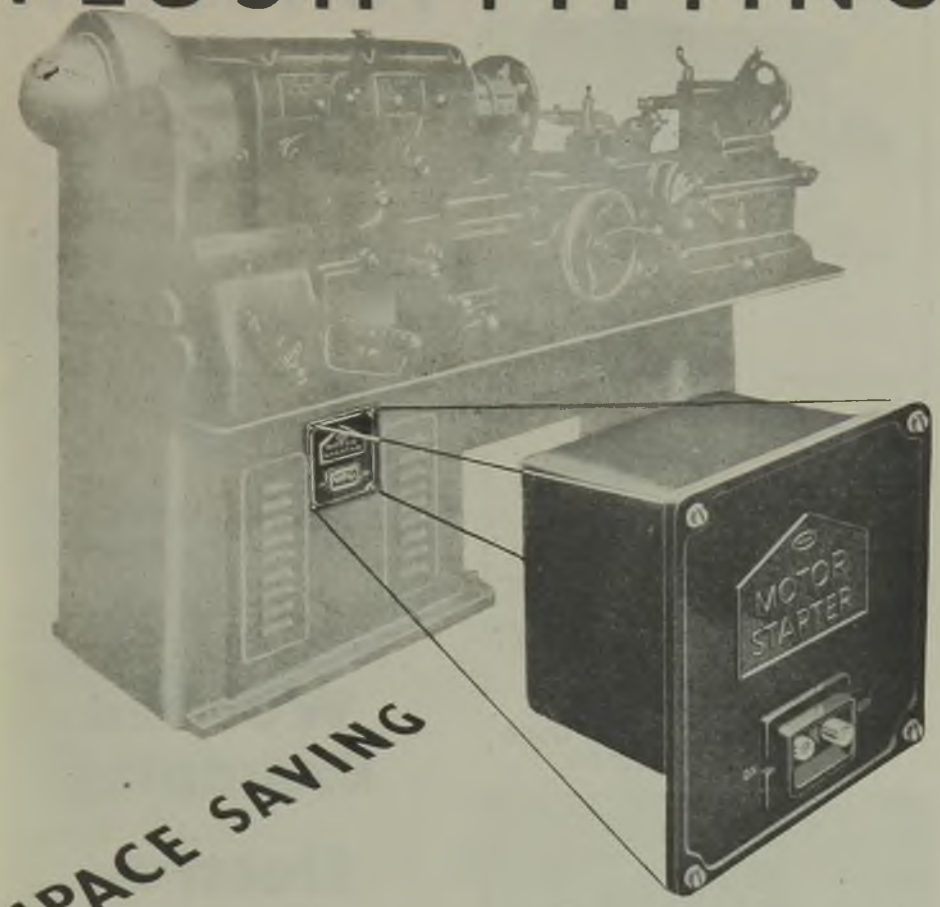
ILLUSTRATED above are two installations of Allen turbine plant in heavy industries. The upper picture is of a 1,500 kW mixed-pressure geared D.C. turbo-generator at an Iron and Steel Works, and the lower picture shows a 1,500 kW high-pressure geared turbo-alternator installed in a Colliery power house.

This Company has specialised for many years in the design and construction of complete industrial turbine plant installations to suit the operating conditions and requirements of widely differing industries. The Allen range includes all types of machines, single or multi-cylinder, for power outputs up to 5,000 kW (7,500 b.h.p.).

W. H. ALLEN, SONS & Co. LTD

BEDFORD ENGLAND

FLUSH FITTING



SPACE SAVING

Here is Britain's most popular motor starter arranged for flush fitting to save space and improve the appearance of the machine. The M.E.M. "Auto-Memota" Push-button Automatic Direct Starter is available in all sizes in enclosed or open versions of this inset form. M.E.M. "Auto-Memota" Inset Starters are suitable for motors from $\frac{1}{6}$ to 15 H.P. and give complete overload protection. Designers will find them a great help in giving machines a clean, modern appearance. Full details can be obtained on application. Write for List No. 249.

M·E·M

INSET STARTERS

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

Specialists in the manufacture of Switch, Fuse and Motor Control Gear.

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

ELECTRICAL REVIEW

May 4, 1945

Managing Editor :
Hugh S. Pocock, M.I.E.E.

Technical Editor :
C. O. Brettelle, M.I.E.E.

Commercial Editor :
J. H. Cosens

Contents :—

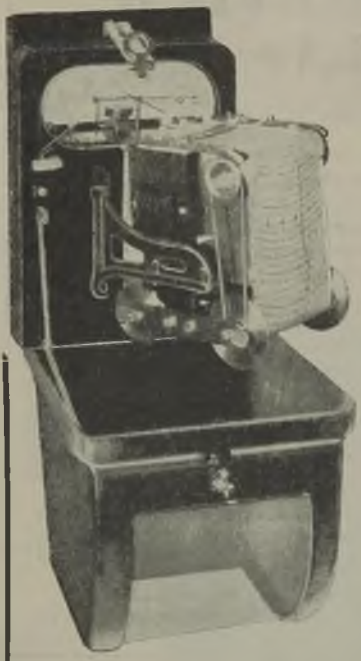
EDITORIAL, ADVERTISING & PUBLISHING OFFICES : Dorset House, Stamford St., London, S.E.1

Telegraphic Address : "Ageekay, Sedist, London." Code : ABC. Telephone No. : Waterloo 3333 (35 lines).

Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage. Entered as Second Class Matter at the New York, U.S.A., Post Office.

Annual Subscription, Post free : British Isles, £2 7s. 8d. ; Canada, £2 3s. 4d. ; Elsewhere, £2 5s. 6d.

Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW LTD. and crossed "Lloyds Bank."



"INKWELL" GRAPHERS

maintain their Leadership with the following exclusive features :

- A roll chart, constant ink supply and synchronous motor drive ensure almost automatic operation.
- Chart driving mechanism is a self-contained unit, hinged on one side to facilitate the changing of charts.
- Unique inking mechanism secures accuracy and sensitiveness.
- The ink supply is self-adjusting.
- Evenly divided charts for alternating and direct current.
- Synchronous records on all graphic instruments assured by Synclock motor drive.
- They comply with British Standard Specification 90.

WRITE FOR CATALOGUE SHEET 300

EVERETT EDGCUMBE

COLINDALE WORKS
LONDON, N.W.9

Telephone : COLINDALE 6045

Manufacturers of all kinds of indicating and recording electrical instruments. Photometry experts

ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXVI. No. 3519. MAY 4, 1945 9d. WEEKLY

Coal Price and Quality

Remedying the Present Situation

WHEN it was stated a week or two ago that there was a deficit of £25,750,000 on the operation of the Coal Charges Account coal users braced themselves for the inevitable and regular rise in the price per ton. This was announced by the Minister of Fuel and Power last week; as from May 1st the increase will be 3s. 6d. At the same time the Minister attempted to soften the blow by saying that, after all, the price of coal (evidently he meant domestic coal) had risen by only 50 per cent. during the war. Such an increase could be regarded as reasonable if coal prices had proceeded on as even a level as those of other commodities before the war.

Effect of Flat-Rate Increases

Unfortunately power station operators know that this was by no means the case. Moreover, by the very inequitable flat-rate increases imposed, which take no account of the heat value of the coal, their position has been made much worse. In its recently published seventeenth report the Central Electricity Board included curves showing the trend of coal prices since 1932 (this was reproduced in our issue of April 20th). From this it is seen that the average cost per ton of fuel delivered to stations operating under the Board's directions commenced to rise in 1935 and has proceeded steadily upward since then. Taking the 1932 price as 100, by the middle of 1939 the figure had risen to 140 and in 1944 had almost reached 260, *i.e.*, an increase of 160 per cent. since 1932 and 85 per cent. since 1939. To add to their burden power stations have had to take any coal allotted to them, with a depressing effect on thermal efficiency. Thus in spite of improved load factor and substantial additions of new and efficient plant the Board had to report that the cost of coal per kWh sent out had practically doubled since 1938.

It is clear that the price of the unit cannot be kept down if the cost of coal is for ever going up and the coal is of unsuitable quality. No amount of "co-ordination" of the electricity supply industry will balance the ill-effects of the anarchic coal situation. Remedies are easy to suggest but difficult to apply. It seems fair to ask, however, that as far as possible the power stations should be supplied with, if not good coal, coal of a consistent quality which will permit stable boiler-house conditions to be maintained. Transport considerations enter into this, but from what we have heard these considerations have not always included economic haulage. It is also most desirable that a little more attention should be paid to cleaning and grading.

Man-Power and Modernisation

It should be possible to achieve these improvements in a comparatively short time. Price is another matter. It can be suggested that the Minister should consider whether the present method of increasing coal prices is fair to electricity supply undertakings, but what should be aimed at is the avoidance of further increases. This is a problem for which there can be no quick solution. It is wrapped up with

the subjects of man-power, reorganisation and re-equipment, regarding which there have been many proposals. The third of these factors is the one in which the electrical manufacturing industry can offer valuable assistance and by reducing costs provide power stations with coal at a lower price. This would not be the first example of electrical manufacturers coming to the aid of the supply industry.

Grossly Exaggerated

ONE expects Mr. Herbert Morrison to favour the nationalisation of electricity supply but not to hear him, as he did last Sunday, describe the industry as being in a state of chaos and muddle. Chaos is a strong word and by no means applicable to such a well-run industry as electricity supply. What other unsubsidised "commodity" has risen so little in price as electricity? Mr. Morrison, as is the habit of politicians, bracketed electricity with coal. Unfortunately electricity is tied to the coal industry, but why should its reputation continually be blackened by that association? And why should politicians think that the reorganisation of electricity supply will make any difference to the state of the coal industry, which is truly chaotic?

Grid Cables

DURING the past ten or twelve years leading cable manufacturers have undertaken considerable research and development work in producing underground cables for operation at the highest transmission voltages. In this they have had the great advantage of testing the performance of their products on the grid system, and recent annual reports of the C.E.B. have referred to their satisfactory operation. In this issue Dr. P. Dunsheath describes a notable example in the 132-kV cable used for connecting the Buccleuch Street station at Barrow to the grid as a prerequisite for its operation under the Board's directions. Bad weather introduced some problems in regard to the jointing and sealing ends, but these were solved without much real difficulty.

Engineering Wages

THE National Arbitration Tribunal apparently did not accept the engineering employers' view that a further increase in basic wage rates would be inflationary in character and would tend to prejudice our ability to export. On the trade unions' side the principal motive for the claim for higher pay seemed to be to make sure that their members' wages did not come down to too low a level when overtime ceased to be a regular thing. This attitude seems to be reasonable but the idea if carried too far would result in a maintenance of abnormal wartime wages for a considerably lower production; this would be inflation and of little ultimate good to the workers, anyway.

Kelvin Lecture

MORE people than on any previous occasion, we believe, attended this year's Kelvin Lecture, which was a most instructive account by a protagonist of the scientific principles on which radiolocation is based. It provided yet another example of disinterested scientific inquiry that had unexpectedly momentous consequences. Further than that the censorship does not permit us to say. The many who were unfortunate in failing to obtain admission either to the main theatre or to the "overflow meeting" will be glad to learn that Sir Edward Appleton has agreed to repeat his lecture on May 17th. They will share the pleasure of those present last week in noting the improvement in the appearance of the theatre by the reinstatement of the portraits of the electrical "giants" after their almost war-long seclusion.

Temporary Services

WE have already referred to the question of the cost of services to temporary houses. Electricity supply authorities have sought to ascertain whether they will be compensated for expenditure upon mains to the sites of temporary housing schemes when the houses are pulled down. The Minister of Works appears to consider that this is a matter for settlement between the supply undertakings and the housing authorities and moreover has suggested that the mains will not be wasted because permanent dwellings will later be erected on the same sites. As the loan period for mains is twenty-five years, if the sites are not continued in use after the ten years for which the temporary houses are designed, electricity supply undertakings will be at a loss unless housing committees are accommodating. There seems to be a need for definite instructions on the subject.

High-Voltage Change-over

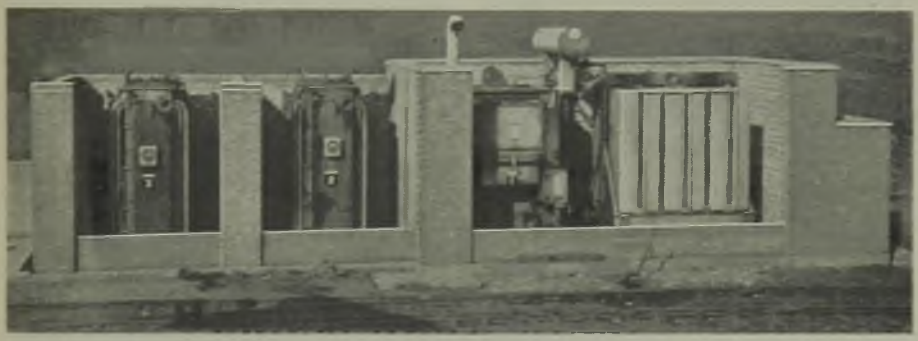
Bringing the Bedford Rural Scheme Up-to-date

THE change-over during the past two years of the major portion of the 6·6-kV high-voltage system feeding the Bedford Corporation Electricity Department's rural area to 11 kV is an achievement of considerable merit. In the first place the carrying out of such a task in the middle of a war, with depleted staff and other difficulties, calls for some enterprise and courage, especially as the electricity undertaking has had to give priority to providing new supplies required in connection with the war. Perhaps equally remarkable is the low cost of the scheme, due to a large extent to the employment of recovered equipment rendered redundant by a re-arrangement and unification of systems feeding the rural or county area and also to the "up-grading" and adaptation of such equipment for a working pressure of 11 kV. The effect of the change-over of existing cables and overhead lines has, of course, practically doubled their load capacities whilst the network modifications have generally improved the security of supply and have further increased the system capacity to the outer areas.

Before describing the conversion scheme it is necessary to refer to the complex rural distribution existing when Mr. P. G. Campling became chief engineer and general manager of the Bedford electricity undertaking in 1938. The rural area of approximately 200 sq. miles, which includes the 100 sq. miles developed as the Bedford Demonstration Scheme, contained both 11 kV and 6·6 kV transmission. The higher voltage was obtained through 6·6/11-kV transformers situated at remote points on the town's 6·6-kV system, such as Putnoe Street, Goldington (500 kVA), Bromham (1,000 kVA), Milton Ernest (500 kVA), Kimberly (1,000 kVA), Clophill (500 kVA) and Cotton End, Haynes (500 kVA), it being necessary to provide automatic voltage regulators at certain points on the system.

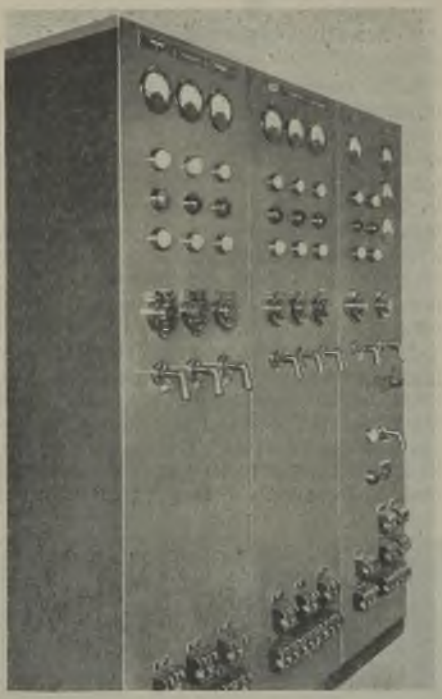
A further complication was that at Sandy the supply was stepped down through a 500-kVA transformer, to 6·6 kV, for local and extended distribution to Potton where it was again increased to 11 kV by a further 500-kVA transformer to link up with the rural area. Moreover, the earthing of the rural system through an arc suppression coil was associated with many technical difficulties resulting in solid neutral earthing being ultimately adopted. In addition, there was a relic of early days comprising a six-mile length of non-standard 11-kV network serving brickfields, a most important class of consumer to the undertaking in pre-war times. This non-standard system, which extended into the rural area, was supplied independently from two 5,000-kVA and two 2,000-kVA 6·6/11 kV star/star transformers at the power station.

However satisfactory the above arrangements may have been in the initial stages of development, by 1939 the growth of load had



Two 5,000-kVA and one 10,000-kVA 6·6/11-kV interbus transformers supplying the new 11-kV switch-house at the power station

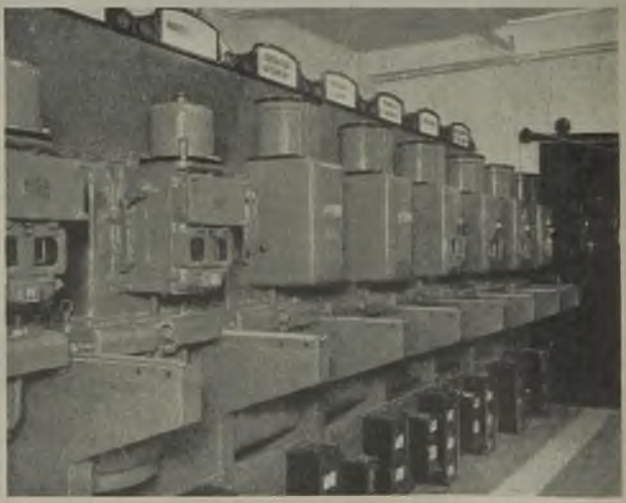
already created a serious situation. The domestic and farm load had reached 3,000 kW, while the industrial load totalled 5,560 kW, the combined consumption amounting annually to 34 million kWh. The outbreak of war resulted in an influx of evacuees, with a consequent increase in the domestic load, and considerable further demands for electricity were made by farmers for operating grinding mills, pumps, workshop plant, etc. The increase in the rural area, resulting from domestic, industrial and special loads associated with the war has amounted to 5,700 kW. This new load is widely dispersed and has thus only been slightly relieved by the reduction of about 3,400 kW in the demands of the brickworks.



Remote control gear at the new 11-kV switch-house

As it was, due to the long transmission lines, voltage regulation was becoming increasingly difficult especially in the outer districts, while the method of feeding the 11-kV rural area by step-up transformers at remote points was proving unsatisfactory. Moreover the lack of discriminating protection on long 11-kV lines prevented their being operated as ring mains, and it was obviously uneconomic to have two independent 11-kV systems. In general, therefore, the problem was to provide duplicate or alternative means of supply for all places in the rural area, particular attention being paid to special war establishments; to augment the rural system to cater for the additional load and to overcome poor voltage regulation; and to relieve the town feeders of the rural load.

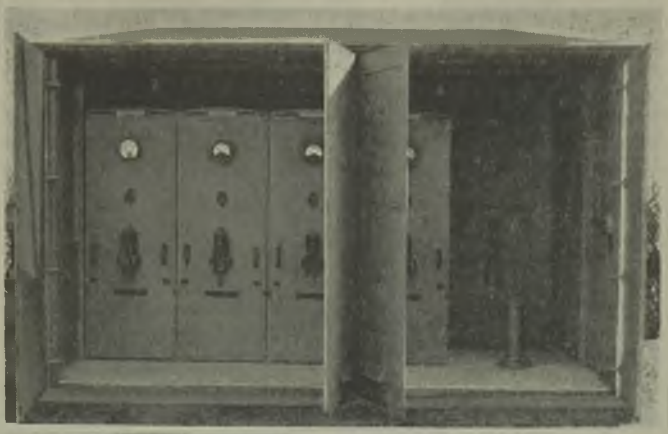
The first step was the construction of an 11-kV switch-house on the power station site in Prebend Street. With existing generation and C.E.B. connections at 6·6 kV, inter-bus transformers — one 10,000-kVA Metrovick and two 5,000-kVA B.E.T.—were used to feed the switch-house, the B.E.T. transformers having been recovered from the system and suitably modified. When the present scheme of 33-kV transmission and new grid supply is completed, this and a second switch-house not yet provided will be supplied from the undertaking's new 33-kV switching station at Austin Canons through three 15,000-kVA transformer-feeder circuits so arranged as to restrict the fault energy to 150 MVA. The remote controlled switchgear



Metrovick gear at the new 11-kV switch-house

contained in the new 11-kV switch-house is sectionalised by dividing walls and fireproof doors; one half comprises a nine-panel Metrovick type "KOC" and "KOA" switchboard and the other half an eight-panel Reyrolle type "C3T" switchboard.

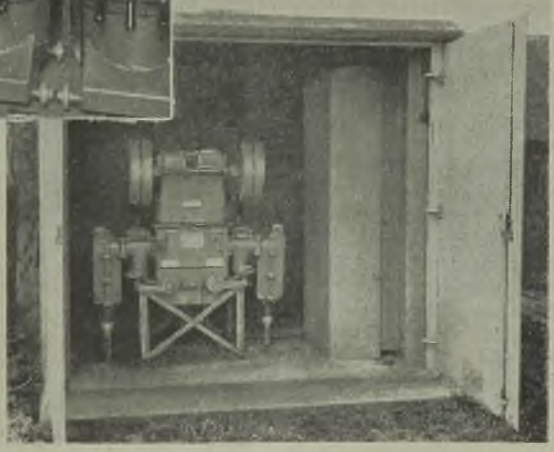
The increase of load in the rural area during recent years has been such that the 6·6/11-kV conversion has



B.T.H. cubicle gear installed at Deadman's Cross to replace pole-mounted air-break gear

six miles of overhead lines with larger conductors. Metrovick "Translay" or Reyrolle "Solkor" protection is provided on all main feeders whilst Metrovick directional induction type relays are employed on the outer portions. Forty-eight new or existing substations have been affected by this work. The main features of the scheme are shown diagrammatically on the plan.

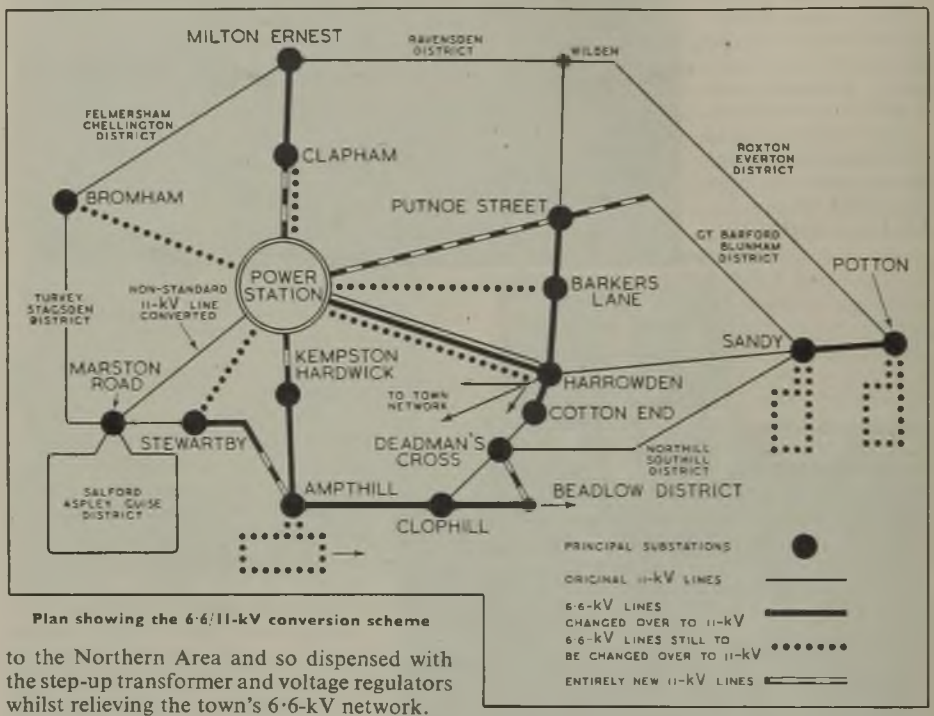
From the new 11-kV switch-house at the power station a 0·15-sq. in. cable has been laid to new switchgear at Clapham Folly and the outgoing 6·6-kV type



Above: Some of the 6·6-kV switchgear at Harrowden has been "upgraded" to 11 kV
Right: This kiosk at Maulden was moved to a new position when the supply was changed over to 11 kV and a Reyrolle ring-main isolator was installed

been carried out in conjunction with other works for special supplies. In this connection it has been necessary to lay about 60 miles of underground cable and erect 10 miles of overhead lines, besides restringing about

feeder to Milton Ernest has been changed over to 11-kV working. New 11-kV switchgear has been installed in the existing kiosk at Milton Ernest and two 500-MVA 6·6/11-kV transformers have been temporarily transferred to Clapham Folly. These alterations have provided a direct 11-kV supply to the Northern Area and so dispensed with the step-up transformer and voltage regulators whilst relieving the town's 6·6-kV network.



Plan showing the 6·6/11-kV conversion scheme

Another 4½-mile length of 0·15-sq. in. cable has been run from the power station to Kempston Hardwick and a rearrangement by stages of the existing 11-kV network in this area has brought the two 11-kV systems into unison thereby making the most advantageous use of all cables available. The Marston Road substation now serves the whole of the south-western district.

The conversion in the southern district supplying Ampthill, Clophill, Haynes, etc., included the changing-over of 6·6-kV cables and overhead lines to 11 kV without material alteration in order to establish an 11-kV ring network. A new 11-kV feeder from Stewartby has strengthened supply for Ampthill and provided an interconnection to the adjacent district. New 11-kV switchgear has been installed at Ampthill, recovered step-down transformers being used to maintain the local 6·6-kV distribution until the expense of renewing transformers and switchgear can be justified. At Deadman's Cross, Cotton End and Harrowden substations, the existing 6·6-kV switchgear has been retained for use at the higher pressure.

Augmentation of supply for the eastern area included the modifications to such existing substations at Putnoe Street, Goldington and Harrowden, the changing over of a section of 6·6-kV network, the laying of a new 11-kV underground cable from the power station to Putnoe Street and also the restringing of existing overhead lines. This work has provided four main 11-kV feeders for the district leaving the local distribution at Sandy and Potton at 6·6 kV until the completion of the conversion is justified.

Some time must yet elapse before the change-over is complete and even then, as has been indicated, it forms only a portion of a far more ambitious scheme of improvements which will equip the system to meet anticipated post-war demands. We are grateful to Mr. P. G. Campling for giving us the opportunity of inspecting the scheme and thank him, Mr. A. Wainwright Evans, his deputy, and Mr. A. A. Nimmo, mains superintendent, for their assistance.

Kelvin Lecture Meeting

I.E.E. Honours Two Past Presidents

AT the opening of the meeting of the Institution of Electrical Engineers on April 26th, the President (SIR HARRY RAILING) referred to the death of President Roosevelt and said that a resolution had been passed by the Council expressing regret and sympathy with Mrs. Roosevelt and her family. The members stood in silence for a few seconds.

The President then presented the parchment Certificate of honorary membership of the Institution to Mr. J. S. Highfield, whose election was announced in February, in appreciation of his distinguished work in the development of the science of the supply and application of electricity. After outlining Mr. Highfield's career, Sir Harry recalled that it was in Mr. Highfield's year of office as President 24 years ago that the first Faraday Medal of the Institution was awarded to Oliver Heaviside whose early work contributed in no small measure to the present state of radio technique.

MR. HIGHFIELD said that there were no honours more pleasing than those received from one's fellow workers. He gave an amusing account of his journey to Torquay to hand the first Faraday Medal to Oliver Heaviside.

The Faraday Medal

The President next presented the Faraday Medal to Dr. C. C. Paterson, F.R.S., Past-President, for the conspicuous services rendered by him in the advancement of electrical science, particularly in the field of electrical research. During the war the Government had entrusted to Dr. Paterson the solution of some of the most urgent and important problems which could not be mentioned at present, but in regard to which he and his associates had done work of outstanding value to the country.

DR. PATERSON said there was probably nothing in the gift of the Institution which was so much prized and rightly prized, as the Faraday Medal. He had special reason to be appreciative of the award because, on behalf of the members, he had had the honour of carrying the Faraday Centenary Celebrations through during his year of presidency in 1931.

The President announced that in view of the tremendous interest that was being shown in this year's Kelvin Lecture, Sir Edward Appleton had kindly consented to repeat the Lecture on May 17th, at 5.30 p.m., at the Institution. Sir Edward Appleton was one of the leaders of British physics who had made his great discoveries not by chance but by patient experiment and brilliant deduction and took a worthy place in the line of British electricians which started with Faraday, and continued with Maxwell, Kelvin and Heaviside. His inspiration and wise guidance of our use of science in so many fields of national activity became a major factor in the success of the scientific effort of this country, both in peace and in war.

The President emphasised that the meeting was a private gathering of the Institution's members and their friends at which the proceedings were entirely confidential.

SIR EDWARD APPLETON then delivered the Kelvin Lecture on "The Scientific Principles of Radiolocation," and SIR STANLEY ANGWIN, in proposing a vote of thanks to Sir Edward, said that not only was this Lecture appropriate to the memory of Kelvin but the subject matter and the presentation of it, together with the demonstration that had been given, were truly in the Kelvin tradition.

SIR ARTHUR FLEMING, seconding the vote of thanks, said he supposed that none of the great scientific war developments had gripped the popular imagination so much as radiolocation. Radiolocation had mitigated that incalculable menace of air attack and it represented a great British achievement and a contribution to the war equipment of the Allies. That evening there was the largest audience that had ever listened to a Kelvin Lecture, and the lecture had been given by a great British scientist, himself eminent in the field chosen. SIR EDWARD APPLETON briefly acknowledged the vote of thanks.

Furnace–Temperature Control

VARIOUS ways of controlling the temperature of heat-treatment furnaces are surveyed in a paper by MR. E. E. COOK presented at Birmingham to the Midland Section of the Institute of Fuel.

For low and medium temperature furnaces there is available a variety of thermostatic controllers and mercury-in-steel recorder/controllers, but most heat treatment is done at temperatures above the safe limit of such instruments, which is 550 deg. C., so thermo-electric pyrometers (direct deflection or millivoltmeter types) have to be employed.

After describing the development of the direct deflection measuring circuit, automatic regulation and multi-position control are explained, the author differentiating between two-position floating control with a circuit interrupter and control that is proportional to change of temperature; the last mentioned can be electric, pneumatic, or hydraulic in actuation. Half the paper is devoted to outlining various combinations of the two latter systems, illustrated with devices developed by a number of manufacturing concerns.

Views on the News

Reflections on Current Topics

IT is a kindly act on the part of our American friends to send us 30,000 temporary houses; the one which I saw last week is at least as good as most of the British designs. But it is a pity that gas cookers are being supplied. There are two good reasons why the Americans were unable to equip the dwellings with electric cookers of course. The first is that in the United States operating voltages are half of ours—which is not our fault. The other is that if they had attempted to meet our requirements they would not have known for what voltages to make the cookers suitable for which, no doubt, we are to blame.

* * *

On the water heating side the American houses could be bettered. The hot-water cylinder is rather small and accommodates a 2-kW immersion heater only, whereas 3 kW is desirable. The wash-boiler, too, which is a British product, is inadequate but as it is gas operated I should not worry I suppose. People comparing this with the usual electric model will be more favourably impressed by the electric one.

* * *

One of our leading professors of electrical engineering sends me two examples of answers to examination questions which he thinks are worthy of wider appreciation than they would ordinarily receive. The first is the result obtained by a second-year student when asked to find the current through a coil having a resistance of 22 ohms and an inductance of 0·07 henry when the applied voltage was 200 volts and the frequency 50 cycles per second. He worked it out in the following way :—

$$I = \frac{V}{\sqrt{\omega^2 L^2 + R^2}} = \frac{200}{\sqrt{(4\pi^2.50^2.49.10^{-4} - 22^2)}}$$

$$= \frac{200}{\sqrt{(483-484)}} = \frac{200}{\sqrt{-1}}$$

∴ current through coil is imaginary.

My correspondent says :—The trained eye will see at once that the figures 22 and 0·07 were chosen to make $\omega L = R = 22$ and thus make $I = \frac{200}{22 \times \sqrt{2}}$, but by substituting a minus sign for the plus sign, and getting—probably on a slide-rule—483 instead of 484, he obtained the magic symbol $\sqrt{-1}$ and was apparently perfectly satisfied with the imaginary current.

* * *

The other example is of an entirely different type. Being faced with the problem of finding the capacitance of two 0·05 μF condensers connected in parallel a final-year student obtained the correct answer in an extremely roundabout manner. He replaced the parallel condensers by a star network of three condensers Z_A, Z_B and Z_C. Then by delta-star transformation equations he showed that $Z_A = \frac{Z_{AB} \cdot Z_{AC}}{Z_{AB} + Z_{AC} + Z_{BC}} = 0$

$\therefore Z_{AB} = 0$, similarly $Z_B = 0$

$$Z_C = \frac{Z_{AC} \cdot Z_{BC}}{Z_{AC} + Z_{BC}} = \frac{\frac{1}{0{\cdot}05\,\omega} \times \frac{1}{0{\cdot}05\,\omega}}{\frac{1}{0{\cdot}05\,\omega} + \frac{1}{0{\cdot}05\,\omega}}$$

$$= \frac{1}{\omega}\left[\frac{1}{0{\cdot}05^2} \times \frac{0{\cdot}05}{2}\right] \frac{1}{\omega} = 0{\cdot}1.$$

From this the equivalent circuit of the two 0·05 μF condensers was shown to be a single 0·1 μF condenser. "This," says the Professor, "shows that, if properly manipulated, a steam-hammer can be used to crack a nut."

* * *

I have often suspected that many of the complaints regarding high charges for electrical service in country districts come from people with large isolated houses of the type that used to be customers for "country house plant." This was confirmed by a member of the Provincial Electric Supply Association with whom I got into conversation at the Association's annual luncheon last week. Isolated "commercial" farms are a different matter; they should be able to obtain a supply at a reasonable price. But that doesn't mean that a supply authority should have to bear the whole cost.

* * *

The illumination of towns by searchlights is a matter which continues to crop up fairly regularly. I see that it has again been raised by a town councillor at Nottingham. The chairman of the Lighting Committee has effectively replied by quoting the views expressed in a paper read before the Association of Public Lighting Engineers in 1943 in which it was shown that quite apart from the general inefficiency of such a system there would be serious danger of glare to motorists and that on a cloudless night there would be practically no reflection.

* * *

Lamp manufacturers will have to find an easier name for the fluorescent lamp. Too frequently it appears in print, and in conversation, as "flourescent"—reminiscent of the powders employed perhaps. But I have also seen it printed as "florescent" which is prettier but no more accurate.—

REFLECTOR.

Excess-Current Protection

Fuse Developments and Relay Operation Problems

TWO papers on the protection of medium-voltage circuits against excess current and faults were to be read at a meeting of the Installations Section of the Institution of Electrical Engineers, yesterday (Thursday).

In one of them Mr. R. T. LYTHALL (Johnson & Phillips, Ltd.) deals with protection by fuses of the h.r.c. powder-filled cartridge type. Following a brief commentary on two types (tripping and non-tripping) and on their fault-clearing ability, consideration is given to the various forms of protection afforded. Future possibilities are next surveyed, with special reference to a scheme for open-circuit protection, a new time-limit fuse with an accuracy equal to that of the h.r.c. cartridge and a suggested solution of the earth fault protection problem.

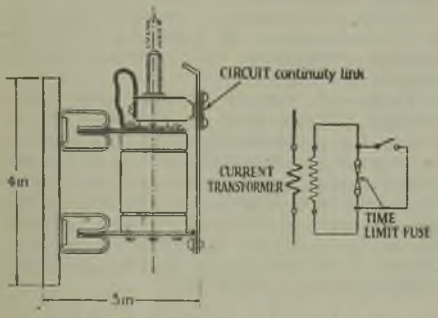


Fig. 1.—Time-limit fuse with switch striker

These developments may cause the overload coil to be superseded, three-pole tripping being assured when only one fuse operates, so leading to such simplification of switchgear that the more expensive class (whether oil or air) capable of clearing faults equivalent to 25 or 30 MVA can in many cases be dispensed with.

The new time-limit fuse (Fig. 1) has a striker device which directly actuates the circuit-breaker trip bar. The continuity link which is inserted in the circuit after the striker has started to move, but before final current interruption, prevents open-circuiting of the current transformer secondary circuit. Further refinement will reduce to insignificance the cost of fuse element replacement.

An earth fault striker (Fig. 2) has also been evolved from the tripping fuse; it is no more costly and is similar in external appearance, but is calibrated as it has to protect as well as trip. It needs a core-balance current transformer in the primary circuit like a relay and is connected to the secondary circuit in the same way. There are no main current elements and operation is not dependent upon fusion; instead a short heating element A is suspended between two low resistance leads BB; it has a high specific resistance, being wholly embedded in a small chemical charge. The temperature setting of the latter is related to the section of the element in such a way that the striker operates at definite current values within definite time limits. The relation between current and time can be represented by an inverse time/current characteristic, which is important, in that an earth fault does not need to be of a prescribed magnitude to cause operation, as required with the fixed setting of a relay. The small fault will cause operation in the time necessary to heat the element to the temperature sufficient to fire the charge. A higher fault value causes immediate operation, which prevents a fault persisting indefinitely at some value below a definite setting.

The present stage of this development indicates that instantaneous tripping can be obtained at values of 7½ per cent. earth leakage. Higher values do not present any difficulty. Tests have shown that in the spill circuit of the current transformer about 1·0 to 1·25 A is necessary for operation.

In the design of circuit-breaker mentioned earlier, where the primary fuses actuate a trip bar, provision is made to house the striker in its contact clips in such a position that it also actuates the trip bar. In another application (*Electrical Review*, July 28th, 1944, p. 113) the striker and its current transformer are housed in a metal box suitable for insertion in an existing feeder. An auxiliary or tumbler switch, operated by the striker, is arranged to ring a bell, sound a klaxon, light a lamp, or energise a trip coil on an associated circuit-breaker.

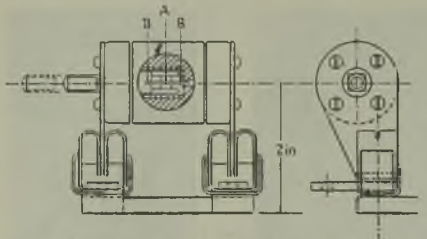


Fig. 2.—Earth fault striker device

The striker pin is locked after operation, so that the circuit breaker cannot be reclosed until the striker has been removed; when the device operates, the current-transformer secondary is left open-circuited, but the voltages are not high enough to cause concern. To ensure that sustained running in this condition is avoided it is relatively simple to arrange that, when a "blown" striker is removed, the current-transformer secondary is short-circuited until a new striker is inserted.

Mr. Lythall's paper concludes with comments on the selection of fuses for different duties and on the need for fuse designers to strive for a greater measure of standardisation.

In the second paper Messrs. A. G. SHREEVE (Brookhirst Switchgear, Ltd.) and P. J. SHIPTON (Cantie Switches, Ltd.) review protection by means of over-current relays. They stress the need for full co-operation between users and manufacturers, which they claim will solve the problems encountered. The remedy for troubles experienced in service is in the hands of engineers, but misunderstanding must be expected so long as manufacturers of different parts of an installation work in watertight compartments and maintain that the equipment they supply complies with B.S. Specifications, while the latter continue to be written around what has been established practice.

The authors make suggestions for the correlation of relevant B.S. Specifications and review some of the difficulties caused by existing basic designs of overload relays. The effect of temperature variation on thermal and oil devices is outlined; also excess current due to lost-phase faults, with suggestions for the type of protection which is required to meet various circuit conditions.

General design points are reviewed in the light of past experience and recent developments. The relation of equipment to both excess load-current capacity and short-circuit rupturing capacity is considered, as well as the correlation of fuses and overload relay design with the thermal rating of electrical gear in the protected circuit.

It is the authors' experience that the most lucid explanation of why a relay has failed to operate will not impress a user who has thereby experienced a shut-down. They, therefore, endeavour to explain what can and what cannot be expected of excess-current protection with normal existing designs of overload relays.

There are certain definite laws which existing designs have to follow; for instance, the characteristic curve of a solenoid or thermal device can be moved as a complete function, raised or lowered with respect to its time base, whereas the alteration of the general shape of the curve is a very different matter, but it is the latter alteration which is desired to enable the apparatus to satisfy many industrial applications.

Radio Industries Club

Fourteenth Annual Meeting

THE fourteenth annual general meeting of the Radio Industries Club was held following the usual monthly luncheon at the Connaught Rooms, London, on April 24th.

Sir Robert Renwick

Mr. H. Donisthorpe

Sir Noel Ashbridge, M.I.E.E., the retiring president, was in the chair for the first part of the proceedings.

The annual report was introduced by the chairman (Mr. H. de A. Donisthorpe), who dealt with some of its outstanding points. He referred to the Radio Industries Club of Wales and Monmouthshire, a recently-formed affiliated club. He paid a tribute to Sir Noel Ashbridge, and announced that a special victory meeting of the Club would be held at the right and proper time.

Col. V. Z. de Ferranti, proposing the adoption of the report, said that a "spontaneous" society such as the Club was much more successful than one which suffered from too much organisation. He expressed the thanks of the Club to Mr. Donisthorpe and the Committee, and to Sir Noel Ashbridge. The report was seconded by Mr. Elliot Macintosh and adopted.

Sir Noel Ashbridge then proposed the election as president for 1945-6 of Sir Robert Renwick, Bt., Controller of Communications, Air Ministry, and Controller of Communications Equipment, Ministry of Aircraft Production. Sir Robert was elected with acclamation, and then took the chair. He said that during the war he and the radio industry had got to know one another very well. The radio industry had fought a trying war and had come through with flying colours. But its labours were not yet over, for there was the coming battle of competition and trade survival.

A vote of thanks to the chairman and committee of the Club was proposed by Mr. E. E. Rosen and Mr. Donisthorpe replied. As the result of a postal ballot Messrs. A. G. Beaver, H. de A. Donisthorpe, C. H. Hunt, W. E. Miller and R. F. Payne-Gallwey were elected to vacancies on the Committee.

CORRESPONDENCE

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

Oil Engine Stations

REFERRING to your leading article of April 6th and to your leaderette of April 20th, I would like to support the views expressed by Mr. W. E. Jones in your issue of the date last mentioned. From the operational standpoint my experience confirms that oil engine generating sets require only a fraction of the time taken by a similar turbo-alternator, of any design, to be run up from cold and synchronised. I mention "synchronised" intentionally, as I wish to dispel the mistaken impression of some engineers that, as a class, alternators driven by oil engines are difficult to synchronise.

Perhaps, however, the most useful contribution the oil engine will make in the future was suggested by Mr. Jones himself in November, 1938, *viz.*, that large Diesel stations should be used as a stand-by against complete failure in the event of an attempt by an enemy to destroy our power stations because they can be hidden very effectively from the observation of enemy aircraft. We may yet see such stations built underground on concealed sites remote from large centres of population, powered not with Diesels, but with internal-combustion turbines.

L. BULL, F.R.S.A., M.Inst.F.

Burton-upon-Trent.

I WOULD like to substantiate the remarks made by Mr. Jones regarding the operation of oil engine AC generating plant running in parallel with the grid. My own electricity supply undertaking has had very old low-speed type Diesel engines, running in with the grid and power companies' plant, for peak load purposes, for the past twenty years. Previous to this they were in use for a period of ten years to give the normal twenty-four hours' supply. Even when the frequency dropped considerably in the early part of this year, the plant functioned quite satisfactorily.

Could not more attention be given to installation of Diesel plant for meeting peak loads? With the rapid development of this type of engine during the last ten years it appears to be an ideal proposition for peak load purposes.

Just recently I have been investigating the position regarding peak loads on my own undertaking. This has an annual load factor of 41 per cent. By reducing the maximum demand on the bulk supply with peak load plant by 24 per cent. the units are only reduced by 0·8 per cent. This would increase the bulk supply load factor to 53 per cent. The load factor on the peak load plant would be 1·32 per cent. and annual running hours 400 out of the total of 8,760.

The capital expenditure required to install Diesel plant to deal with the 24 per cent. of maximum demand is much less than that of selected station plant, and I consider that the selected station plant already installed to supply this 24 per cent. of maximum demand could be more usefully employed on a 53 per cent. load factor instead of a 1·32 per cent. load factor as at present. There would also be a further considerable saving in transmission charges as the 24 per cent. of maximum demand would be available on site and would not have to be transported from plant many miles away for a period of less than three weeks in the whole year.

Gillingham. H. HALL, A.M.I.E.E.

Too Many Catalogue Sizes

AN important tributary to the growing stream of post-war planning proposals has not received the attention it merits. I refer to the need for bringing rational order into the present chaotic state into which the dimensions and general make-up of catalogues and similar engineering publicity matter have been permitted to drift.

Comparatively soon there will be much activity in the issue of new catalogues, folders, brochures, data sheets and price lists, and we should get away from the untidy array of sizes, types and bindings which litter our bookshelves and filing cabinets (and which most practising engineers will agree are a pretty constant source of irritation). It is high time that the various interests concerned got together in an attempt to rationalise the whole matter and to introduce such a measure of standardisation as would lead to greater efficiency without necessarily preventing the exercise of individual expression and progressive improvement.

Lincoln. EFFICACE.

Universal Domestic Tariff

IN spite of all my arguments Mr. Crowsley will not separate the fundamental issue from the particular anomalies which would be inevitable in a change-over from existing tariffs to a new universal tariff (whether it be on the lines I suggest or otherwise). Nor will he accept my explanation that the numerical figures in my original article were not intended to convey any exact relationship with the figures which will eventually have to be assessed.

The real basis of his complaint regarding my tariff seems to be that the benefit given by an increase in N is too large. This may be true and the remedy is clear without altering the fundamental nature of the tariff. For instance, one could reduce my tariff to a simple fixed charge of 10s. per quarter with follow-on rates per kWh of 1·00, 0·66, 0·63, 0·60 and 0·57d. for N values of 1, 2, 3, 4, and 5. It is again not suggested that the particular costs represent any final issue in this respect, even though they have been raised to present levels rather than 1938 levels. It is now in a shape which may satisfy Mr. Crowsley and which would certainly satisfy others who have pointed out the limitations of existing accounting machines. If one is bold enough to suggest a universal tariff then one must be prepared to see it reshaped by other national influences. The only point that concerns me is its fundamental suitability for the purpose specified, and it is on this point that Mr. Crowsley has not given a reasoned reply. It should be added that small appliances such as irons, vacuum cleaners or shavers would not qualify as heavy loads.

Regarding Mr. Crowsley's last question I would refer him to a recent article of mine on the " Unification of the Supply Industry." If he reads between the lines of that article he will perceive that I have worked out an answer to his query in terms of hard cash. My reply to " Buscome's " criticisms also shows that this aspect of the universal-tariff has not passed unnoticed.

Wolverhampton. J. L. FERNS.

Guarantees

REGARDING Mr. Purse's letter in your issue of April 20th, the industry has paid its way quite well on the present 20 per cent. guarantee which I proved in my last letter by facts not theories. Conditions differ widely in different undertakings and I agree that 20 per cent. may not suit certain badly placed undertakings, but it is the general or average not the particular case that is in question.

Mr. Purse suggests that I have fallen into a trap but I think the boot is on the other leg because he is mixing up a particular year's relationship (*viz.*, London Area revenue 44 per cent. of mains outlay for 1937-38) with the prerequisite condition for a healthy start (*viz.*, national revenue increase 20 per cent. of mains outlay increase; averaged over a period of years). His last paragraph is therefore pointless.

The yearly revenue/outlay percentage is higher than the rate-of-change percentage because of continued working. If Mr. Purse installed a 200-kVA transformer to supply 500 houses in 1925 he surely would not expect the same size of transformer to carry the load of the same houses to-day. Tariffs have been gradually adjusted over the years so that they accommodate the average alterations in capital charges and growth of consumption just as much as the alterations in the other controlling factors. I grant that the main basis has been that of continued growth but the national statistics do not indicate any decline in the national output. The fact remains that there *has* been an adequate national consumption on the tariffs charged.

If Mr. Purse could prove that the class of load we are connecting to-day will not give an upward trend in consumption, there might be some grounds for his contentions, but as he cannot do this we have to be content with average values based on past experience.

Mr. Purse is also on dangerous ground in making his 40 per cent. guarantee proposal because he has overlooked equity. Surely he does not seriously suggest that one could ask Consumer A for a 40 per cent. guarantee whilst his neighbour Consumer B connected the previous year gets away with a 20 per cent ?

If Mr. Purse wishes to convince us of the dire need for a 40 per cent. guarantee he will have to give a far more explicit financial case than he has so far presented.

Wolverhampton. J. L. FERNS.

Lease-Lend Houses

Equipment of American Model

LAST week an opportunity was given us of inspecting the first of the 30,000 emergency houses which the United States is sending to this country under the Lease-Lend plan. We found it to be a pleasant little dwelling, having ample room for three or four people, with timber-framed compounded board walls and asbestos sheet roof faced internally with wall-board and covered with roofing felt.

The internal equipment is simple and fairly adequate, but electricity plays but a small part. The lighting is naturally wholly electric; there is a wall bracket with simple plastic shade in each room, supplemented in the kitchen by an enclosed glass unit. There are plug points at waist height in each room—one in the kitchen and the two bedrooms and two in the living room.

The main heating is by a coal stove (although we saw a 500-W electric fire in use in the living room) with a boiler at the back connected with a glass-lined storage cylinder. In this cylinder a thermostatically-controlled 2-kW immersion heater is fitted. The cooker is a gas model supplied by the Americans with the houses, and this being so, electric cooking is definitely ruled out. The wash-boiler—not of really adequate size—is also gas, but as this is provided by the Ministry of Works it might as well be electric. All the wiring is done in this country; there are chases in the ceiling for it and it is taken down the walls in wood casing. The Ministry of Works says that the wiring does not lend itself to the " harness " system but will probably be pre-cut.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE new chairman of the B.E.A.M.A. Council, **Mr. E. C. Holroyde,** has been a member of the Council since 1934. He was born in Auckland, New Zealand, in 1887, and was educated at Sydney Grammar School, Australia. In 1903 he joined Noyes Bros. (Sydney), Ltd., and was appointed a director in 1918, a position which he still holds. In 1921 he was appointed chairman of Parkinson (Australia), Ltd., and later came to England to join Crompton Parkinson, Ltd., becoming sales director in 1932 and joint managing director in 1943. Mr. Holroyde served as Industrial Advisor to the Director, Gun and Carriage Production, Ministry of Supply, in 1940-41.

Mr. E. C. Holroyde

Mr. E. M. Lee has been elected chairman of the Radio Component Manufacturers' Federation for 1945-46; **Mr. R. W. Cotton,** vice-chairman, and **Mr. A. J. D. Dobie,** hon. treasurer. The following are members of the Council:—Belling & Lee, Ltd. (executive representative, Mr. E. M. Lee); British Rola, Ltd. (Mr. R. W. Cotton); A. F. Bulgin & Co., Ltd. (Mr. A. F. Bulgin); Morgan Crucible Co., Ltd. (Mr. H. C. Mills); Plessey Co., Ltd. (Mr. G. A. Upton); Reliance Electrical Wire Co., Ltd. (associate member) (Mr. H. C. Davies); Tannoy Products (G. R. Fountain), Ltd. (Mr. Guy R. Fountain); Telegraph Condenser Co., Ltd. (Mr. P. A. Sporing); Telephone Manufacturing Co., Ltd. (Mr. W. A. Jackson); Westinghouse Brake & Signal Co., Ltd. (Major L. H. Peter); Wingrove & Rogers, Ltd. (Mr. A. J. D. Dobie); Wright & Weaire, Ltd. (Mr. R. W. Merrick). The retiring chairman, **Mr. P. A. Sporing,** was elected a vice-president for the ensuing year in place of **Mr. J. R. Spink.**

Major F. L. Armstrong

Major F. L. Armstrong, R.A., has been awarded the M.B.E. for meritorious services in connection with A.A. Command. Before the war Major Armstrong served in the Tyne Electrical Engineers, R.E. (Territorial Army), and he was a member of the staff of Merz & McLellan.

Mr. R. H. Fawcett, managing director of Edward Holme & Co. (1931), Ltd., electrical engineers, Altrincham, was entertained to supper by his co-director, Mr. Boyd, and the employees of the company on April 21st. Mr. Fawcett joined Edward Holme & Co., Ltd., in April, 1920, and when the company was reorganised under its present name in 1931 he became a director, being appointed managing director in 1939. He has thus completed twenty-five years with the company and to mark the occasion he was presented with an engraved silver tray.

Major-General Sir Evan Gibb has been elected to serve a third term of office as president of the London Chamber of Commerce. Sir Evan Gibb is associated with Sir Alexander Gibb & Partners, consulting engineers.

Mr. Matthew Seaman, M.Sc., A.M.I.Mech.E., has recently resigned his appointment as general works superintendent of the Ironworks Branch of Newton Chambers & Co., Ltd., and has taken up his new appointment as general manager of P. R. Jackson & Co., Ltd., Manchester—a company of the David Brown group. Before joining Newton Chambers & Co., Mr. Seaman was production superintendent at the Penistone branch works of David Brown & Sons (Hudd.), Ltd., whom he joined after a period as works manager of one of the factories of Ferranti, Ltd., at Hollinwood, Lancs.

Dr. P. Dunsheath, O.B.E., was last week elected vice-president of the Institution of Electrical Engineers, in the place of **Mr. W. J. H. Wood,** who has retired from the position on account of ill-health. An article by Dr. Dunsheath appears elsewhere in this issue.

Dr. P. Dunsheath

Mr. C. C. Hill, B.Sc. (Eng.), M.I.E.E., who has been appointed assistant general manager of the Northmet Power Co., was last week presented with a set of classical gramophone records, a handbag for Mrs. Hill, and a card of good wishes from the administrative staff of the Brighton Electricity Department, of which he has been deputy engineer and manager. Mr. H. Pryce-Jones, the engineer and manager, made the presentations.

Over a hundred members of the Forces were entertained by Partridge, Wilson & Co., Ltd., on the occasion of the company's annual dance, which was held on April 20th at the Corn Exchange, Leicester.

Mr. L. Wall has been appointed manager of the Birmingham branch of Electrical Components, Ltd., and **Mr. E. C. Came** manager of the Leicester branch.

The most ambitious show yet given by the G.E.C. Dramatic Society, a production of Noel Coward's "Blithe Spirit," resulted in over £200 being handed to the Hon. Mrs. Gamage as a donation to the Red Cross Prisoners of War Fund, this bringing the Society's total contribution to war charities to more than £1,000 since 1939. The cast included

Joan Marshall, Jean Freeman, William Peacock, Robert Scutt, Eileen Brotherton, Kathleen Wilson and Elsie Walbancke. Dudley Pearmain was the producer, and Lewis A. Foster was responsible for the stage management and for the setting.

The General Electric Co., Ltd., has announced a number of changes in managerial positions in its organisation in India (the General Electric Co. (India), Ltd.). For health reasons **Mr. E. J. Warren**, general manager in India, has retired from that position and for similar reasons **Mr. C. E. Cutting** has retired from the management of the branch in Madras. **Mr. A. J. Emery**, who has been in charge of the Bombay branch, has been appointed to succeed Mr. Warren and **Mr. T. G. May**, who was for many years at the Calcutta branch, has been appointed manager of the Bombay branch. **Mr. J. Meek** becomes manager of the Madras branch of which he was engineer.

Mr. F. Riley, Controller of London Post Office Telegraphs, has retired after forty-five years' service with the G.P.O. During the war he has had many difficulties to contend with, the greatest being the restoration of service after the Central Telegraph Office had been destroyed in the fire raid of December, 1940. For four years before the war Mr. Riley was head postmaster at Bradford. Before this he was at G.P.O. headquarters as inspector of telegraph and telephone traffic.

Mr. F. Riley

Mr. R. A. S. Thwaites, chief engineer and manager of the Manchester Electricity Department, has been elected chairman of the North-Western Association of the Institution of Civil Engineers for the forthcoming session. He has also recently been appointed a member of the National Consultative Committee of the Central Electricity Board.

Brig.-Gen. R. F. Legge, C.B.E., D.S.O., has been appointed to the board of directors of the Britannic Electric Cable & Construction Co., Ltd., one of the Philco group of companies. He is also chairman of British Mechanical Productions, Ltd., another member of the group. In addition, Brig.-Gen. Legge is a director of the British Power & Light Corporation, Ltd., and associated companies.

Mr. C. M. Cock has been appointed chief electrical engineer of the Southern Railway to succeed **Mr. A. Raworth**, who has retired. Mr. Raworth is acting as consulting electrical engineer to the company for twelve months.

Sir Summers Hunter has been re-elected president of the North-Eastern Coast Institution of Engineers and Shipbuilders. The vice-presidents are **Messrs. D. Somers Brown, F. W. Dugdale** and **W. Spencer Paulin.**

Mr. J. B. J. Higham, Lecturer in Electrical and Mechanical Engineering at the Treforest School of Mines, has been nominated for the chairmanship of the Western Centre of the I.E.E. for the next session. Other nominations are:—Mr. R. W. Biles (C.E.B.), first vice-chairman; Mr. J. B. Gwynn Lewis (George Ellison, Ltd.), second vice-chairman; Mr. J. W. Elliott (Edison Swan), hon. treasurer; Mr. L. Burdes (Bristol Electricity Dept.), hon. secretary; and Mr. J. Vaughan Harries (South Wales Power Co.), assistant hon. secretary.

Mr. F. J. Elliott has been nominated as chairman of the South Midland Centre with **Mr. C. F. Partridge** and **Mr. W. S. Burge** as senior and junior vice-chairmen respectively. **Mr. A. Brookes** has been nominated for the chairmanship of the Radio Group Committee of the Centre.

The Philco Radio & Television Corporation of Great Britain, Ltd., announces the return of **Mr. "Jerry" J. S. Bush** to the company. He will be area manager for London and South-Eastern England.

Mr. C. A. Russell has been appointed manager of the British Thomson-Houston Co.'s Sheffield district office in succession to the late Mr. H. W. E. Hall. After receiving technical training in Sheffield and then gaining practical engineering experience, Mr. Russell joined the B.T.H. Company in 1912. Except for nearly four years during the 1914-1918 war, when he served in the Army in France, he has spent practically his whole time on the staff of the Sheffield district office. He is well known in engineering circles, particularly in connection with large rolling mill installations, various electrification schemes in iron and steel works, colliery winders and the many applications of electricity in collieries.

Mr. C. A. Russell

Appointments Vacant.—In this issue the County Borough of Wallasey is advertising for a borough engineer and manager (£1,305 plus war bonus). The Somerset County Council invites offers for the position of engineering assistant in the County Architect's Department. Applicants must be members of the I.H.V.E. and I.E.E.; the salary scale is £550 rising to £600.

The Electrical Power Engineers' Association is advertising for a technical editor for the *Electrical Power Engineer* and director of studies of the correspondence tuition scheme of the Association.

Obituary

Mr. T. R. Renfree.—The death occurred on April 30th of Mr. Thomas Rolls Renfree, representative of the British Electric Transformer Co., Ltd.

I.E.E. Report and Accounts

COPIES of the annual report of the Council of the Institution of Electrical Engineers for the session 1944-45 and of the accounts for the year ended December 31st, 1944, to be presented at the annual general meeting on May 10th, can now be obtained by members of the Institution on application to the secretary.

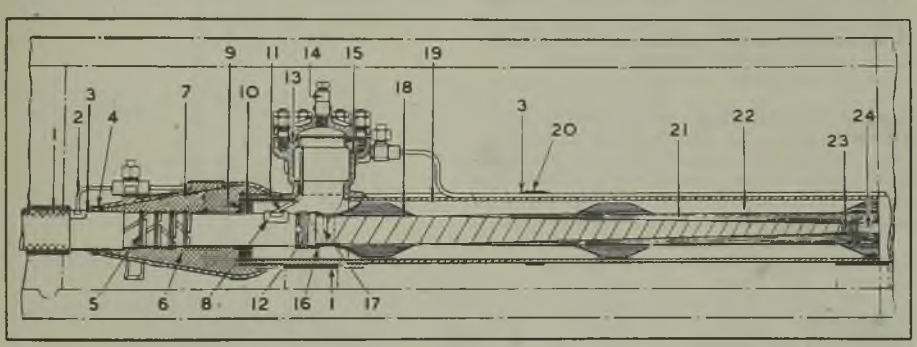
132-kV Cable

The Gas-cushion System at Barrow

By P. Dunsheath, O.B.E.*

IN linking up Kendal and Barrow last summer the Central Electricity Board installed a 132-kV double-circuit overhead line terminating in a new main substation on the outskirts of Barrow and connected to the town substation by a 1,130-yd. run of underground cable. The loading specified for each circuit was 75 MVA and at the town end the voltage was transformed to 6·6 kV for leading in to the nearby power station. The main cables are gas-filled, that on circuit No. 1 being of the pre-impregnated type and that on circuit No. 2 of the mass-impregnated gas-cushion type. On both circuits the cables are 0·3 sq. in. copper (37/·103) single-core lead-alloy-sheathed and served; in the same trench are two twenty-five-core control cables and one medium-voltage four-core service cable.

For the greater part of the route, the cables are laid direct in the ground, crossing a main road at a depth of 8 ft. and a main-line railway at a depth of 6 ft. At both crossings Key fibre conduit was installed by the thrust-bore method. The route was divided into four sections and individual joints are arranged at each joint bay.



Detail of straight-through joint

1—Compounded hessian tape. 2—Connection to outer lead sheath for gas leakage detection. 3—"Ozokerite" tape. 4—Tallow impregnated cotton tape. 5—16-SWG T.C. wire. 6—Filled with C.P.U. metal. 7—Gunmetal mould. 8—Connection to inner lead sheath for gas by-pass. 9—Heat resisting Neoprene sleeve. 10—Split lead bush. 11—Dead soft copper pipe. 12—12-SWG lead wire soldered. 13—Oil resisting Neoprene washer. 14—Gas valve. 15—High-tensile aluminium bronze expansion chamber. 16—Compound barrier. 17—Plain copper tape. 18—Paper cone (impregnated). 19—Copper tube silver soldered to expansion chamber. 20—Brass clamp. 21—Insulation rebuilt by hand. 22—Filled with compound. 23—Metalised paper (for pre-impregnated cable only). 24—Flush ferrule.

Gas-cushion Cable Design.—The conductor of the gas-cushion cable is insulated to a thickness of 0·60 in. and finished with a conducting screen of perforated metalised paper. The first ternary-alloy sheath is 0·12 in. thick, and is applied over the impregnated core with a clearance of 30 mils. It is reinforced with four layers of 10-mil brass tape over a thin bedding of compounded paper and cotton tape. After the application of a second cotton tape, a second alloy sheath, 0·09 in. thick, is applied, finished with two compounded papers, a compounded cotton tape and one compounded hessian as waterproof mechanical protection. The overall diameter of the single-core cable is approximately 2·8 in.

Maximum stress at working voltage is 85 kV per cm. at the conductor; the capacitance per thousand yards is 0·184 μF and the maximum current rating for each of the two three-phase circuits laid direct in the ground is 328 A or 75 MVA at 132 kV with a maximum operating temperature of 80 deg. C. on the conductor. The internal nitrogen gas pressure at normal ambient temperature and no load is 200 lb. per sq. in.

Pre-impregnated Cable Design.—The pre-impregnated cable differs fundamentally from the gas-cushion cable in the use of paper insulation which is impregnated before application to the conductor and contains very little free compound. Otherwise the two types differ only slightly in physical dimensions; their maximum working stresses, current ratings and gas pressures are identical.

Straight-Through Joint.—In the straight-through joint for the gas-cushion cable a flush-fitting ferrule is used to provide the

* Dr. Dunsheath is a director and chief engineer of W. T. Henley's Telegraph Works Co., Ltd.

smoothest possible surface as a basis for the uniform application of the insulation which is built up by hand over the tapered cores.

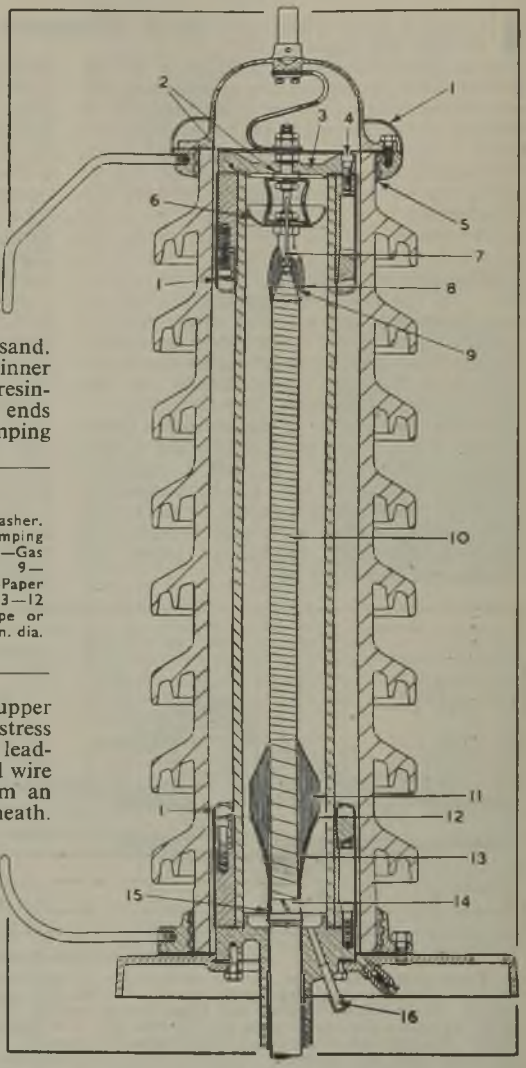
Impregnated-paper stress cones are provided at each end and impregnated paper spacers maintain concentricity of the core within the compound-filled joint shell. The latter is of drawn copper, designed to withstand the full working gas pressure, and is attached to cast expansion chambers at each end, which in turn are connected to the sheath by means of cast plumbed unions, thus ensuring complete gas-tightness of the system. Gas is transferred through the joint by a short copper tube connecting the interior of the inner lead sheath to the expansion chambers, which are linked together by an external copper tube connection. The complete joint is enclosed in a concrete coffin filled with sand.

Sealing End.—In the sealing end an inner pressure-retaining tube of synthetic-resin-bonded paper houses the cable core, the ends of which are secured by wedge-type clamping rings to the alloy-base casting and the upper alloy end cap. An impregnated paper stress cone is fitted to the dielectric over the lead-sheath termination; several turns of lead wire are applied over the lead cone to form an earth electrode extended from the lead sheath.

Longitudinal expansion is allowed for by laminated flexible connections between the cable end and the external connector on the top dome. The external porcelain is of the anti-fog pattern with double skirts to each shed and is not required to withstand gas pressure. The space between the synthetic-resin-bonded paper tube and the porcelain is filled with insulating compound.

Gas System.—Full pressure of nitrogen gas is maintained in the whole cable system by a simple control arrangement. Each set of three-phase cable terminations is provided with a fabricated steel cabinet which houses the gas-charging and leakage-alarm accessories. The gas pressure in each cable (200 to 250 lb. per sq. in.) is indicated by means of copper pipes connected at the upper ends to each sealing end and at the lower ends to pressure gauges, which are provided with electrical contacts to give an alarm if the gas pressure falls to 180 lb. per sq. in. The three pipes are also connected to a storage cylinder, from which gas can be fed into any cable through a valve and a pressure regulator.

To safeguard the unreinforced outer lead sheath of the cable against possible excessive gas pressure, the space between the inner and outer lead sheaths is made continuous across each cable joint and is connected at each end of the route to low-pressure relief valves, each of which is fitted with a bubble glass to give a visual indication should the valve



Detail of sealing end

1—Copper screen. 2—$\frac{3}{8}$ in. oil-resisting rubber washer. 3—High-tensile aluminium bronze cap. 4—Clamping screws. 5—Cement. 6—Copper stress shield. 7—Gas transference pipe (lead). 8—" Henleseal " tape. 9—" Henleseal " compound. 10—Oiled silk tape. 11—Paper cone (impregnated). 12—$\frac{1}{4}$ in. dia. lead wire. 13—12 SWG lead wire soldered. 14—Plain copper tape or metalised paper. 15—Compound barrier. 16—$\frac{1}{8}$ in. dia. copper pipe silver soldered in position.

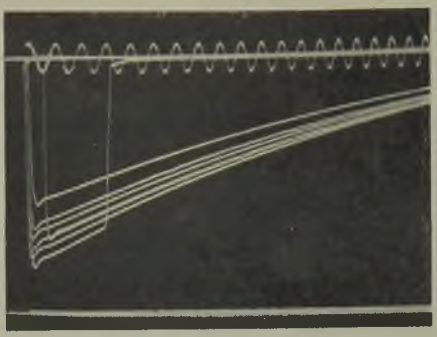
operate. The inter-sheath space is filled with nitrogen at 15 lb. per sq. in. by means of valves, which also facilitate periodic pressure-gauge readings to check that the outer sheaths are undamaged. The cabinet interior is ventilated by two screened ventilators and an 80-W tubular heater.

Tests on Gas-Cushion Cable.—The complete system of cables with joints and sealing ends withstood a pressure test of 264 kV DC for 15 min. after installation. As a check on gas-tightness the whole system, including gas charging and control equipment, was tested at 275 lb. per sq. in. for four days and an intersheath pressure of 25 lb. per sq. in. was also maintained for the same period.

Samples of gas-cushion cable were subjected to the usual 50-cycle voltage and power-factor tests, together with thermal stability, thermal resistivity and bending tests, all in accordance with the C.E.B. specification. The voltage test was applied at 250 kV AC for 15 min. after bending the cable round a barrel twenty times the overall diameter. A separate bending test on a sample bent round a barrel sixteen times the diameter over the outer lead sheath produced no cracking of the dielectric.

A sample joint completely assembled withstood 250 kV AC for 15 min. and the results of power factor tests taken before and after the pressure test were of the same order as those obtained on the cable. Flashover tests at 50 cycles were conducted on two complete sealing ends fitted to cable and under dry conditions no flashover took place at 355 kV to earth. Under rain conditions specified in BSS No. 223 the sample withstood 284 kV to earth without flashover. The cable and sealing end interiors were unaffected.

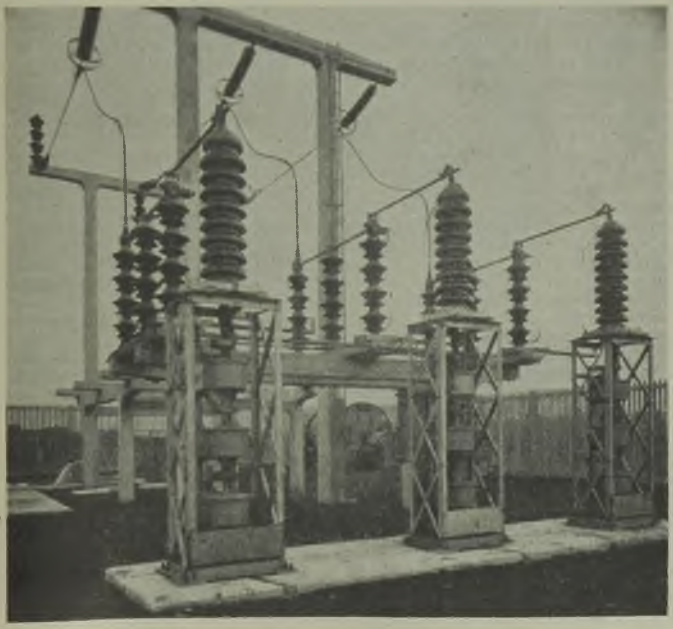
An extensive series of impulse tests has



Oscillogram of impulse tests. Six negative waves up to 830 kV peak

been carried out at the N.P.L., some of the results of which were described by Mr. D. B. Irving of the C.E.B. in a paper presented before the Transmission Section of the I.E.E. in November 1944 (*Electrical Review*, November 10th and 17th). The C.E.B. specification requires impulse tests to be taken at 640 kV peak on a 1/50 wave on a simple system containing cable, two sealing ends and a joint. The system is required to withstand a minimum of ten impulses without puncture, with not more than 50 per cent. flashover occurring with either negative or positive waves. Since the capacitance of such a system is much greater than that usually encountered in impulse testing, thus causing a lengthening of the impulse-wave front, the plant was adjusted to give a 1/50 wave as closely as possible but with a wave front of 1½ micro-seconds. All voltages mentioned below are peak values.

The mass impregnated gas-cushion system withstood twelve impulses at 640 kV



Terminal structure at Barrow 132-kV sub-station

positive wave, followed by eleven impulses at 640 kV, all without arcing horns. When horns were fitted the minimum negative flashover was 630 kV. With horns removed in order to determine the limiting strength of the system, breakdown finally took place at 770 kV after a total of fifty-nine impulses in the full series of tests. The breakdown was confined to one side of the joint along a path between the surfaces of the machine and hand-lapped dielectrics.

In a further series of tests on a sample of gas-cushion cable fitted with sealing ends, without a joint, negative impulses were applied; flashover across the porcelain (without arcing horns) did not occur until 830 kV was reached. One of the sealing ends subjected to standard rain conditions (BSS No. 223) withstood negative impulses up to 630 kV. Horns were fitted at each end for this test and flashover occurred between them at the dry end when the voltage was raised to 720 kV. After removing the horns from the dry end, flashover returned to the horns at the wet end at 670 kV. During this series of tests the cable and sealing ends were subjected to a total of 223 impulses without showing trace of damage.

Similar tests were conducted on pre-impregnated cable, sealing ends and joint. This system withstood ten positive impulses at 640 kV followed by ten negative impulses at the same voltage. The system ultimately broke down at 640 kV, through the machine-applied dielectric on the cable inside the joint, after a total of thirty-four impulses in the full series of tests.

The results of these impulse tests indicate a reasonable margin of safety above the minimum requirements of the specification, and, moreover, show a satisfactory balance between the breakdown values of cable and sealing-end interiors and the external flashover value of the porcelains.

The entire installation, which was planned and carried out under Henley's contract manager, Mr. A. V. Burnett, was completed in August, 1944. No. 2 circuit with gas-cushion cable was made alive on September 29th, 1944, and No. 1 circuit with pre-impregnated gas pressure cable on November 23rd, 1944.

Tummel-Garry Inquiry

THE inquiry into the North of Scotland Hydro-Electric Board's second constructional scheme—Tummel-Garry—opened in Parliament House, Edinburgh, on (April 25th). It is expected to continue almost a fortnight as there are 27 objectors. The inquiry is being heard by Mr. John Cameron, K.C., Sir Robert Bryce Walker, and Major G. H. Broun-Lindsay.

Mr. R. P. Morison, K.C., who appeared for the Board, gave the total estimated cost of the scheme excluding housing and transmission, as £6,174,000, and said it would pay £27,000 a year in rates. Assuming that it was possible to begin work in July of this year, the Pitlochry and Clunie section would be completed, it was hoped, by the winter of 1947, and the Errochty section by the winter of 1948. If the scheme was not sanctioned, there was risk of serious curtailment of electricity supplies in central and southern Scotland in three years. It was estimated that at one time 4,000 men would be directly employed, and the amount of labour needed to produce materials would be at least as great. No other scheme, could deliver power at so low a cost and there was no other available source of power, steam or water, delivering the output of the Tummel-Garry Scheme, which could be ready by the same date.

On the principal objection, that amenity would be impaired, he hoped to convince the Commissioners that the scheme would not act as a deterrent to visitors, but that, as in the Galloway scheme, it would attract visitors. The "Queen's View" of Loch Tummel would become a view of a slightly wider loch extending farther into the distance, and, in his submission, it would be enhanced. Regarding objections of injury to fisheries, Mr. Morison claimed that the Board's proposal would have no serious effect on the Tay fishings generally.

The Earl of Airlie, chairman of the Board, said it would be of national advantage because it would meet the present need for a further supply of electricity in Scotland. It was one which would be able to pay for the many uneconomic schemes, which they had got to face up to in the future.

Sir John Kennedy (Electricity Commission) attended the inquiry to give any assistance he could. In reply to a question, he said that the Commissioners were very much exercised as to how the future demand for electricity in the next five or six years was going to be met. There was not the slightest doubt, as far as Scotland was concerned that the output of this scheme and of Loch Sloy, as well as the proposed station in Glasgow, would be required to meet the demands of the Scottish area.

Mr. James Beard, consulting engineer, said that the estimated revenue from the energy sold to the Central Electricity Board amounted to £567,710. The total annual cost of operation was estimated at £480,920, which included £111,610 for transmission. The surplus of £86,790 would meet the deficit on the Gairloch and Aultbea schemes, calculated at £8,000, and the remainder could be used to meet the deficit on other schemes. Asked whether any alternative project to the Tummel-Garry scheme could be developed, witness replied he did not think so—certainly not one which would be available for the same date. Technically, the Tummel-Garry scheme was one of the most interesting in the world.

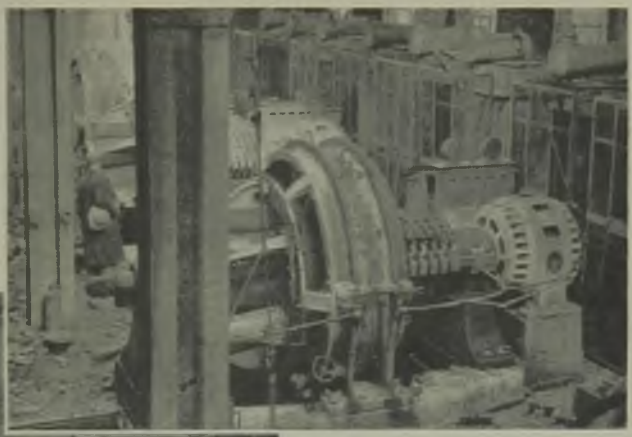
Mr. James Williamson, consulting engineer, agreed that if the scheme went through it would flood the Grampian Company's dam built in 1938 at a cost of £27,000 by the outflow from their Tummel Bridge power station and the dam would be of no further use.

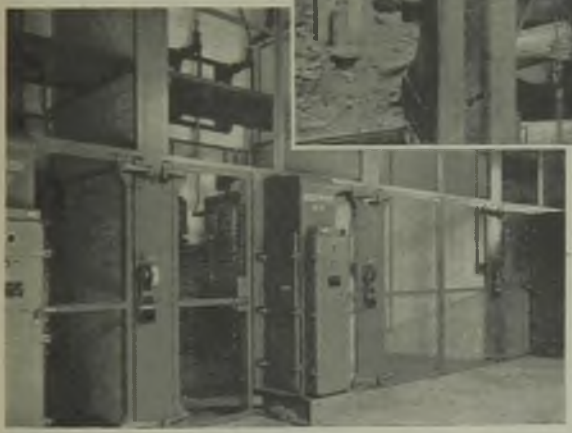
Bombed Railway Substation

Reconstruction at Streatham and Purley

OF the forty-three attended rotary convertor substations supplying traction current for the Southern Railway's train services to the suburban areas, one was destroyed by enemy action during the "blitz" period, when Streatham substation received a direct hit on October 2nd, 1940, resulting in the whole substation becoming completely gutted with the immediate loss of traction and signalling current supplies. The 11-kV supply to Sutton substation was also interrupted.

Emergency cable repairs were immediately instituted, and while the substation still burnt, work was commenced on joining the two 11-kV Sutton feeders to two of the Tulse Hill substation feeders, the third Tulse Hill feeder being arranged temporarily to give a supply of signalling current from this latter substation. These emergency repairs were completed only seventeen hours after the substation was wrecked.





Burnt-out rotary convertors and transformers at the Streatham substation and (left) the new 33-kV switchgear at the Purley substation

The problem then was to restore the substation, which had contained four 1,500-kW rotary convertor equipments including twelve single-phase transformers, together with associated groups of 11-kV switchgear in stonework cell structures, and 660-V DC switchgear, all of which had been destroyed. Finally, it was decided to reconstruct the substation in its original form, and to obtain the necessary plant from Purley substation, replacing that plant by mercury-arc rectifiers, which were more easily obtainable and cheaper than rotary plant. The Purley substation was ideally placed for conversion to a mercury-arc rectifier unattended substation since it was on the direct line of the 33-kV cable supply from South Croydon to Star Lane, both of which are unattended rectifier substations. Actually Purley could only provide three rotary convertor equipments, so a spare unit was obtained from Warlingham substation.

In order to avoid interruption of the supply from the Purley substation the reconstruction, and the installation of the rectifier plant with its switchgear was handled in three stages, each stage embracing one-third of the plant. The main features of the new plant were the installation for the first time for traction service on the Southern Railway of 33-kV indoor type cellular switchgear with circuit-breakers of the minimum oil type and pumpless air-cooled steel-tank rectifiers.

Travellers' Benevolent Institution

The half-yearly Court of Governors of the Commercial Travellers' Benevolent Institution will be held at the London offices, 4b, Frederick's Place, E.C.2, on June 30th.

COMMERCE and INDUSTRY

Higher Engineering Wages. New Export Credit Policies.

Export Credits Guarantees

PARTICULARS are given in the *Board of Trade Journal* of April 28th of the E.C.G.D. (Contracts) Policy for consumer goods which became available under the Export Credits Guarantee Scheme on May 1st. This supersedes the War Emergency Policy the valuable features of which it retains with further protection to the exporter. It covers insolvency or protracted default on the part of the buyer; exchange restrictions which prevent the transfer of sterling to the United Kingdom; the occurrence of war between the buyers' country and the United Kingdom or war, revolution, etc., in the buyer's country; and the cancellation or non-renewal of an export licence or the imposition of restrictions on the export of goods not previously subject to licence. Up to 85 per cent. of the contract price is guaranteed for insolvency or default and up to 90 per cent. in all other cases. For exporters who do not wish to insure against losses occurring before shipment the E.C.G.D. (Shipments) Policy is available at a lower premium.

For capital goods similar guarantees are available but in this case policies are framed to suit individual contracts. Full particulars are obtainable from the Export Credits Guarantee Department, 9, Clements Lane, Lombard Street, E.C.4.

Refusal to Work Overtime

Fifty maintenance men at three Manchester Corporation power stations are declining to work overtime because of dissatisfaction arising from a claim for a wages increase which has been considered nationally. The men who are employed on the overhaul of machinery are acting against the advice of their trade union.

Engineering Wages Increased

An award has been issued by the National Arbitration Tribunal upon the claim made by the engineering trade unions for an increase in the basic rates of their members. The Tribunal approves an immediate increase of 4s. 6d. per 47-hour week in the basic wage rates for adult male employees to apply to both time and piece workers. The existing national bonus remains unaltered but it is ruled that piece-work prices must be sufficient to enable a man of average ability to earn at least 27½ per cent. over the new basic time rate. It is stipulated that time workers' merit rates, lieu rates and compensatory bonuses, etc., shall continue.

Ulster Electricity Workers' Wages

The Industrial Court, under an award issued in London last week, has decided that a claim for a wage-rate increase for labourers in the area of the Electricity Board for Northern Ireland shall be settled in accordance with an agreement made by the parties. This provides that instead of the present varying rates for different districts the basic rates shall be as follows:—From the first full pay period following April 18th, 1s. an hour; from January 1st next, 1s. 0½d. an hour; and from July 1st, 1946, 1s. 1½d. an hour. The trade union side of the National Joint Industrial Council for the industry had claimed that the basic rates of wages for labourers in the area should be replaced by those for labourers in Londonderry, namely 1s. 1½d., plus the war bonus payable to all electricity workers in Great Britain and Northern Ireland.

High-Speed Steel

Under the Control of Iron and Steel (No. 41) Order, 1945 (S.R. & O. 1945 No. 408), high-speed steel, for which a licence from the Iron and Steel Control has hitherto been required, may now be obtained by Departmental authorisation (M. form). The Order also frees iron powder from control.

Water Treatment

Fuel Efficiency Bulletin No. 39, issued by the Ministry of Fuel and Power, deals with means of preventing scale and corrosion in boilers and auxiliary plant. Separate sections are allocated to types of natural water supply, methods of treatment (*viz.*, internal, external, conditioning and electrical), blow down, corrosion, routine control, removal of oil and destruction of bacteria. The note on electrical treatment is limited to the statement that while several forms have been devised, in which minute currents are passed through the water, giving good results in some cases, the scientific basis does not yet appear to have been completely elucidated. It is recommended that expert advice should always be obtained before adopting any system.

Y.E.P. Offices

The *Yorkshire Post* reports that the Yorkshire Electric Power Co. has acquired Scarcroft Lodge, with 160 acres of land. Recently the company submitted to Wetherby R.D.C. plans for administration offices, residential buildings, canteen and sports ground on land at Scarcroft.

Training Building Apprentices

About 25,000 apprentices a year are needed to enter the building industry (as compared with a new entry of 6,000 last year) to make good the natural wastage on an assumed force of 625,000 craftsmen. If a proper balance between craftsmen and apprentices (*i.e.* the proper balance of age) is to be reached within five years it is necessary that this annual recruitment of 25,000 should start now. This is one of the conclusions reached in the second report of the Building Apprenticeship and Training Council (Stationery Office, 9d.).

Besides indicating essential minima for all apprenticeship agreements in the building industry, the Council has prepared a scheme which has been approved by the Government for apprentices to erect buildings under the guidance of craftsmen instructors, the work

being carried out on behalf of any local authorities by an "apprentice master" nominated by a joint apprenticeship committee. Applications to participate in the scheme have already been received from nine local authorities and will require 409 apprentices, who will be engaged on building 113 houses. The Council believes that the scheme can be developed to enable at least 10,000 boys who cannot obtain suitable training in the industry to learn their trade under craft instructors and will also enable a few badly needed permanent houses to be erected now.

Lighting Progress

Fluorescent lamps, which were still subject to control, provided most of the lighting development during 1944. The British Thomson-Houston Co., Ltd., in its report on progress says that the most striking feature was the extensive adoption of continuous troughing, largely because it is unobtrusive and reduces installation costs. The troughing is available in single-lamp and two-lamp units. There has been an increasing preference for fittings giving a fair amount of upward light which does away with the depressing effect of dark ceilings. Another tendency has been towards more robust fittings.

During the year the company's lighting engineers have been frequently called upon to design installations. One task has been the designing and production of equipment for the improved street lighting authorised by the Ministry of Home Security. The engineers have had to consider the conversion of existing lanterns in the simplest and cheapest way. The rehabilitation of normal street lighting has also commenced.

January 1st saw the introduction of the "Warm-White" fluorescent lamp. The combination of a reduction in price with an improvement in the life rating of fluorescent lamps is said to have given the user a 40 per cent. increase in light value. Special lamps have found application in optical instruments, particularly the 250-W M.E. electric discharge lamp which has been extensively used in the Vickers projection microscope.

Philips' Sub-licensing Rights

A *Reuter* report from New York states that the National Bank Trust Co., has announced that all licences issued by the Radio Corporation of America under U.S. patents of Philips' Incandescent Lamp Works, Eindhoven, Holland, will terminate on July 1st. From that date, Philips will handle their own licensing arrangements in the United States. Licences which cover possibly as many as 700 radio patents were issued by Philips in 1925 to the General Electric Company and the Westinghouse Co. While the companies had the right to sub-license, the bulk of the sub-licensing was done by the R.C.A.

Non-Ferrous Metals Federation

At a meeting held in Birmingham last week over 150 firms in the non-ferrous metals industry were represented at the inauguration of the British Non-ferrous Metals Federation, when Mr. Horace W. Clarke was elected first president, Mr. W. J. Terry and Mr. W. H. Henman vice-presidents, Messrs. Peat, Marwick, Mitchell & Co., 18, Bennett's Hill, Birmingham, secretaries and Mr. R. Lloyd Gibbins treasurer.

During the proceedings it was emphasised that such a Federation could materially assist in the post-war reconstruction period by creating a fully-organised industry to which Government direction could be applied as a whole instead of to a collection of competing firms, big and small.

The aims of the new Federation are not confined merely to a basic scheme of co-operative effort to ensure fair trading within the industry and economic stability, it intends also to promote and support research into methods of production and to encourage all branches of technical, market and industrial design. Its activities will tend towards a hitherto unknown degree of rationalisation and modernisation both of plant and of production methods, which obviously must do much to assist in the revival of export trade.

The founder members of the Federation are:—The Brass and Copper Tube Association, the Brass Wire Association, the Brazed Brass Tube Association, the Cold Rolled Brass & Copper Association, the Condenser Plate Association, the High Conductivity Copper Association, the Manufactured Copper Association, the Nickel Silver Association and the Zinc Rollers' Association.

Trade Publications

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4. Leaflet (No. 143) describing and illustrating the first three-core 132-kV cable, of the impregnated (nitrogen) pressure type capable of transmitting 110,000 kVA, to be installed commercially for the Central Electricity Board.

Leaflet (No. 139), illustrating a straight cable-joint box, mining type, of uncrushable pressed steel design.

Crofts (Engineers), Ltd., Thornbury, Bradford, Yorks.—Illustrated folders (Nos. 4413 and 4415) describing "Airflex" clutches and brakes, expanding and contracting, made under Fawick patents for actuation by compressed air.

Banner Electric Co., Ltd., Burford House, Hoddesdon, Herts.—Leaflet descriptive of a tester (short circuit and continuity) for small coils.

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

Powdered-metal Contacts

The wide variety of composition, shapes and sizes in which electrical contacts are being fabricated from metal powders for switches and similar current-breaking devices is indicated by Mr. E. I. Larsen (P.R. Mallory & Co., U.S.A.) in a short paper recently presented at a symposium arranged by the American Institute of Mining and Metallurgical Engineers.

Contact pieces made in this way weigh from 0·001 oz. up to 4 lb., the contacting face being as small as 0·001 sq. in. up to 6 sq. in in area. Shapes include round and rectangular buttons, some with radii or bevels on the contacting faces; rings, cups, rectangular bars, some with a radius across the width and/or at one end of the contacting face; while form-pressed pieces have included both acute and obtuse angles and such irregular shapes as a radius blended into a flat, which may be stepped. Nearly all contacts made in this way are brazed or welded to a copper or alloy backing member;

these operations must be performed with care to avoid overheating, which may change their chemical composition and is thus detrimental to operating characteristics.

Powder metallurgy is claimed to combine high load-carrying properties with ability to interrupt short circuits. Because of the complexity of manufacture the author does not describe in detail the exact procedure; instead he emphasises the absolute necessity for rigid control of raw materials and fabricating processes as well as the need for close collaboration between users and makers in the establishment of correct designs.

St. Pancras House-Service Unit

Following a request by the Ministry of Works Directorate of Post-War Building that the electrical industry should consider the development of a combined control unit for single-meter domestic electrical installations, a number of units have been designed and submitted to the E.D.A. and the appropriate committee of the I.E.E. At this week's meeting of the St. Pancras Borough Council the Electricity and Public Lighting Committee reported that one of these units was the result of the combined efforts of the technical staff of the Electricity Department. The unit had been submitted to the General Electric Co., Ltd., with a request for a quotation for its manufacture on a mass-production basis. The company had quoted for 1,000 lots to be taken as and when they were required during the next two years, two gross to be ordered shortly at £2 14s. 8½d. each net. The Committee recommended the purchase of 288 units at the price quoted, the Contracts and Finance Committees concurring.

Flue-Gas Washing at Battersea

The Electricity Commissioners recently invited the observations of the London County Council and the Metropolitan Borough Councils concerned on an application by the London Power Co., Ltd., for consent to a further extension of the Battersea power station by the installation of a 60,000-kW generator, a 5,000-kW house-service set and two boilers. For security reasons the use of flue-gas washing plant at the station has been discontinued during the war, but while these reasons no longer exist, the Commissioners propose to defer the question of the resumption of gas-cleansing in connection with existing plant and its adoption for the new plant until they have considered a report by the Department of Scientific and Industrial Research on the subject. The L.C.C. and the Battersea, Chelsea, Kensington and Westminster Councils are making representations for the immediate re-establishment of the precautionary measures and for the imposition of any more stringent or specific measures which may appear desirable in the light of the D.S.I.R. report.

Photo-telegraph Services

In recent years radio transmission of photographs, drawings, documents and plans has been greatly developed. Before the war, Cable & Wireless, Ltd. operated only three photo-telegraph circuits—with Melbourne, New York and Buenos Aires. Traffic was negligible, except on the New York circuit, on which about 45 pictures were handled every month. To-day, although the whole of the London photo-telegraph apparatus was lost in the fire which destroyed the company's central telegraph station at Moorgate in May, 1941, eleven services are being operated with Empire and foreign countries, and nearly 2,000 photographs and facsimile documents a month are now being transmitted and received.

Electricity Supplies Cut Off

The cold snap at the beginning of this week necessitated the cutting-off of electricity supplies in many parts of the country on Monday last. In most cases there was a stoppage of 45 minutes commencing just before 8.30 a.m.

Trade Announcements

Hellerman Electric, Ltd. and the Bowthorpe Electric Co., Ltd., state that they have "outgrown" their London office and Messrs. N. L. Keen, C. E. D. Catley and K. A. Sillick are now available at 138, Sloane Square, S.W.1 (Sloane 3579).

Allan Eyre & Co., Ltd., Chesterfield, inform us that they recently opened a branch at 19-21, Woodstock Road, Oxford, where they are carrying a full range of switchgear and all electrical accessories. The branch manager is Mr. W. T. Vernon.

The British Aluminium Co.'s Manchester office is temporarily at Chancery Chambers, 55, Brown Street, Manchester, 2 (telephone: Blackfriars 8913; telegraphic address: Aluminium Manchester). The branch manager is Mr. J. R. Whitelegg.

J. M. Webber & Co., Ltd., have moved to 244, Tottenham Court Road, London, W.1.

TRADE MARKS

RECENT applications for trade marks include the following; objections may be entered within a month of April 25th :—

ANOVANE. No. 632,238, Class 9. Electrical measuring instruments; meteorological instruments, and apparatus for measuring volume, pressure, temperature and speed.—Pilot Engineers, Ltd., Ford Street Works, Chestergate, Stockport.

ARDENTE. No. 633,156, Class 9. Telegraphic and telephonic apparatus; radio apparatus; loudspeakers; speaking tubes; and parts (not included in other classes) of all such goods.—R. H. Dent, Ltd., 309, Oxford Street, W.1.

BRADCON, BRADRUM and BRADMATIC. Nos. 633,171, 633,172 and 633,173, respectively, Class 9. Coin-freed and coin-controlled apparatus, electrical apparatus not included in other classes, electric switches, radio and television apparatus, etc.—L. C. Bradley, L. J. Bradley, F. C. Bradley and N. E. Bradley, trading as L. C. Bradley, 20, Church Road, Perry Barr, Birmingham, 20.

LONDEX. No. 629,705, Class 9. Electrical instruments and apparatus, and parts thereof, none being goods included in other classes.—Londex, Ltd., Brettenham House, Strand, W.C.2.

LUM-ARC. No. 628,510, Class 11. Floodlight, limelight and like projector lamps adapted for use with an electric arc, and parts and fittings not included in other classes.—Lum-Arc Manufacturing Co., Ltd., 22, High Street, Kingston-on-Thames, Surrey.

Manufacturers' War Work—II

A Diversity of Products

In the second of our series of articles on the wartime activities of electrical manufacturers details are given of the important work done in producing a variety of war requirements, ranging from pull-throughs to gun mountings.

Ferguson, Pailin, Ltd.

IN view of the large part fabricated steel structures play in their normal product, it is natural that the major contribution of Ferguson, Pailin, Ltd., would be in this direction. Development of manufacturing processes of a bomb hoist for the Wellington

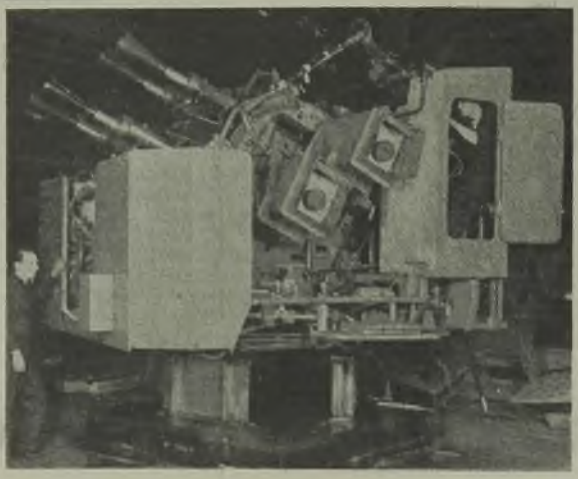
Fabricated posts for the Bailey pontoon bridge and (right) converting 2-pdr. naval pom-pom mountings from hand to power operation at the Ferguson, Pailin works

aircraft and of the airscrew hub for the Merlin engine was carried out early in 1939, and following a pause from 1939 to 1941 during which time switchgear for new war factories, etc., was of high priority, contracts were carried out covering driving sprockets for the Matilda tank and Universal carrier, Valentine 2-pdr. tank gun mountings, shoulder pieces and feed trays for 37 mm. gun mountings, mudguards for Churchill tanks and prismatic visors for Crusader and Centaur tanks.

A large contract for spare parts for Matilda tanks was executed, experimental idler wheels for the Churchill tank were designed, and with the demand for heavier fire power in our tanks steel fabrications for adapting a heavy gun to a Churchill chassis were produced. Before " D " day, and at the urgent request of the Tank Production Department, a large quantity of components were produced for the waterproofing of Churchill vehicles.

Work carried out on gun equipment and carriages has varied from complete 6-pdr. anti-tank carriages to converting 2-pdr. naval pom-pom mountings from hand to power operation. Recoil gear for 4-in. naval guns, fabricated frames for 40-mm. Bofors guns and various assemblies for a new naval anti-aircraft gun have also been produced. Assistance has been given in designing and developing fabricated steel gear boxes for gun mountings to replace existing casting designs and a cartridge chute for a new naval mounting. This assistance also included items of equipment for the remote power control of guns and automatic setting of fuses.

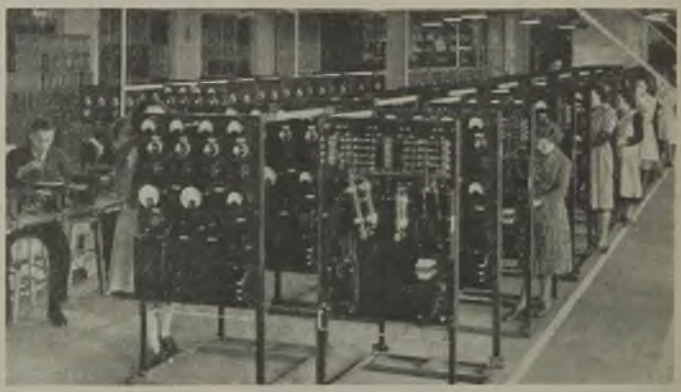
In 1942 the company undertook the manufacture of fabricated posts to link the various sections of the Bailey pontoon bridge together and has now produced about 13,000. On behalf of the Admiralty many thousands of transformers for radiolocation and wireless equipment have been designed and produced. Experimental equipment has also been provided in connection with application of radiolocation in aircraft. Other items have been equipment for training anti-aircraft



personnel, fabricated covers for main gear cases for Battle and Fleet class destroyers, as well as transport frames for aircraft engines.

Berry's Electric, Ltd.

About 1,020,000 smoke shells, 230,000 2-inch mortar bombs, 530,000 percussion fuses, 1,770,000 pull-throughs, 40,000 telescope cases, 201,300 electrical detonators, and 103,000 wireless carriers and valve cases have been produced by Berry's Electric, Ltd. In addition the Ministry of Aircraft Production has had 100,000 special voltage regulators, 70,000 rheostats and control panels for U-boat detection apparatus, and 13,000 flare-path equipments. Though a pre-war product, the company's switchgear, to-day representing about one-fifth of the total output, has found its way into a large number of war establishments, including ordnance factories, docks and quaysides, aircraft factories and aerodromes. Much special apparatus has been supplied and no fewer than 2,500 switchboards have been constructed for mobile R.A.F. generating plants.



Over 2,500 of these special switchboards have been made by Berry's Electric, Ltd., for use with mobile generating plants

Nearly all the radiators installed in the Royal Navy, Mr. Raymond Berry, chairman and managing director of the company, tells us, are supplied by Berry's, the "Adberry" (a version of the "Magicoal" type) for the principal cabins and an extremely robust wall unit for general purposes. The Admiralty also purchases water heaters required for certain purposes. A very few utility radiators are also being made.

William Geipel, Ltd.

Before the war William Geipel, Ltd., produced control gear, hand and automatic, both to standard and special designs for a wide range of uses. Since the armament programme began there have been many novel applications of their products and much interesting development work undertaken which, though primarily for war purposes, will have their peacetime uses and adaptations. In heavier gear, control of wind tunnels with extremely fine variations of speed, equipment for Royal Ordnance and aircraft "shadow" factories, control from the watch office of aerodrome fire and attack alarm systems, part supply arrangements and warning systems in relation to aircraft movement, are examples of the company's activities.

Whilst most of these equipments have been special, it is in the field of communications and radio that the most intensive development work has been carried out and a vast number of applications of power supplies for these uses on seagoing duty has been met. Contactors capable of operating in all conceivable positions and resistances in compact form capable of dissipating appreciable heat have been widely used. The need for resistance to climatic changes, shock conditions, etc., as well as the space factor made the company's patent steel-clad resistance particularly suitable for naval work, and resistance assemblies for many duties have been built up.

Apart from the incorporation of standard designs of contactors in gear for tank starting, signal and anti-submarine work, many new designs have been developed. Special designs of push-buttons, protective circuit arrangements, regulating gear, etc., have been undertaken.

Burco, Ltd.

Millions of fuses have been made by Burco, Ltd., whose other "unusual" products have included tracers, canister bombs, parachute assemblies, air-raid apparatus, oil drums and other sheet metal work. A large number of boilers were supplied at the beginning of the war for use in A.R.P. shelters—the number for London alone was several thousand. Very few boilers have been made during the war, as the plant was turned over completely to munition production.

Midland Electric Manufacturing Co., Ltd.

Besides meeting increasing demands for material to be used by the electrical trade in the equipping of essential works, war production factories, etc., the Midland Electric Manufacturing Co., Ltd., has been engaged on the production of essential electrical equipment in large quantities for the Admiralty, War Office and Air Ministry.

Provincial Electric Supply

Minister at Association's Annual Luncheon

THE Minister of Fuel and Power (Major G. Lloyd George) was the principal guest at the annual luncheon of the Provincial Electric Supply Association at the Savoy Hotel, London, on April 25th. The chairman of the Association (Mr. S. Selwyn Grant) presided and in proposing the health of the guests welcomed Major Lloyd George, Mr. Henry Berry, chairman of the Conjoint Conference of Public Utility Associations and of the Metropolitan Water Board, and Sir Robert Renwick. Mr. Grant assured the Minister of the industry's goodwill and claimed that the Association had done a great deal to provide electricity to country districts.

In his response, Major Lloyd George referred to his Ministry's heavy task and said that not all sections were so easy to handle as the electricity supply industry. Not only had it made a most valuable contribution to industry during the war, on the domestic side many more people had turned to electricity when coal was short, which at times had raised a great problem. There was a severe shortage of generating plant and this lack would be accentuated as the war came to an end and the demand for appliances increased. It would be some time before the situation could be rectified. During the war the Government had had to take tremendous risks and they had been justified; only on five or six occasions had it been necessary to cut off supplies. The Government was extremely grateful to the C.E.B. and the industry for the way in which they had met the situation.

Continuance of some measure of control would be necessary after the war but he wanted to see it exercised with the consent of the industry itself. Through a joint committee which he had set up representing the heavy electrical plant manufacturers and the Ministry, high priority had been obtained for labour for the production of plant. Referring to the depletion of coal stocks, the speaker said that the Ministry was doing its best to build them up again and although by October he might have to say that the position was not saved, with the co-operation of the supply industry and the consumers we should be able to get safely through next winter.

People did not realise how much had been done in the way of rural electrification. He recognised that the cost of construction and of wayleaves was a serious handicap. Agriculture could benefit considerably from electricity and electricity depended upon coal. The reorganisation of the coal industry was of vital concern to electricity. There were difficult times in front of us but electricity could make things less difficult and his Ministry desired to be of the greatest possible assistance to the supply industry.

Mr. Henry Berry also responded, mentioning his desire to meet each of the associations represented upon the Conjoint Conference.

Annual Meeting

Reporting upon the past year's activities at the subsequent annual meeting, Mr. Selwyn Grant said that Mr. Frank Christy had retired from the Executive Committee, his place being taken by Mr. H. J. Aylott. Sir John Dalton had also joined the Committee and Mr. E. G. Baker had been appointed secretary. Following the withdrawal of the Edmundson Group from the Association, Messrs. Towers and Mekie had resigned from the Committee.

During the year there had been an increase in the war bonus of 1d. per hour and the trade union side had put in a demand for a further increase which was not justified by the cost of living figure; this had been rejected by the Industrial Court. There had been a failure to arrive at a uniform sick pay scheme for the electricity, gas and other public utility services.

Mr. Grant spoke appreciatively of the work of the Joint Committee of Electricity Supply Organisations of which the Association's vice-chairman, Mr. A. J. Fippard had been appointed chairman. As the result of an approach by the National Farmers' Union, an increase in wayleave payments for compensation for interference with agriculture had been negotiated. They were hoping to place their views upon proposed amendments to the Commissioners' prescribed form of accounts before the Joint Committee so that an agreed report could be submitted to the Commissioners. They had made proposals to the Central Electricity Board for modifications in the form of the grid tariff. They favoured the basing of the kilowatt charge upon the average of the highest half-hourly demands in January, February, November and December; the I.M.E.A. concurred in this. They had kept an eye on proposed legislation to ensure that their statutory rights were not being prejudiced. He feared that there was not likely to be a diminution in the number of such proposals.

After a reference to the work of the Conjoint Conference, Mr. Grant dealt with the subject of rural electricity supply—a matter in which members were particularly concerned. He said they were anxious and

ready to proceed with the drive which was so noticeable before the war but the serious handicaps of increased costs and uncertainty as to the future of the industry had to be faced. He pointed out that the price of electricity had largely remained at the pre-war level which reflected the greatest credit upon the industry and had proved the value of private enterprise. Mr. Grant said he hoped that the authorities when considering the question of reorganisation would measure the solid achievements of the past against the abstract estimates and hopes of the future trumpeted by political theorists.

B.E.A.M.A. Annual Meeting

Sir Harry Railing's Address

THE thirty-fourth annual general meeting of the British Electrical and Allied Manufacturers' Association was held in London, on April 19th, SIR HARRY RAILING, chairman of Council, presiding. In presenting the report, the chairman referred to the losses which the Association and the industry had suffered by the deaths of Mr. P. S. Turner, Mr. J. A. Hirst, Mr. A. Berkeley, Mr. F. Dudley Docker and Mr. A. G. Seaman. The chairman also mentioned the knighthood bestowed on Dr. A. P. M. Fleming.

Turning to the activities of the Association, Sir Harry dealt with the change in the constitution of the Council, by which the elected representation was increased from 18 to 24, and the Council was given power to co-opt ten instead of seven additional members. In the elections which had just been held the Council had been brought up to the number agreed upon. He believed that this change would be of mutual assistance to members in putting their problems before the Council, and to the Council when considering and advising members on their problems.

The prospect of early victory, at least in the European war, was so close that they were justified in turning their thoughts to the production of their normal peacetime products, so far as labour conditions would permit. Although the industry had been engaged largely on war work during the year, there had been an opportunity of considering certain aspects of the future and preliminary discussions had taken place with Government Departments on a number of problems. The Association had been in touch with the Ministry of Works, and as a result the interested members had made arrangements collectively to supply the necessary electrical equipment for the immediate housing programme. In these negotiations the manufacturers received the closest support from the Electrical Development Association, and a Joint Committee of the E.D.A. and manufacturers, established at the suggestion of Mr. Clarence Parker, chairman of E.D.A., had been of the utmost value.

Negotiations were well advanced with the Ministry of Supply and the Board of Trade for the disposal of surplus electrical equipment, whereby a scheme would be put into operation which they believed would result in this equipment being released for commercial use in a manner which would disturb the normal working of the industry as little as possible. Details could not be given until they had been finally approved and agreed by other interested bodies.

The Association's relations with the British Engineers' Association continued to be most cordial, and the Directors of the two bodies were in constant touch over the problems affecting the engineering industry as a whole, in addition to the meetings of the joint B.E.A./B.E.A.M.A. Committee, which had been held during the year. The joint meetings of the I.M.E.A./B.E.A.M.A. Committee had continued throughout the year and had resulted in several problems being rapidly and amicably disposed of.

Sir Harry said he was convinced that the establishment of the Professional Engineers' Appointments Bureau, in which he, as President of the Institution of Electrical Engineers, had a particular interest, would be of the greatest value to a very large number of professional electrical engineers, and also to manufacturers, when those engineers were securing positions after the war, or manufacturers were seeking to fill the gaps caused by the war.

He expressed thanks to Mr. Watlington and to members of the staff for the excellent services they had rendered during the sixth year of the war in extremely difficult and trying circumstances. In conclusion he said that the reconstruction problems and post-war problems with which they would be faced in the not too distant future would require from them the same qualities which they had shown during the long years of war. Each firm and each unit should do its utmost to develop its needs individually and with great efficiency, and jointly, as members of the Association, they must concentrate always on the great aims that united them rather than over-emphasise points of detail. That applied to their industrial problems in the same manner as it applied to national and international questions. If they worked in this spirit they would continue to fulfil their responsibilities to their great industry and to the economic life of the nation.

The chairman then announced the result of the ballot electing twelve members of the Association to be members of the Council for the session 1945/6 as follows: Belliss & Morcom, Ltd.; Bruce Peebles & Co., Ltd.; Brush Electrical Engineering Co., Ltd.; Chloride Electrical Storage Co., Ltd.; English Electric Co., Ltd.; W. T. Glover & Co., Ltd.; Hick Hargreaves & Co., Ltd.; Jackson Electric Stove Co., Ltd.; Johnson & Phillips, Ltd.; Micanite & Insulators Co., Ltd.; Nalder Brothers & Thompson, Ltd.; and J. H. Tucker & Co., Ltd.

MR. G. R. BARCLAY proposed a vote of thanks to Sir Harry Railing, which was seconded by MR. ELLICE CLARK and carried unanimously.

At the subsequent meeting of the Council the following companies were co-opted members of the Council: Allen West & Co., Ltd.; Crompton Parkinson, Ltd.; Lancashire Dynamo & Crypto, Ltd.; Quasi Arc Co., Ltd.; and A. Reyrolle & Co., Ltd. Mr. E. C. Holroyde (joint managing director of Crompton Parkinson, Ltd.) and Sir Harry Railing (chairman and joint managing director, General Electric Co., Ltd.) were elected chairman and vice-chairman respectively for the next session.

I.E.E. Scottish Centre

Proposed Edinburgh Sub-Centre

A REQUEST for the formation of an Edinburgh Sub-Centre has been received by the Scottish Centre Committee of the Institution of Electrical Engineers. A memorandum has been circulated setting out the arguments which have been advanced for and against the proposal and members of the Centre are being asked to express their views. The Sub-Centre, if formed, would serve the counties of East Lothian, Midlothian, West Lothian, Peebles, Selkirk, Roxburgh and Berwick. The southern half of Fife, now served by the Dundee Sub-Centre, might also be recommended for inclusion.

In its 1944-45 report the Committee states that after careful consideration it has decided that specialised groups would not receive adequate support in the area and at the moment are not desirable. A good mixture of papers from the Sections will be maintained in the programme. The membership of the Centre has increased from 1,179 to 1,287 and during the past session the average attendance at meetings has been about 68 compared with 63 in the previous session. The average attendance of Students' Section meetings has been 31 in Glasgow and 15 in Edinburgh. The Dundee Sub-Centre (membership 130) reports an average attendance at meetings of 45 (against 40 in 1943-44).

New Battery Vehicles

Greater Speed and Range Claimed

IMPROVEMENTS in design incorporated in a new range of battery electric vehicles are claimed by the makers, A. C. Morrison (Engineers), Ltd., 10, New Street, Leicester, to increase both mileage and speed by one-third and reduce operating costs by one-third. An average speed of about 21 MPH and a range on straight running of 60 miles per charge (or 80 miles with an oversize battery) are the actual figures said to be attained. These results have been achieved by reducing the weight of the vehicle (by as much as 13 cwt.), by increasing the efficiency of the motor (to an average efficiency of 84 per cent.) and by reducing the transmission losses (by 20 per cent.).

The peculiar body/chassis frame assembly incorporates no chassis frame as such but has, fitted to the base, two short longitudinal inverted channels, only the length of the batteries. Transversely, to tie these and carry the batteries, are two angles, while inside the channels, at either end, are fitted four quarter-elliptical springs with double leaves. Instead of the usual motor with axle and differential, two separate split-pole motors with aluminium yokes drive the back wheels through pinions on the motor shafts and ring gears on the hubs.

Three sizes of vehicles will be available—15 cwt., 20 cwt. and 30/40 cwt., with 30-, 36- and 44-cell batteries respectively, each 161 Ah. Standardisation of parts for these three models has been effected to a very considerable extent and no fewer than 90 per cent. of the parts are common to the whole range.

The types of body provided for the new vehicle include an enclosed van, an open-sided milk truck, a semi-open-side milk truck and a plain truck. The body panelling consists of $\frac{1}{8}$-in. plywood, on one side of which is bonded a steel sheet. The panels are riveted to the steel body frame and the joint is sealed with plastic synthetic rubber. The method of construction permits the vehicles to be packed for export in an unassembled state, requiring only 50 man-hours for final assembly abroad.

Morrison 20-cwt. battery vehicle

Forthcoming Events

Saturday, May 5th.—*London.*—I.E.E. London Students' Section. Visit to Brimsdown power station (2.45 p.m.).

Monday, May 7th.—*Birmingham.*—James Watt Institute, 6 p.m. (tea, 5.30 p.m.). Annual general meeting and visit of the President, Sir Harry Railing.

Tuesday, May 8th. — *London.* — University College, Anatomy Theatre (entrance from Gower Street), 1.15 p.m. Lecture on "The Future of Domestic Lighting and Heating," by Prof. R. O. Kapp. (Admission free without ticket.)

London.—Royal Empire Society, 1.15 p.m. Institute of Export. Address by Lord Woolton on "Export Trade After the War."

Manchester.—Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Centre. Annual general meeting and paper, "The Place of Radiant, Dielectric and Eddy-Current Heating in the Process Heating Field," by L. J. C. Connell, O. W. Humphreys and J. L. Rycroft.

Wednesday, May 9th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. "Localisation of Faults in Low-voltage Cables, with Special Reference to Factory Technique," by J. H. Savage.

London.—At Institution of Civil Engineers, 10.30 a.m. Iron and Steel Institute. Annual general meeting (continued on Thursday).

Sheffield. — Royal Victoria Station Hotel, 7.30 p.m. Association of Supervising Electrical Engineers. "Modern Repair Workshop Practice," by W. E. Hymas.

Thursday, May 10th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Annual general meeting (corporate members and associates only).

Friday, May 11th.—*London.*—Royal Institution, 5 p.m. "X-ray Analysis: Past, Present and Future," by Sir Lawrence Bragg.

London.—39, Victoria Street, S.W.1. 6.30 p.m. Junior Institution of Engineers. Informal meeting to discuss the formation of a Research Discussion Circle.

Newcastle-on-Tyne.—County Hotel, Neville Street, 7 p.m. I.E.E. North-Eastern Students' Section. Annual general meeting and "smoker." (Altered date and time.)

Saturday, May 12th.—*Cardiff.*—Physics Department, University College, Cathays Park, 2.30 p.m. Institute of Physics (South Wales Branch). "Use of Infra-red Radiation in Medicine," by Prof. W. V. Mayneord. (Open to visitors.)

Monday, May 14th.—*Nottingham.*—Corporation Gas Showrooms, Parliament Street. 6 p.m. Nottingham Society of Engineers. Display of films of engineering interest. Compère, M. A. Crosbie.

Tuesday, May 15th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Radio Section. Discussion on "The Characteristics of Luminescent Materials for Cathode-Ray Tubes," to be opened by C. G. A. Hill.

London.—Lighting Service Bureau, Savoy Hill, 6.15 p.m. Association of Supervising Electrical Engineers. Winning entries in Branch papers competition.

London. — At Institution of Mechanical Engineers, 5 p.m. Illuminating Engineering Society. Annual general meeting and (5.30 p.m.) address on "Daylight and its Penetration into the Sea," by Dr. W. R. G. Atkins.

Thursday, May 17th.—*London.* — Institution of Electrical Engineers, 5.30 p.m. (tea at 4.45 p.m.). Repetition of Kelvin Lecture on "The Scientific Principles of Radiolocation," by Sir Edward Appleton, K.C.B., F.R.S.

Saturday, May 26th. — *Birmingham.*—Grand Hotel, 12.30 for 1 p.m. Birmingham Electric Club. Luncheon.

Brisbane Services

THE New Farm power station, Brisbane, which is operated as a sub-department of the City Department of Transport, supplies electricity in bulk to both the electricity and transport undertakings and also to the City Electric Light Co. In 1943-44 the total output was 163·3 million kWh compared with 144·1 million kWh in the previous year, an increase of 13 per cent. Of this 114·0 million kWh was supplied to the Department of Electricity at 0·503d. per kWh and 39·8 million kWh to the Department of Transport at 0·552d. per kWh, both figures being considerably lower than in the preceding year. The report states that the combined representations of the Council and the City Electric Light Co. to the Commissioner of Prices and the Minister of Mines on the high pithead price of coal (21s. 9d. per ton) and the poorer quality have not so far produced satisfactory results. A reduction of 5 per cent. in railway freight costs, however, made the average price of coal delivered (£1 9s. 4d. per ton) lower than in 1942-43.

The Department of Electricity reports a record profit of £71,480, revenue increasing by £72,465 to £597,869. The average revenue per domestic consumer was £4 13s. 6d. per annum, equal to 1·735d. per kWh sold. Corresponding figures for commercial and industrial consumers were £41 10s. 5d. and 1·103d.; and for rural consumers £13 13s. 2d. and 1·418d. Total sales were 102·8 million kWh, including 60 million kWh for industrial and commercial purposes and 40·4 million kWh for domestic uses.

It is recorded that the supply was satisfactorily maintained in spite of severe electrical storms and abnormal interruptions caused by a plague of frogs (how they interfered with the supply the report does not say). In the quick restoration of supply the Department's radio station again rendered good service. A recently established standardising laboratory and instrument repair section has proved of great benefit to the State generally; many instruments have been repaired and calibrated for the Services, including gyro compasses for the Royal Australian Navy.

There was a large increase in the revenue of the Department of Tramways (from £1,288,301 to £1,500,644) and the net profit rose from £248,034 to £333,324; in the year preceding the outbreak of war the profit was only £90. The number of tickets issued in 1943-44 represented 157 million passenger journeys against 135 million in 1942-43. Trams ran 10 million miles and buses 0·5 million.

Power Development in Russia

SOME information relating to power developments in Russia shortly before the war have been sent us by the Society for Cultural Relations with the U.S.S.R. By the end of 1937 the aggregate installed capacity of all power stations was 10·9 million kW with an output of 38,000 million kWh. Hydro-electric output is not given for later than 1934, when it was 2,123 million kWh, but that figure is said to have increased in each of the following years. In 1935 the aggregate length of high-voltage transmission lines was 7,500 miles, 220 kV being used for inter-regional connection and 110 kV (50 per cent. of the total) and 38 kV (40 per cent.) for local networks. Additions were being made at the rate of 600 miles per annum.

Fourteen of the steam stations in which peat is largely used as fuel had over 100,000 kW installed, the average per station being 36,200 kV. Steam pressures of 470, 880 and 1,470 lb. per sq. in. were used. Stations are built with a view to high-voltage inter-connection.

Hydro-electric schemes included the Dnieper station containing nine units with an overall rating of 558,000 kW. Work has been started on the construction of a chain of stations to use the resources of Lake Sevan in Soviet Armenia, which is situated 6,500 ft. above sea level. The accumulated energy reserves of the lake are to be used over a period of fifty years by lowering its natural level by one metre each year, the outflow passing through a cascade of stations developing about 2,000 million kWh annually. The Kanakir station, the lowest of the cascade, is already in operation.

Further development of the Kuibyshev hydro-electric scheme, which is to have an ultimate installed capacity of over 3 million kW and an annual output of over 7,000 million kWh, to be transmitted to Moscow and the Urals at 330 or 440 kV, was stopped by the war.

These data are taken from "Twenty-Five Years of Power Development in the U.S.S.R." by A. V. Winter which was published in 1943. Another work entitled "Twenty-Five Years of Soviet Power Engineering" by V. I. Veitz, also published in 1943, contains some figures relating to combined heat and power stations. In 1939 the number of such stations was 106 with an installed capacity of 1,750,000 kW or 22 per cent. of the total capacity of thermal stations at that time. These had a heat output of 22 million mega-calories. The supply systems have a total length of about 320 miles.

L.C. Oscillators

PUBLISHED data on the instability of inductances and capacitances are a formidable reminder of the difficulties to be expected in devising stable L.C. oscillators, which may be defined as thermionic AC generators whose frequency is controlled by a resonator having inductance and capacitance elements which may be lumped or distributed. There is some risk that oscillators of this kind may receive less attention than they properly deserve because of the high repute that has been deservedly won by crystal oscillators during the last two decades.

A paper prepared by MR. N. LEA (Marconi's Wireless Telegraph Co., Ltd.) for the Radio Section of the Institution of Electrical Engineers presumes some familiarity with the subject and has been compiled largely from the development engineer's point of view, being based upon the author's experience within a limited field. It is an admission that present knowledge makes it necessary to visualise an unpleasantly long list of instability factors, which assume varying orders of importance when applied to individual designs. But it is well to remember that a design may be built up on the basis of any one of almost endless combinations of materials, functions and dimensions; hence one need not be unduly discouraged by a catalogue of difficulties, many items of which may be circumvented by methodical reasoning and/or happy inspiration.

It is clear that L.C. oscillators with some pretensions to stability will play a part in the future of telecommunications and that their possible uses will cover the whole frequency spectrum with but minor reservations. Crystal and L.C. types should seldom be considered as rivals, since the frequencies generated by the latter are capable of variation manually or by modulation over ranges that are quite impossible with the former.

Methods of thermal compensation are discussed and the importance of humidity is emphasised, a diagram of the permittivity of moist air being included. Attention is directed to the advisability in some cases of sacrificing high Q values, which are one of the outstanding merits of the crystal resonator, in order to facilitate design from a thermal point of view.

New Swedish Power Stations

DURING March two further power plants were inaugurated in the north of Sweden by the Waterfalls Board, namely, the Torpshammar station on the Gima River, a tributary of the Ljungan River, and the Stadsforsen station on the Indal River. They rank among the biggest in the country and constitute fine examples of modern Swedish engineering in this field.

The Torpshammar station, which has cost 36,000,000 kr., including 8,000,000 kr. for the regulation of the lake system, utilises a head of 128 metres, an exceptionally high fall for Swedish conditions. This has been created by extensive rock blasting. The machine hall is situated in the rock 125 metres below the surface of the ground, and after having passed the turbine, the water is conducted through a blasted discharge tunnel 4,700 metres long. The station is designed for 100,000 kW, though for the present only one set of 55,000 kW capacity is installed. The water is conducted from the river to the turbine through a vertical steel tube.

Above Torpshammar, at the Lering Falls, a smaller power station of 10,000 kW has just been completed, at a cost of 4 million kronor. As a consequence, the natural channel of the Gima River has been dried up, and to carry the large amount of timber that is floated in these parts, an artificial 3-mile-long flume has been constructed of concrete.

The Stadsforsen station, which utilises a fall height of 30 metres, has two sets with a combined capacity of 90,000 kW. It is planned to install a third unit in the near future.

ELECTRICITY SUPPLY

Glasgow Emission Complaint. State Aid for Southend.

Glasgow.—GRIT EMISSION.—At the last meeting of the Electricity Committee the town clerk submitted a letter from solicitors on behalf of the proprietors of various properties. The solicitors referred to damage which was alleged to be due to the deposit of grit emissions from the Dalmarnock power station lodging in the roofs and gutters, and intimated that their clients proposed to hold the Corporation liable. The Committee repudiated liability and authorised the town clerk to defend any action that might be raised.

Guildford.—SUPPLY TO ESTATES.—The Electricity Committee is seeking sanction to borrow £13,034 for providing an electricity supply to the Stoke Hill and Park Barn estates.

London.—HIRE OF PORTABLE APPARATUS.—Hackney Electricity Committee has approved the purchase of 1,000 electric kettles and irons as and when they are obtainable. In spite of the increased cost, it is recommended that the apparatus should be hired at existing rentals to consumers who have been rehoused following damage to their premises by enemy action.

Scotland. — SMALL SCHEMES ADVOCATED. — Writing in the *Scottish Geographical Magazine* Mr. Allan Arthur, M.Inst.C.E., M.I.E.E., a member of the National Trust for Scotland, says that the policy of the North of Scotland Hydro-Electric Board is largely based on practice on the Continent, where conditions are totally different. Many small projects of under 50 kW are operating economically to-day in Highland glens at well under ½d. per kWh. These schemes, which could supply all the needs of the Highlands, could be constructed for a fraction of the cost of the very large schemes projected. In most cases the smaller schemes take water from small streams without interfering with the watershed or local amenities.

Southend-on-Sea. — GOVERNMENT ASSISTANCE. —Councillor S. Lewis, chairman of the Finance Committee, informed the Town Council recently that the amount of Government assistance given to Southend was £1,132,000. The view was held in some quarters that the assistance had been obtained by way of grant, but he regretted to say that every penny of the money advanced to the trading undertakings would have to be refunded. The amounts received by the undertakings were: electricity, £122,120; transport, £60,804; gas, £7,904; and water, £4,721.

Tynemouth.—PURCHASE OF UNDERTAKING.—The Electricity Committee has asked the electrical engineer to make inquiries as to the commitments which would be involved in the event of the purchase by the corporation of that part of the undertaking of the North-Eastern Electric Supply Co., Ltd., which lies within the borough.

Overseas

Canada.—QUEBEC RURAL ELECTRIFICATION BUREAU.—The Government of the Province of Quebec intends to spend $12,000,000 to promote rural electrification, the money to be granted to electricity co-operatives, according to the text of a new Bill. The measure, sponsored by the Premier (Mr. M. Duplessis) will create a Rural Electrification Bureau to be composed of three members, one of them representing the agricultural class. The Government will appoint the members and a secretary and all salaries will be paid out of the consolidated revenue fund. The president will receive $10,000 annually, the other two members $8,000 and the secretary $6,000.

East Africa.—POWER LINE BETWEEN KENYA AND TANGANYIKA.—It is officially announced that on May 1st the East African Power and Lighting Co., Ltd., is to apply to the Government of Kenya for a bulk supply licence authorising the purchase of electricity at Moa in Tanganyika. According to *African World*, this application may be regarded as a preliminary step in the inauguration of an electric power line between Kenya and Tanganyika.

India.—SIND ELECTRIFICATION PLAN.—A report in *Indian Engineering* states that a programme is being prepared for the electrification of every town in the province of Sind after the war. Under it, three stations would be set up in Upper, Lower and Central Sind, operated by hydraulic power from the Tando Mastikdan Falls near Sukkur. The cost of the scheme is estimated at two crores of rupees.

TRANSPORT

Brazil.—PROPOSED UNDERGROUND RAILWAY —The Brazilian Ministry of Transport has received favourably a project to link the electrified suburban line of the Central do Brasil at Rio de Janeiro with a new metropolitan underground system. According to the sponsor, the line could be completed in about two to three years and would require the sum of 200 million crs. in public subscriptions. The main project consists of the establishment of one underground trunk line, called the Circular Dupla, which will be a prolongation of the existing suburban lines of the Central do Brasil. It would be about 6 km. long and two branch lines would complete the principal net of the system. It is believed that at the end of this year the project will be definitely organised and sale of shares in the enterprise will be started.—*Reuter's Trade Service.*

RADIO and TELEPHONY

France.—HAVRE-NEW YORK CABLE RESTORED. —Paris Radio reported last week that the direct Havre-New York cable had been restored.—*Reuter.*

Great Britain.—NEW PHOTO-TELEGRAPH CIRCUIT.—As part of their plans for the development of telecommunications in the S.E.A.C. area, Cable & Wireless, Ltd., are operating a direct photo-telegraph circuit between London and Colombo, Ceylon. The circuit is working on an experimental basis and is not yet open for general Press or public traffic.

ONE CANNOT PLEASE EVERYBODY

(But L.S.E. will always try !)

Some customers like large terminal boxes. Others want them small and out of the way. Some like them on top and others at the side. Quite a few don't care because they don't have to connect up the motors !

On the new L.S.E. industrial size motors the terminal boxes are split diagonally, which makes it easy to get at the terminals without necessitating a great big box, and the cables can enter from any one of four directions. This is a good box, worthy of the motor, and we hope that it will please more than half our customers.

LAURENCE, SCOTT & ELECTROMOTORS LIMITED

NORWICH, MANCHESTER LSE LONDON AND BRANCHES

Radio Receiver Design

Competing in Export Markets

LAST month's discussion meeting of the Radio Section of the Institution of Electrical Engineers dealt with the design of receivers, both broadcast and television, for the post-war market.

MR. L. H. BEDFORD introduced the subject with the forecast that elaborate radio sets would be replaced by television receivers, so that the ordinary broadcast sound receiver would eventually be regarded as the "second" set. The wartime " boom " enjoyed by the radio industry had probably raised labour costs above the average of industry as a whole. It would therefore be faced with the necessity for offering its products at price levels which would be regarded as good value by the public. The solution of that economic problem would appear to lie in the mechanisation of manufacturing methods and economy in design to avoid unnecessary elaboration, as well as the standardisation of components, including valves.

Push-button actuation, although technically frivolous, was likely to be a permanent feature of all but the simplest sets in future, being a logical means of satisfying the genuine public demand for the simplification of operational control. There was adverse judgment upon the future of tuning indicators of the " magic eye " type.

The very extensive development of "radar" would appear to affect television only to a limited extent. Apart from much extended knowledge of pulse and time-base circuits, the main advance seemed to have been made in the production of improved screens and electron-guns for cathode-ray tubes. Other aspects considered were viewing-screen size and the relative merits of direct viewing and projection.

Home Market Too Small

In the discussion which followed it was pointed out that the home market would be able to absorb only a fraction of the potential output of the radio industry if it continued at its present level of production. There was, however, a world shortage but we should have to act quickly and improve our production planning if we were to compete successfully with other countries. For the immediate post-war period we should concentrate on sets designed primarily for export which could also be sold in the home market.

The pre-war broadcast receiver attempted to combine too many functions; it was difficult to tune on short waves and the quality of reproduct on from the local station was often spoilt by a.v.c. There was much to be said for the idea of two sets for every household, a quality receiver for the local station and, for long distance reception, one of the export models. In the past, British sets for export were often equipped with American valve types to facilitate servicing; there was an urgent need for a comparable British standard range of valves. The development of miniature components during the war would have some influence on design, particularly in relation to car radio receivers and " personal " portables, but it was necessary to guard against the temptation to reduce unduly the size of high-powered sets until we had also discovered a " miniature watt."

Better Sound Reproduction

Opinion was divided on the desirability of including a " magic eye " tuning indicator. On the question of providing higher quality of reproduction of sound transmission, it was held that too much emphasis had in the past been given to high frequencies in the " kilocycles " region and that there was a tendency to overlook distortion at the lower end of the scale. The taste of the general public, long debased by hearing only cheap receivers, would have to be re-educated before high quality sets could be regarded as a commercial proposition. To accomplish that it would be necessary to set aside a B.B.C. channel, probably at u.h.f., which could be relied upon to maintain the highest quality throughout the day.

In the present state of the art, television projection could not compete economically with direct viewing of the image on the fluorescent screen. There was a strong case for standardising ordinary cathode-ray tubes, giving a lead to valve manufacturers. The development of tubes for projection was a legitimate field for unrestricted competition. There was room for improvement in the brightness of direct viewing screens, so that they could be used in a normally lighted room. A tube face with a surface designed to discriminate against reflections from external sources would facilitate a solution. Simplification of controls was essential; both focusing and synchronising controls should disappear, leaving only those for main tuning, sound volume and brightness. The cost of the set to the purchaser should include any special aerial equipment needed. There would be a limited market for comprehensive instruments with provision for broadcast, television and gramophone reproduction. If housed in a single cabinet such a set would be unwieldy, and it was worth while considering the building of such equipment on the unit system.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Electric Supply Corporation, Ltd.—Mr. A. J. Fippard (chairman) stated at the company's annual meeting last week that in Sussex where they had nearly 600 miles of mains and over 400 substations they had been allowed to connect more farms, but apart from these and supplies on all areas for direct war purposes, normal development ceased five years ago. Critics often overlooked that.

Referring to the " White " Memorandum on post-war reorganisation, he said that it had the support of the great majority of company and municipal undertakings, including progressive power companies. Electricity distribution, as distinct from generation, was essentially a local matter and for maximum efficiency and enterprise the units should not be too large. No one had yet suggested a tribunal better qualified than the proposed area committees nor any more practical scheme for furthering the interests of present and prospective consumers.

Present coal prices, the chairman said, emphasised the need for a uniform basis for bulk supply charges to all undertakings instead of the unfairness of some sections of the 1926 Act.

The British Oxygen Co., Ltd., proposes to pay a final ordinary dividend of 8 per cent. (same). With the increased interim dividend this makes 16 per cent. (against 15 per cent.) for the year. Net earnings for 1944, after provision for E.P.T., were slightly smaller at £370,369, compared with £384,527 for 1943, but £107,777, representing recoveries in respect of war damage and air-raid precautions expenditure previously written off, has been credited to appropriation account. This additional amount is included in the £150,000 which is placed to general reserve. The balance carried forward is approximately the same as last year's figure of £87,471.

Telegraph Construction & Maintenance Co., Ltd.—In his statement circulated with the report and accounts the chairman, Mr. Colin F. Campbell, says that the company's works have been fully occupied during the year; the output is still well beyond their normal capacity and has exceeded expectations. Despite the present burden of taxation a strong financial position has been maintained which will be of inestimable value when the company is called upon to satisfy the peacetime demands of the home and export markets, both of which will undoubtedly be heavy.

The British Electrical Resistance Co., Ltd., reports a trading profit for the year ended July 31st last of £50,349, as compared with £24,087. The net profit was £5,694 (£5,766). The dividend is maintained at 20 per cent., and £4,402 (£3,708) is carried forward. There is no transfer to general reserve (against £2,299).

W. Canning & Co., Ltd., record a trading profit for 1944, after taxation, of £78,481 (against £81,623), and the other income amounts to £1,559 (£662). The net profit is £67,733 (£68,498) to which is added £52,571 (£47,823) brought in. Reserve receives £15,000 (£25,000), employees' benevolent fund £5,000 (same) and the University of Birmingham development appeal £10,000 (nil). The dividend is maintained at 22½ per cent. by a final payment of 5 per cent. and a bonus of 12½ per cent., and £56,554 is carried forward.

The Telephone & General Trust, Ltd.—In a statement circulated with the report, Sir Alexander Roger, chairman, says that the valuation of securities shows an appreciation of 15·74 per cent. compared with 9·15 per cent. Negotiations for the purchase of the Jamaica Government telephone system have not yet been finally concluded but a draft agreement is now reaching its final stages and, if approved, will be presented for ratification to the House of Representatives.

The Wessex Electricity Co. reports a net profit for 1944 of £187,280 (against £204,615) to which is added £77,507 brought in. A sum of £30,000 is written off discount on debenture stock. After maintaining the ordinary dividend at 5 per cent. by a final payment of 3 per cent. £84,787 is carried forward.

The Urban Electric Supply Co., Ltd., is paying a final dividend of 4 per cent., again making 8 per cent. for the year. The net profit for 1944 was £19,612 (against £16,233).

The South Wales Electric Power Co. proposes to increase its final dividend to 4 per cent., making 6 per cent. (against 5½ per cent.) for the year. The net profit last year was £192,325 compared with £168,413 for 1943.

The Isle of Wight Electric Light & Power Co., Ltd., has announced a final dividend of 5 per cent., making 8 per cent. (same) for the year. Last year's profit was £58,334 against £51,067 the year before.

Allen West & Co., Ltd., have announced a dividend of 7½ per cent. (same) on the ordinary shares. The profit for the year to January 31st last was £50,197 against £49,873 for the preceding year.

Tube Investments, Ltd., is paying an interim dividend of 10 per cent. on the ordinary stock and one at the same rate relatively on the liaison ordinary shares. Similar interim dividends were paid last year.

The London Electric Transport Finance Cpn., Ltd., in its accounts for 1944 show loans to transport undertakings amounting to £36,975,658 (£36,675,658) and to municipalities and public bodies, £131,000 (£281,000).

The Pressed Steel Co., Ltd., is maintaining its dividend at 27½ per cent. by a final payment of 17½ per cent.

The Cables Investment Trust, Ltd., is again to pay an interim dividend of 2 per cent.

The Ever Ready Co. (Great Britain), Ltd., reports a net profit for the year ended March 31st last of £588,935, compared with £621,813 for the preceding year. The dividend on the ordinary stock is being maintained at 40 per cent. by a final payment of 25 per cent.

New Companies

Barlite Lamps, Ltd.—Private company. Registered April 18th. Capital, £7,000. Objects: To carry on the business of manufacturers, producers and assemblers of, and dealers in, gas discharge and fluorescent tubes, fluorescent chemicals, electric lamps, gas discharge and fluorescent advertising signs, gas and oil lamps, etc. Subscribers: G. H. Knight, Birches, Head Road, Hanley; and P. K. Brennan, Indene, Blythe Bridge. Registered office: Glebe Street, Stoke-on-Trent.

C. & D. Electric (Appliances), Ltd.—Private company. Registered April 19th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical appliances, including dynamos, motors, armatures, magnetos, batteries and lamps, wireless sets and accessories, etc. Directors: J. H. Hinton and Bertha I. Hinton, both of 33, Hartington Road, Bolton. Registered office: Court Chambers, Mawdsley Street, Bolton.

Harman & Suckling Co., Ltd.—Private company. Registered April 19th. Capital, £100. Objects: To carry on the business of electrical engineers, electricians, etc. First directors: J. E. Harman, 90, Wilmington Gardens, Barking (chairman) and R. Suckling, 75, Hetherfield Gardens, Barking. Registered office: 90, Wilmington Gardens, Barking.

Monton Radio Co., Ltd.—Private company. Registered April 21st. Capital, £1,000. Objects: To carry on the business of wireless distributors, manufacturers of, and dealers in, wireless and electrical equipment, etc. C. Cullimore, Christleton, Chester, is a permanent director. Registered office: 10, White Friars, Crewe.

T. A. Garness, Ltd.—Private company. Registered April 21st. Capital, £3,000. Objects: To carry on as electrical contractors and general electrical engineers, etc. First directors: T. A. Garness (permanent managing director) and Mrs. Hilda V. Garness, both of 99, Harland Rise, Cottingham. Registered office: 93, Anlaby Road, Hull.

Parker Wilson Products, Ltd.—Private company. Registered April 23rd. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, radio and television sets, batteries, etc. Directors: H. Parker Wilson, 25, Kenton Park Crescent, Kenton, Middlesex, and three others. Solicitors: Mills, Currie and Gaskell, Kenton, Middlesex.

W. J. McIntyre Electrical Engineers, Ltd.—Private company. Registered April 23rd. Capital, £1,000. Objects: To acquire the business of an electrical engineer carried on by W. J. McIntyre at 118, Queens Head Road, Birmingham. Directors: Mrs. Eva F. McIntyre and James Thompson, both of 118, Queens Head Road, Birmingham, which is the registered office.

Lowdil Electrical Contractors, Ltd. Private company. Registered April 23rd. Capital, £100. Objects: To carry on the business of electrical contractors, electrical and mechanical engineers, etc. Permanent directors: H. L. Dillow, 144, College Road, N.W.10, and three others. Secretary: Gwendoline W. Dillow. Registered office: 76, New Cavendish Street, W.1.

Companies' Returns

Statements of Capital

Economic Electric Co. (Liverpool), Ltd.—Capital, £10,000 in £1 shares. Return dated December 4th, 1944. 8,300 shares taken up. £8,300 considered as paid. Mortgages and charges: £2,550.

Alliance Electrical Co., Ltd.—Capital, £2,500 in £1 shares. Return dated November 16th, 1944. 1,330 shares taken up. £502 paid. £828 considered as paid. Mortgages and charges: Nil.

Increase of Capital

Durrington Electric Light Co., Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 shares, beyond the registered capital of £3,500.

Mortgages and Charges

Sanders Radio, Ltd.—Mortgage dated September 29th, 1939, charged on 42, Victoria Road West, Hebburn (being properties acquired by the company on December 30th, 1944). Amount owing: £281. Registered pursuant to Section 81 of the Companies Act, 1929. Holders: Jarrow Permanent Building Society.

Telephones & Radio Coil Winding Co., Ltd. (formerly Tuskite Tube Manufacturing Co., Ltd.).—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, registered March 30th, 1945, to secure £500. Holder: R. Harrison, Maidenhead.

E. Dawson (Lamp Factors), Ltd.—Satisfaction to the extent of £250 on December 1st, 1943; £250 on April 17th, 1944; and £500 on March 6th, 1945, of debentures dated December 5th, 1938, and registered December 13th, 1938.

R. J. Kemp & Co., Ltd.—Assignment on March 26th, 1945, of proceeds of contract, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £2,500.

G. N. Haden & Sons, Ltd.—Satisfaction to the extent of £49,000 on March 9th, 1945, of series of debentures authorised January 22nd, 1921, and registered January 31st, 1921.

Winding-up Petition

B. & B. Batteries, Ltd.—A petition for the winding-up of the company is to be heard next Monday, May 7th, at the Royal Courts of Justice, Strand, London, W.C.2.

Bankruptcies

C. R. G. Webb, trading as Southern Electrical Mechanical Co., 146a, Eastern Road, Brighton, and formerly carrying on business at 94 St. George's Road, Brighton.—Application for discharge to be heard on May 31st at the Court House, Church Street, Brighton.

J. Boult and **J. H. Boult**, trading as "John Boult," electricians, at 3, Grosvenor Street, Chester. (Separate application of J. H. Boult.)—Application for discharge to be heard on June 5th at Chester Castle, Chester.

STOCKS AND SHARES

TUESDAY EVENING.

THE general effect of last week's Budget was to cause a rise in the shares of companies which had any connection with America, these being bought by reason of the double income-tax pact made recently between Great Britain and the U.S.A. Industrials as a whole developed renewed firmness on account of the veiled hint given by the Chancellor of the Exchequer in regard to a possible reduction in E.P.T. This was taken to mean that, if there should be an autumn Budget, it might conceivably announce the 20 per cent. relief in E.P.T. about which expectation had already been guessing.

Demand for Radio Shares

At the end of last week demand suddenly arose for radio shares, the lead being taken by Electric & Musical Industries which rose 1s. 9d. to 36s. bid. Concurrently, Cossors advanced ¼ to 34s. 3d. and Philco 9d. to 15s. 3d. Rumour ran that the companies had been granted, or were on the point of being given, permission to increase their output by 30 per cent. A similar report had been previously in circulation in regard to the manufacture of electrical fittings.

Rising Trend

British Insulated and Callender's Cable Construction at 6 and 6¼ respectively, have held the gains they secured on the announcement of the amalgamation. Following upon this, Henley's 5s. shares hardened to 30s., equal, of course, to £6 for a £1 share. Other members of the manufacturing and equipment group are a firm market. Enfield Cables, for instance, are 1s. up at 65s. 6d. Siemens remain at 37s., Telegraph Construction at 62s. 6d. Midland Electric Manufacturing are 5s. better at 7⅝; Consolidated Signals are 2s. 6d. up, at £7.

Automatic Telephones have risen 4s. to 72s. 6d. H.T.A. advanced to 32s. 6d. A prominent feature is a gain of 3s. in Oriental Telephones, which raised the price to 58s. 6d. Demand for these shares appears to have been stimulated by the prospect of the company's recovering its interests in the Far East. The search for stocks and shares in companies with American connections led to a rise in Anglo-American Telegraph deferred stock to 30½. International "Tel. & Tel." improved to 34, and Anglo-Portuguese to 28s. 6d.

Miscellaneous Movements

Electricity supply ordinary shares maintain their usual level of stability. Bournemouths at 65s. 6d. and Yorkshire Electrics at 47s. are a little better. The rise of 3s. 6d. per ton in the price of coal served to bring a few electricity supply shares to market, but it failed to cause any decline in share values. Canadian Marconis at 12s. 6d. are 1s. higher. Amongst other movements, a rise to 26½ in Tokyo Electric 6 per cents. is worth noticing. Singapore Traction 7 per cent. preference have changed hands about 19s. 6d. The company's property is at present held by the enemy and the last distribution on the shares was 3½ years ago. The dividend is cumulative.

To-day's High Prices

The post-Budget rise in the prices of many industrials has been considerable enough to cause doubts about its possible permanence. The end of the war in Europe being in sight, caution—some people call it pessimism—looks for a General Election that may result in the return of a Labour Government. Should this materialise, prices would be expected to give way. On dividends and yields, industrials are undoubtedly highly valued at the present time, but whether there will be any material shrinkage in value remains to be seen.

Telephone & General

Telephone & General Trust, Ltd., came into being about 19 years ago and is now controlled by the Automatic Telephone & Electric Co., Ltd. The Trust has been very successful, and has paid a steady annual dividend of 8 per cent. on the ordinary shares for years past. The report and accounts for the year ended December 31st, 1944, for presentation at the meeting on May 2nd., show an increase of £3,600 in the income for the year. The valuation for 1944 gives an appreciation of 15·74 per cent. on the previous total. The price of the ordinary shares has ranged in recent years from 19s. in 1940 to the present price of 39s., the latter being the highest reached within the past decade. The company's 7 per cent. preference shares, amply covered by assets, and their dividend by income, stand at 33s. 6d., on which the yield on the money comes to £4 3s. 7d. per cent.

Tube Investments

Tube Investments has again declared an interim dividend of 10 per cent. on its ordinary stock, and the price of the £1 unit remains at 5 5/16. The dividend last year was made up to 22½ per cent. against 20 per cent. in each of the three preceding years. At the present price, the yield is practically 4 per cent. on the money, a rate regarded nowadays as not unsatisfactory by the investor whose chief concern is with the stability of the shares in which he employs capital, and to which he looks for appreciation in price after the war. The earnings on Tube Investments ordinary shares during the past decade have varied from 24 per cent. in 1936 to 42 per cent. for 1933-34.

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.

AUTOMATIC Telephone & Electric Co., Ltd., and L. M. Simpson. — "Electrical signalling systems." 16553. October 9th, 1943. (568622.)

Begwaco, Ltd., and E. Butterworth.—"Prepayment mechanism of meters." 10892. July 5th, 1943. (568581.)

Bowen Instrument Co., Ltd., and D. G. Prinz. — "Electric voltage-measuring instrument." 19641. November 24th, 1943. (568591.)

British Thomson-Houston Co., Ltd. — "Apparatus and methods for purifying water." 16216/43. October 5th, 1942. (568553.) "Electric motor control systems and in automatic compensation for ohmic drop in motor armatures." 18514/42. January 1st, 1942. (568668.) "Tone control systems." 2337/43. February 19th, 1942. (568672.) "Thermal responsive devices for electrical apparatus." 16938/43. October 17th, 1942. (568687.)

Communications Patents, Ltd., and G. B. Ringham.—"Electric wave oscillation generators." 9193. June 8th, 1943. (568544.)

A. C. Cossor and D. A. Bell.—"Frequency-changers for superheterodyne radio receivers and the like." 16624. October 11th, 1943. (568684.)

A. C. Cossor, Ltd., and A. Levin.—"Cathode-ray oscillograph circuits." 16623. October 11th, 1943. (568683.)

J. A. Crabtree & Co., Ltd., and W. E. Hill.—"Terminal ends of electric conductors." 12448. July 31st, 1943. (568632.)

A. K. Croad (Aerovox Corporation).—"Electrical machine for the classification and segregation of dielectric sheets." 3945. March 11th, 1943. (568674.)

Electric Furnace Co., Ltd. (Ohio Crankshaft Co.).—"Method and apparatus for electric induction heating of articles." 12775. August 7th, 1943. (568637.)

English Electric Co., Ltd., and P. W. Seewer.—"Operating gear for adjustable propeller type blades in hydraulic turbines and pumps." 3156. March 7th, 1941. (568530.) "Operating gear for adjustable propeller blades." 2668/42. March 7th, 1941. (Divided out of 568530.) (568531.) "Operating gear for adjustable propeller blades." 11811. August 21st, 1942. (Addition to 568531.) (568533.)

A. D. Ferguson, F. J. Hamelberg and Metropolitan-Vickers Electrical Co., Ltd.—"Electric cable couplings." 14855. October 22nd, 1942. (568596.)

Ferranti, Ltd., R. G. B. Gwyer and J. G. Heaps.—"Ultra high radio frequency thermionic oscillators." 7967. May 3rd, 1940. (568564.)

Foster Instrument Co., Ltd., and C. E. Foster.—"Instruments for measuring and indicating variables." 4926. March 26th, 1943. (568676.)

J. R. Fothergill.—"Electric lifts." 10981. July 6th, 1943. (568550.)

G. H. S. Grene and Wild-Barfield Electric Furnaces, Ltd.—"Heating packs of sheets." Cognate applications. 11959/43. and 11960/43. July 22nd, 1943. (568631.)

Hackbridge Electric Construction Co., Ltd., and E. Tobin.—"Arc suppression coils." 30327. October 20th, 1938. (568592.)

Igranic Electric Co., Ltd.—"Controllers for synchronous dynamo-electric machines." 10519/43. July 3rd, 1942. (568549.)

O. E. H. Klemperer.—"Electron lenses." 61. January 2nd, 1942. (568572.)

Micro Switch Corporation.—"Snap-action electric switches." 16444/43. December 31st, 1942. (568620.)

Mullard Radio Valve Co., Ltd., and J. E. Keddie.—"Moving coil electro-acoustic apparatus." 16616. October 11th, 1943. (568682.)

J. H. Reyner, Furzehill Laboratories, Ltd., and S. Smith & Sons (England), Ltd.—"Electrical bridge circuits." 16650. October 11th, 1943. (568554.)

A. Reyrolle & Co., Ltd., and J. W. Bayles.—"Electric air-break circuit-breakers provided with arc-extinguishing chutes." 14856. September 10th, 1943. (568648.)

G. H. Scholes & Co., Ltd., G. H. Scholes and F. J. Pearce.—"Electric change-over switches." 15590. September 23rd, 1943. (568653.)

S. Smith & Sons (England), Ltd., and H. G. Wardroper.—"Variable resistances." 11970. July 22nd, 1943. (568583.)

Standard Telephones & Cables, Ltd., and R. E. Seymour.—"Electric cable joints." 14409. September 3rd, 1943. (568643.)

F. H. Townsend and Pye, Ltd.—"Indicator for indicating positions on screens." 15674. September 24th, 1943. (568654.)

F. Watson (Aktiebolaget Elektrolux).—"Electric current coupling devices." 5222. April 1st, 1943. (568678.)

Westinghouse Electric International Co.—"Frequency dividing circuits." 17375/43. October 22nd, 1942. (568556.)

L. W. Young.—"Latch for performing both a locking operation and an electrical switching operation." 11945. July 22nd, 1943. (568630.)

INFORMATION DEPARTMENT

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

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

Makers of "Jarvis" and "Tyne" hair dryers.

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.

Adwick-le-Street. — May 19th. U.D.C. Electricity Department. E.h.v. steel-wire armoured and l.v. steel-tape armoured cables; 250-kVA indoor transformer; and substation distribution panel. (See this issue.)

Australia. — PERTH. — June 21st. Government of Western Australia. Switchgear, motor-generator sets and batteries. (See this issue.)

Birkenhead.—May 14th. Electricity Department. Cables, meters and general stores. (April 27th.)

Bury. — May 7th. Electricity Department. Meters and p.i. cables. (April 20th.)

Long Eaton.—May 12th. Electricity Department. H.v. switchgear. (April 27th.)

Louth.—May 11th. Electricity Department. Cables, transformers and switchgear. (April 20th.)

Salford.—May 26th. Electricity Department. Thirty-six steel street lighting standards. (See this issue.)

Swansea. — May 16th. Waterworks Department. Supply and erection of electric pumping plant. (See this issue.)

Woolwich. — May 11th. Electricity Department. 22-kV and 6·6-kV switchgear, and feed pumps. (See this issue.)

Orders Placed

Ilford and Barking.—Joint Sewerage Committee. Accepted. 6,000-BHP Diesel engine (£4,832).—English Electric Co.

London.—ISLINGTON.—Electricity Committee. Recommended. Cambric-insulated cables for twelve months.—British Insulated Cables.

Tynemouth.—Corporation. Accepted. One 400-kVA single-phase transformer and one 500-kVA three-phase transformer.—C. A. Parsons & Co

Contracts in Prospect

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

Aberdeen.—Post-war plan for rebuilding the Palace Hotel (108 bedrooms, ballroom, etc., air conditioning plant, panel radiators); architects, L.N.E.R., Edinburgh.

New junior centre for Y.M.C.A. (library, gymnasium, spray baths); secretary.

Arran.—Cinemas, near Lamlash pier, and in Brodick and Whiting Bay, after war, for Caledonian Associated Cinemas; secretary.

Aspley (Notts).—Buildings for civil servants near Robins Wood; L. C. White, general secretary, Civil Service Clerical Association.

Chorlton-on-Medlock. — Works canteen, Lincoln Grove, for R. Sharrocks & Sons; Andrews & Butterworth, architects, 9, St. James Square, Manchester, 2.

Clackmannan.—Proposed building and reconstruction scheme for Dollar Academy (post-war); T. Harold Hughes, F.R.I.B.A.

Darlaston. — Works extensions; C. Richards & Sons, Ltd., Imperial Works.

Elgin (Morayshire).—Cinema; manager, Caledonian Associated Cinemas, Elgin.

Formby.—Cottage hospital: surveyor, Urban Council Offices, Freshfield Road.

Glasgow.—Proposed alterations at Possilpark tram depot (£10,000); general manager, Transport Department.

Temporary school, Inkerman Road; city engineer.

Lanchester (Co. Durham).—Depot for refuse collecting vehicles; R.D.C. surveyor.

Leicester.—Two secondary schools and community centre, Western Park; E. Berry Webber, architect, 39, Gordon Square, London, W.C.1.

Leigh.—Maternity hospital (40 beds); T. A. Clare, borough surveyor.

London. — FULHAM. — Flats, Fulham Road (£93,500); borough engineer.

Manchester. — Works extensions, Ashton New Road and Corbett Street; S. Moss, architect, 13, Portland Road, Eccles.

Middlesbrough. — Additions in Askwith Road for Brunton's Dairies, Ltd.; Kitching & Co., architects, 40, Albert Road.

Middlesex.—Extensions, Clare Hall Hospital (£11,060); county architect.

Newcastle-under-Lyme. — Extensions to office and works, Liverpool Road; Hollins & Jones, architects, Lloyds Bank Chambers.

Nurses' home at Isolation Hospital; Ford & Slater, architects, Wedgwood Place, Burslem, Staffs.

North Riding. — Additional temporary accommodation at Saltburn High School (£3,500); county architect, County Hall, Northallerton.

Oldham.—Workshop, store and degreasing plant; G. Dew & Co., Ltd., contractors, Plato Street.

Oxford.—Erection of dining block adjoining West Oxford Council School (£2,150); borough engineer, Municipal Buildings.

Saltash.—Proposed municipal offices at Well Park; S. C. Drabble, borough surveyor, Church House.

South Shields.—Nursery school at Harton; acting borough engineer, Town Hall.

Tynemouth.—Alterations to the Town Hall (£4,600); borough engineer.

Warrington.—Central kitchen; J. Y. Hughes, borough surveyor, Municipal Buildings, Bank Park.

York.—County college; C. J. Minter, city engineer, Guildhall.

form an important section of

this handy TUCKER list

Designed to control Heavy Duty Power installations, this range of 15 Amp. Single and Double Pole Switches conforms to even more stringent requirements than the stipulations of B.S. 816.

Whilst production is at present restricted to high priority Service needs the list will prove a useful reference when Post-war installations are under consideration.

J. H. TUCHER & CO. LTD., Kings Rd., Tyseley, Birmingham 11

Makers of First Grade Electrical Accessories for over 50 Years

Tucker TELAC

LIGHTS ON!

Are you ready with STREET LIGHTING CONTROL

BLACKOUT is ended. Full street lighting will soon follow, but strict economy must still be observed. Are you ready with your plans for effective Street Lighting Control ?

The Standard D.C. Bias System offers you the following advantages :—

Centralised control of street lighting, off-peak load, etc.

Low initial cost combined with negligible maintenance.

Systems can be built up and extended indefinitely from original installation.

Freedom from interference from high-frequency harmonics or induced ripple currents.

Where new mains are required, Standard Power Cables are unsurpassed. Send us also your enquiries for V.I.R. and Synthetic insulated cables of all types.

Standard Telephones and Cables Limited
NEW SOUTHGATE, LONDON, N.11

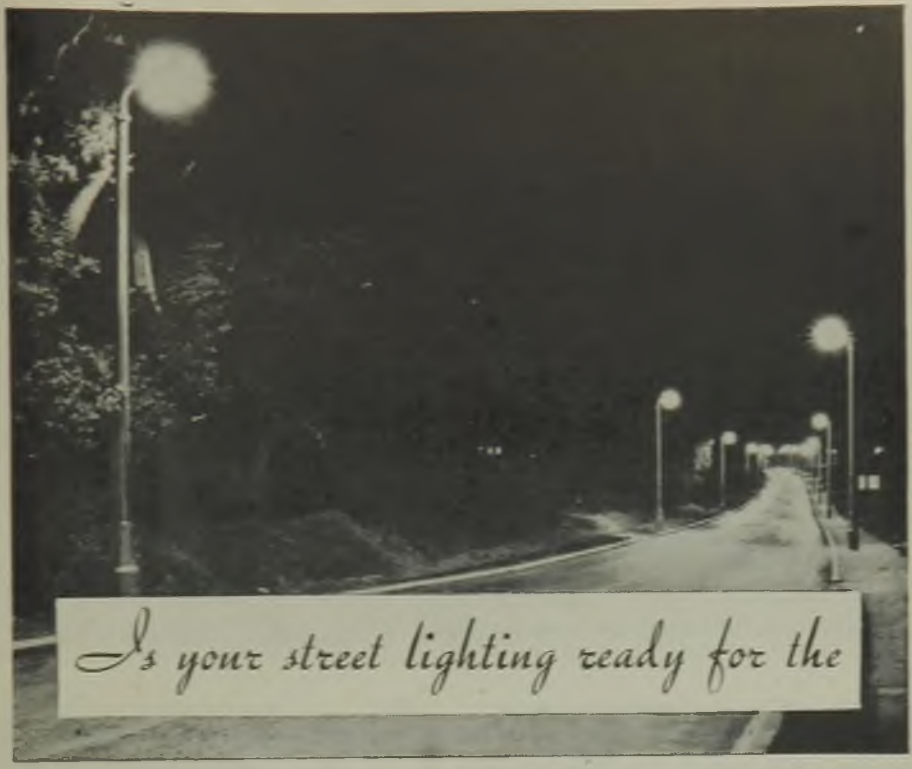
(Photograph by courtesy of the Austin Veneer & Panel Co., Ltd.

VISUAL EFFICIENCY depends on lighting being correctly planned with the correct equipment for the job. Use Crompton Lighting Equipment and call in the Crompton Lighting Service to make sure of maximum visual efficiency.

CROMPTON
LIGHTING EQUIPMENT

FOR THE LATEST IN LIGHTING

CROMPTON PARKINSON LTD. ELECTRA HOUSE, LONDON, W.C.2
Telephone: Temple Bar 5911 *Telegrams: Crompark, Estrand, London*



FIRST NIGHT OF PEACE?

Peace may not give long notice of its coming. Keep your street lighting equipment in good order, ready!

We shall be ready to serve you, as in the past, with street lighting fittings and equipment of the highest efficiency.

ENGINEERING & LIGHTING EQUIPMENT CO. LTD.,

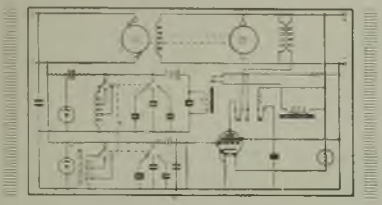
DEPT. W.S., SPHERE WORKS, ST. ALBANS, HERTS.

ELECO

PROBLEMS WE HAVE SOLVED—No. 1

THE ELECTRONIC GOVERNOR

S.E.M. research engineers were asked to produce a governor with an accuracy of at least that of the best centrifugal governor when working under the same variation of load and supply voltage. For this purpose the Electronic Governor was developed. The circuit essentially comprises a resonant circuit tuned to a frequency corresponding



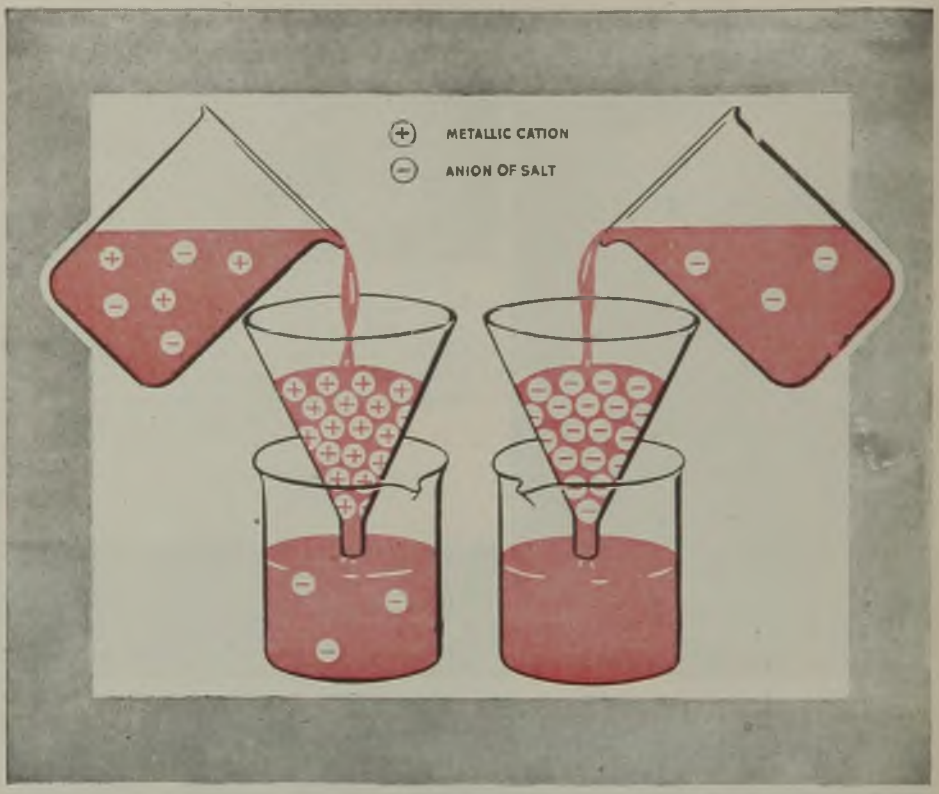
CIRCUIT OF S.E.M. ELECTRONIC GOVERNOR (Pat. No. 16640/41)

to the normal speed of the machine. The alternating current from the resonant circuit is applied through a rectifier to the grid of an amplifying valve, the output from this valve being fed to the control field of the motor.

The control current produced by the governor is applied to an auxiliary field coil on the motor from which the main speed control is obtained. Energization of this coil varies with the speed of the motor, so that any change is immediately compensated by the Electronic Governor.

The governor gives a speed control of less than 0.5%, and the intermittent variation or hunting is less than 10% of that experienced with centrifugal governors. The governor can be fixed at any distance from the rotating machine, and is fitted with a control giving speeds of plus and minus 3% of the nominal speed.

This is only one of the many technical problems which we have been called upon to solve. We specialize in supplying non-standard electrical devices for particular purposes. The entire resources of our research laboratories are available to manufacturers who have a special problem.



How to remove salts by "filtration"

When water containing salts in solution is passed through an acid regenerated "Permutit Zeo-Karb"* exchanger all these salts are converted to their corresponding acids. On passing this acid effluent through "Permutit De-acidite"* material, all the acids are absorbed. In this way the salts are removed and the water approximates to distilled water in quality at a fraction of its cost. Industrial applications include boiler feed and processing of fine quality products. Write for "Distilled Water Without Distillation" to The Permutit Company Limited., Department T.W., London, W.4.

* Registered Trade Marks

PERMUTIT

'DEMINROLIT' PROCESS

SUFLEX LTD., are engaged solely in the manufacture of insulating sleeving. Suflex products include :—

VARNISHED COTTON SLEEVING
VARNISHED SILK SLEEVING
PLASTIC SLEEVING & TUBING
REINFORCED PLASTIC SLEEVING
METAL SCREENING AND METAL SCREENED SLEEVING

from the smallest to the largest diameters.

SUFLEX
INSULATING SLEEVING

SUFLEX LTD., AINTREE ROAD, PERIVALE, GREENFORD, MIDDX. PERivale 4467

3959

CLASSIFIED ADVERTISEMENTS

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

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

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

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

Original testimonials should not be sent with applications for employment.

WHITSUN

Classified Advertisements for our issue of **May 25** should reach us by **first post on FRIDAY, May 18**

OFFICIAL NOTICES, TENDERS, ETC.

WESTERN AUSTRALIAN GOVERNMENT ELECTRICITY SUPPLY, PERTH

THE Government of Western Australia is prepared to receive tenders in duplicate for the following:—

(a) 66,000-volts Switchgear;
(b) 20,000-volts Switchgear;
(c) 6,300-volts Switchgear;
(d) 3,000-volts Auxiliary Switchgear;
(e) 440-volts Switchgear;
(f) 100-kW Motor Generator Sets and Batteries.

Specification, General Conditions of Contract and Form of Tender may be obtained upon application to The Agent General for Western Australia, Savoy House, 115/116, Strand, London, W.C.2, or to the Western Australian Government Tender Board, Perth, Western Australia.

Any further information required by Tenderers may be obtained from the above.

Tenders are to be lodged with The Agent General for Western Australia, Savoy House, Strand, London, or The Chairman, W. A. Government Tender Board, Perth, Western Australia, not later than noon on Thursday, 21st June, 1945.

Specifications and General Conditions of Contract may be obtained from the above on payment of one guinea for each copy of the Specification, such amounts being returnable on receipt of bona fide tender.

C. C. HILLARY,
Secretary.

Office of the Agent General for Western Australia,
Savoy House,
115/116, Strand,
London, W.C.2. 1888

COUNTY BOROUGH OF SWANSEA

Waterworks Department

Pumping Plant

THE Swansea Corporation invites tenders for the Supply and Erection of Electrical Pumping Plant. General conditions and specifications, together with plans, may be obtained on application to the Borough Water Engineer and Manager, Guildhall, Swansea.

Sealed tenders, endorsed "Tender for Pumping Plant," must be sent in the envelope provided and delivered to the undersigned not later than 16th MAY, 1945.

The Corporation will not be bound to accept the lowest or any tender.

T. B. BOWEN,
Town Clerk.

The Guildhall, Swansea.
19th April, 1945. 1882

ADWICK-LE-STREET URBAN DISTRICT COUNCIL

Electricity Department

TENDERS are invited for the SUPPLY, DELIVERY, ERECTION, and LAYING and JOINTING of:—

(a) E.H.T. Steel Wire Armoured Cable.
(b) L.T. Steel Tape Armoured Cable.
(c) 250-kVA, 3,300/400/230-volt Indoor Transformer.
(d) L.T. Substation Distribution Panel.

Copy of specification and form of tender can be obtained from the Electrical Engineer and Manager, Electricity Department, Church Lane, Adwick-Le-Street, nr. Doncaster.

Tenders must be enclosed in a PLAIN SEALED envelope, endorsed "HIGHFIELDS," and addressed to

The Clerk to the Council,
Electricity Department,
10 and 12 Church Lane,
Adwick-Le-Street,
Nr. Doncaster,

not later than the First Post, 19th May, 1945.

The Council do not bind themselves to accept the lowest or any tender, and reserve the right to accept the whole or part of any tender.

C. R. MARSHALL,
Clerk to the Council.

10 and 12 Church Lane,
Adwick-Le-Street,
Nr. Doncaster. 1875

METROPOLITAN BOROUGH OF WOOLWICH

Electricity Department

THE Electricity Committee of the above Council invite tenders for the supply of one Turbine-driven Boiler Feed Pump and one Motor-driven Boiler Feed Pump.

A form of tender and specification for this plant may be obtained upon application to the Borough Electrical Engineer, Electric House, Powis Street, Woolwich.

Tenders, sealed and endorsed "Tender for Boiler Feed Pumps," to be addressed to me at the Town Hall, Wellington Street, Woolwich, S.E.18, and delivered not later than 12 noon on Friday, 11th May, 1945.

The Council do not bind themselves to accept the lowest or any tender. (By order)

DAVID JENKINS,
Town Clerk.

Town Hall, Woolwich.
24th April, 1945. 1884

METROPOLITAN BOROUGH OF WOOLWICH

Electricity Department

THE Electricity Committee of the above Council invite tenders for the supply of 22-kV and 6.6-kV Switchgear. A form of tender and specification for this plant may be obtained upon application to the Borough Electrical Engineer, Electric House, Powis Street, Woolwich.

Tenders, sealed and endorsed "Tender for 22-kV and 6.6-kV Switchgear," to be addressed to me at the Town Hall, Wellington Street, Woolwich, S.E.18, and delivered not later than 12 noon on Friday, 11th May, 1945.

The Council do not bind themselves to accept the lowest or any tender. (By order)

DAVID JENKINS,
Town Clerk.

Town Hall, Woolwich.
24th April, 1945. 1883

CITY OF SALFORD

Electricity Department

TENDERS are invited by first post Saturday, 26th May, 1945, for the supply and delivery of 36 Steel Street Lighting Standards.

Further particulars may be obtained on application to the City Electrical Engineer, Frederick Road, Salford, 6.

H. H. TOMSON, Town Clerk.

1866

SITUATIONS VACANT

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

CITY OF PORTSMOUTH

Appointment of Engineer and Manager, Electricity Undertaking

THE Council invite applications for the position of Engineer and Manager of their Electricity Undertaking from applicants who are Corporate Members of the Institution of Electrical Engineers and experienced in the management and administration of an Electricity Undertaking. The salary for the position will be in accordance with the agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers, dated 9th July, 1941, and in accordance with Clause 10 of the agreement the salary for the first year will be 85% of the full salary and for the second year 92½% thereof.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and to determination by the giving of three months' notice in writing on either side. The successful candidate will be required to pass a medical examination.

Applications, on the forms provided, enclosed in an envelope endorsed "Engineer and Manager, Electricity Undertaking," must reach the undersigned not later than 10 a.m. on Tuesday, the 22nd day of May, 1945.

Canvassing, either directly or indirectly, will be a disqualification.

FREDERICK SPARKS,
Town Clerk.

Municipal Offices,
Royal Beach Hotel, Portsmouth.
19th April, 1945. 1848

CITY OF LANCASTER

Assistant Shift Charge Engineer

APPLICATIONS are invited for a permanent appointment as Assistant Shift Charge Engineer at Caton Road Generating Station, Lancaster.

Salary in accordance with N.J.B. Schedule, at present Grade 9, Class H, £361 per annum.

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

Experience of operation of large boilers and general Power Station operation desirable.

Applications, stating age, qualifications and particulars of training and experience, also probable date on which duties can be taken up, together with copies of two testimonials, must reach the undersigned not later than Saturday, May 12th, 1945.

GEO. C. MILNES, M.C., M.I.E.E.,
"Electricity," City Electrical Engineer.
North Road,
Lancaster. 1887

COUNTY BOROUGH OF WALLASEY

APPLICATIONS are invited for the appointment of Borough Electrical Engineer and Manager. Maximum salary of the National Joint Committee of Local Authorities and Chief Engineers' scale dated 9/7/41 (at present £1,305 per annum) plus war bonus (at present £60 per annum). Further particulars will be sent on receipt of a stamped and addressed foolscap envelope.

EMRYS EVANS, Town Clerk.

1879

SOMERSET COUNTY COUNCIL

County Architect's Department

APPLICATIONS are invited from duly qualified persons for the appointment of Engineering Assistant in the above Department. The salary will be within the scale £550 per annum, by annual increments of £25 to £600 per annum, plus War Bonus. Commencing salary within the scale according to qualifications and experience.

The person appointed will be responsible for designing Engineering Services for all types of County Buildings. Applicants should be members of the I.H.V.E. and I.E.E., and have had experience in the design and calculation of Heating, Ventilating and Electrical Installations for large institutional type buildings, schools, etc., in the supervision of the carrying out of such work and in the inspection, preparation of reports on and supervision of their maintenance.

The selected applicant will also be responsible for dealing with all ancillary engineering services dealt with in a large architectural department, including water and gas services, laundry equipment and large cooking installations.

The successful candidate will be required to pass a medical examination by the County Medical Officer of Health.

Applications, stating age, training, experience and qualifications, position as to Military Service and time required to take up the appointment, together with the names of three persons to whom reference may be made, to be sent not later than Friday, 11th May, 1945, to the undersigned.

R. O. HARRIS, A.R.I.B.A.,
Park Street, County Architect.
Taunton.
Somerset.
26th April, 1945. 1886

ELECTRICAL POWER ENGINEERS' ASSOCIATION

Appointment of Technical Editor and Director of Studies

THE NATIONAL EXECUTIVE COUNCIL invite applications for the combined appointment of Technical Editor of "The Electrical Power Engineer" and Director of Studies of the Correspondence Tuition Scheme of the Association.

Applicants should be corporate members of the Institution of Electrical Engineers, or possess equivalent technical qualifications, and have experience of the technical side of the electricity supply industry, and, in addition, experience of technical journalism. Industrial and teaching experience desirable, together with a background knowledge of trade unionism and industrial relationships.

Salary to commence, £600 per annum.

The successful applicant will be required to pass a medical examination and to contribute to the Association's Pension Scheme.

Forms of application can be obtained from:

The General Secretary,
Department "A,"
Electrical Power Engineers' Association,
102, St. George's Square,
London, S.W.1.

and should be returned duly completed, endorsed "Technical Editor," Dept. "A," NOT LATER THAN FRIDAY, MAY 18th, 1945. 1862

CONTROL Gear Manufacturers require Technical Sales Engineer in export department, central London. Experience in estimating, tendering and overseas correspondence an advantage. Progressive and permanent post, with pension scheme. Write, stating age, salary required, when available and full details of experience.—Box 6983, c/o The Electrical Review.

DRAUGHTSMAN for post-war position. Enquiries are invited from first-class Senior Light Mechanical Draughtsmen for interesting post-war position. The advertisers are a group of light manufacturing engineers of high standing and with exceptional post-war prospects. The present range of products is to be greatly extended and production capacity expanded. In anticipation of the future we are desirous of making advance arrangements for key men against the date of removal of control. All enquiries will be treated in strict confidence. No offer of engagement can be made until the present restrictions of engagement are withdrawn. Please reply to—Box 1833, c/o The Electrical Review.

ELECTRICAL Wholesalers require Representative for the London area. Possession of car an asset. Remuneration on salary, commission and expenses basis. Reply—Box 7015, c/o The Electrical Review.

ELECTRICAL wholesalers require Trade Counter Assistant. Must be conversant with all types of electrical material for installation purposes.—London Electrical Co., 92, Blackfriars Road, S.E.1. 24

ENGINEER for development of domestic electronic appliances. Enquiries are invited from first-class engineers for post-war position. The advertisers are a group of light manufacturing engineers of high standing and with exceptional post-war prospects. The present range of products is to be greatly extended and production capacity expanded. In anticipation of the future we are desirous of making advance arrangements for key men against the date of removal of control. All enquiries will be treated in strict confidence. No offer of engagement can be made until the present restrictions of engagement are withdrawn. Please reply to—Box 1834, c/o The Electrical Review.

HEAD Foreman required by firm engaged on essential work, S.W. London district, to take charge of bakelite moulding dept. Applicants should have thorough up-to-date experience latest processes. Write, giving full particulars and salary required, to—Box 1898, c/o The Electrical Review.

LADY required to take charge of electrical contractors' showroom (London, W.C.). Full particulars to—Box 1863, c/o The Electrical Review.

LEADING firm cable manufacturers and electrical engineers requires immediately Senior Estimators, to work in Central London office; good working conditions and prospects. Full particulars and salary required (in confidence) to—Box 1867, c/o The Electrical Review.

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

REPRESENTATIVES required for a few vacant areas to introduce our non-ring cables and flexibles to contractors, wireless stores, etc.—Box 7002, c/o The Electrical Review.

REQUIRED by old-established company manufacturing small wires and cables, Sales Representative for Manchester. Qualifications required: past experience in handling these manufactures, connection amongst electrical apparatus manufacturers both domestic and industrial. Practical experience in wire and cable manufacture would be considered an advantage. Write, giving age and full details—Box 6987, c/o The Electrical Review.

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

RESPONSIBLE post for man with experience of Commercial Refrigeration and ability to supervise salesmen, South Wales and West of England area. Write, stating age and full particulars of career.—Box 7007, c/o The Electrical Review.

SALES Engineer for export department, progressive position with prospect of overseas travel for young man with a knowledge of A.C. and D.C. motors. Apply—Higgs Motors Ltd., Witton, Birmingham, 6. 1877

SHOWROOM Salesman required for electrical showrooms West London. Knowledge of electrical contracting requirements and sale of all domestic appliances necessary. Write in first instance to—Box 1835, c/o The Electrical Review.

TRANSFORMER Draughtsman, experienced, not over 35 years of age, will be required immediately the present restrictions on employment are relaxed. Applications are invited from men at present employed on this class of work, who will wish to make a change later, and also from those serving with H.M. Forces. Apply to—British Power Transformer Co. Ltd., Ponders End, Middx. 1897

WANTED, Assistant to take charge of Wholesale Electrical Dept. Permanency for right man, exempt.—Louis G. Ford Ltd., Builders' Merchants, Wholesale Ironmongers and Electrical Factors, Eastbourne. 1891

WELL-established lamp firm in London area require a Flame Setter for flanging department. Good post-war prospects. Please write, giving full particulars of experience.—Box 1876, c/o The Electrical Review.

APPOINTMENTS FILLED

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

SITUATIONS WANTED

A young Technician (22), prospective H. N. Cert., A.M.J.I.E., Stu. I.E.E., seeks outside position as Tech. Salesman or Representative, 7 yrs.' A.C./D.C. plant exp., medically exempt. Enquiries invited.—Box 7016, c/o The Electrical Review.

ADVERTISER has an excellent connection to offer a manufacturer who is desirous of maintaining and increasing his present and post-war business. Specialities, insulation, preferably mica, micanite, synthetic resin laminated sheets, tubes, etc., machined and natural.—Box 6984, c/o The Electrical Review.

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

ADVERTISER (50), wide experience Sales and Office Administration, desires change. Fullest details, salary, etc.—Box 6944, c/o The Electrical Review.

AREA Engineer requires change; experienced power installations, airfield lighting, broadcast equipment, contracting. Excellent pre-war record as district manager, sales engineer, trade representative.—Box 7013, c/o The Electrical Review.

CHARTERED Electrical Engineer with 18 years' engineering and commercial experience, also research and development, now holding responsible position with an electrical manufacturing company, desires an improved permanent post requiring experience and initiative.—Box 7009, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer (32), 13 years' experience electrical contracting (supervisory), 3 years clerk of works (W.D.), seeks similar position, Midlands preferred.—Box 7010, c/o The Electrical Review.

ENGINEER (27), Higher National Certificates (Electrical and Mechanical), Grad. I.E.E., comprehensive 5-year apprenticeship, 4½ years manufacturing and 1½ years electrical plant equipment in large engineering firm, seeks responsible position which offers scope for application of technical and practical experience.—Box 7000, c/o The Electrical Review.

EXPERIENCED and Qualified Engineer, under 40, extremely wide experience in senior positions electrical and mechanical design and development of electrical machinery and electro-mechanical devices, F.H.P. to 500 kW, commercial and production experience, foreign govt. liaison, B.S.I. and other committee work, seeks position technical or other branch where experience and initiative can be used. £1,000-£1,500, depending on location.—Box 6985, c/o The Electrical Review.

EXPERIENCED Electrical and Radio Engineer desires a post-war position as Representative.—Box 6968, c/o The Electrical Review.

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

MAN, aged 36, with wide experience in electrical and mechanical engineering, design and production, desires change of occupation, preferably sales or servicing, experienced in handling labour.—Box 6980, c/o The Electrical Review.

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

PROGRESS Manager, age 42 years, 24 years' experience progress and stores control, desires change.—Box 7006, c/o The Electrical Review.

RADIO and Electrical Engineer (31) seeks position pending invaliding. Experienced in aircraft, automobile and electronic equipment.—Box 6979, c/o The Electrical Review.

REPRESENTATIVE, twenty years London area, desires a change from present firm. Minimum salary £380 per annum, plus commission and expenses.—Box 6999, c/o The Electrical Review.

RESPONSIBLE post with scope for initiative required by man (25), B.Sc., Grad.I.E.E., Assoc.Brit.I.R.E., with additional knowledge of physics, chemistry, German and French.—Box 6967, c/o The Electrical Review.

SALES Manager, well known and with excellent reputation, desires change, either similar appointment or directorship with moderate investment. At present with electrical manufacturing engineers of world-wide repute employing approx. 1,000 employees. Excellent sales record, knowledge of export, advertising, control and administration of sales and representatives.—Box 7004, c/o The Electrical Review.

STOREKEEPER, with 30 years' experience handling stocks of cable, conduit accessories, lamps, switchgear, etc., would be pleased to hear from wholesalers regarding post-war position as Assistant Buyer, Storekeeper or Representative.—Box 6975, c/o The Electrical Review.

WEEK-end work required; prepared to undertake wiring and plant installation, maintenance, A.C. and D.C. rewinds, any h.p., time or contract.—Box 7003, c/o The Electrical Review.

FOR SALE

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

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

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

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

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

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

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

ALL LYING AT YATE.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL
1817

10,000-ft. SLOTTED STEEL BARS
for Switchgear and Meter Frames, Channel Sections. Min. lots 100 ft. 1½" 6d. ft.: 2" 9d. ft.: 3" 1s. per ft.

RECONDITIONED STEEL BINS.
9' × 6' × 9", 72 cpts., £12.

500/600 STEEL STORE PANS, 54s. doz.
Nett cash, carriage paid.

WELCH, BROAD ROAD, BIRMINGHAM, 27
B.O.T. Licence No. IM3/12869. 7001

BURDETTE & CO. LTD.

Stock

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

STONHOUSE STREET, CLAPHAM, S.W.4.

Day and night service. MACaulay 4555.

TWO Brook, 400-volts, 3-phase, 50-cycles, Slip Ring totally enclosed Crane Motors, 750 r.p.m.: one Z 12½ h.p., one Z 2 h.p. Condition as new.

ONE Nevelin Mercury Arc Rectifier, input 400 volts, 3-phase, 50 cycles, output 400 volts D.C., 16 kW.

ONE Crompton Alternator, 400/440 volts, 3-phase, 50 cycles and neutral, 80 kW, 750 r.p.m., revolving field type, three bearings on common base plate with automatic voltage regulator.

OLDFIELD ENGINEERING COMPANY LTD.,
96, East Ordsall Lane, Salford, 5. Bla. 3842.
35

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

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

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

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

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

INSPECTION AT YATE.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL
1816

REBUILT MOTORS AND GENERATORS

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

SEND US YOUR ENQUIRIES.

OVER 1,000 RATINGS ACTUALLY IN STOCK HERE.

DYNAMO & MOTOR REPAIRS LTD.,
Wembley Park, Middlesex.
Telephone: Wembley 3121 (4 lines).

Also at Phœnix Works, Belgrave Terrace, Soho Road, Handsworth, Birmingham.
Telephone: Northern 0898.
26

ELECTRIC MOTORS AND DYNAMOS

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

For Sale or Hire. Send your enquiries to:—

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

Telephone: 5512-3 Clerkenwell. 13

CONTROL ABOLISHED

CLERKENWELL SCREWS BEG TO REMIND THE PUBLIC THAT AS FROM FEBRUARY 26, 1945, NO "M" FORMS ARE REQUIRED TO PURCHASE SCREWS, NUTS AND BOLTS.

Stocks in hand of B.A. and Whitworth Brass and Steel Screws, Nuts, Washers, Phosphor Bronze and Steel Spring Washers, Shakeproof Washers, Tinned Soldering Tags, Screwed Rod, etc.

109, Clerkenwell Road, London, E.C.1.
Telephone: Holborn 6504. 6971

FOR IMMEDIATE DISPOSAL

1 PAIR STIRLING WATER-TUBE BOILERS, rated at 180/190 lbs./sq. in., 16,000 lbs./hour, Sugden's Superheater.

1 COMMON (GREEN'S) ECONOMISER.

Full Set Steam and Electrically-driven Feed Pumps, Coal Elevators, Valves, Line Shafting and Drive (Steam and Electric), also Running Spares.

May be seen by appointment. Apply:
ST. ANNE'S BOARD MILL CO. LTD.,
St. Anne's Road, Bristol, 4. 1829

GEORGE COHEN, SONS & CO. LTD.,

for

GUARANTEED ELECTRICAL

PLANT,

MOTORS, GENERATORS.

SWITCHGEAR,

etc.

WOOD LANE, LONDON, W.12.
Telephone: Shepherds Bush 2070
and
STANNINGLEY, NEAR LEEDS.
Telephone: Pudsey 2241.
Established 1834.

27

FOR SALE

1 G.E.C. 100-kW. 220-v. D.C. Generator, rope-driven from Crossley airless inject. oil engine with starting compressor and receiver, oil tanks and accessories. Horizontal twin-cyl. engine, type 02223. Rating 166 b.h.p. at 230 r.p.m. Immediately available for removal.

Also

2 Parker 230-kW. 220-v. D.C. Generators, direct coupled to Belliss & Morcom engines. Triple-expansion vertical type. Complete with condenser, air pump and accessories. Rating approx. 400 i.h.p. at 450 r.p.m. Available for removal shortly.

The above Steam Engine Units completely overhauled a few years ago. All plants in good running order.—Box 1850, c/o The Electrical Review.

WATER TUBE BOILERS IN STOCK

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

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

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

32

ALTERNATORS

Suitable for 400-3-50, in perfect condition.

65 kVA	1,000 r.p.m.	with exciter
160 kVA	300 r.p.m.	for coupling
170 kVA	1,000 r.p.m.	with exciter
235 kVA	300 r.p.m.	for coupling
600 kVA	300 r.p.m.	for coupling

THE ELECTROPLANT CO.
Wembley, Middx.
1870

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

A number of portable Alternating Lighting Sets, fully guaranteed, for quick delivery, 3-5 kVA, 230/1/50.—The Electroplant Co., Wembley, Middlesex. 1871

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

A.C. Motors, 1/50th b.p. to 10 h.p., from stock. Also D.C.—The Johnson Engineering Co., 86, Great Portland Street, London, W.1. Tel.: Museum 6378. 57

A B Fifteen Coalcutter, 450/500 volts D.C., cutting floor level. Trailing cable and gate-end switch available if required.—Clay Cross Co. Ltd., Clay Cross, near Chesterfield. 1878

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

AERIAL Cables, all sizes quoted for: good deliveries against Government contract numbers.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7017

ALTERNATING Set, input D.C. 500 volt, output A.C. 400/3/50, 100 kVA, on bedplate. First class.—The Electroplant Co., Wembley, Middx. 1872

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

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

BEST English Cables, 1/.044 up to 127/.103, deliveries against M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7018

BOILER Feed Pump, Weir, 6" × 8½" × 18" stroke, 2,700 galls. per hour normal, excellent condition, £50 or nearest offer.—The East Anglian Electric Supply Co., Cornhill, Bury St. Edmunds. 1847

CARBONS, large stocks assorted sizes, solid and cored.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7019

DIESEL Automatic Lighting Set, 110 volts, 1½ kW; Electric Washer and Kettle, all as new. Offers to—Murray, 61, Gracechurch St., London, E.C.3. 1885

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

FERRANTI Prepayment Type FC6 Shilling Slot Meters for 200/240 volts, single-phase, 50 cycles. In perfect condition—sixty-five available.—F. H. S., 6, Holne Chase, London, N.2. SPE. 8066. 7014

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

GENERATING Sets for sale, 18 kVA, 400/3/50, petrol; 300-amp. petrol-driven Portable Welding Set; 2½-kW, 220-v. D.C. Crude Oil Set.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 1895

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

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

LARGE quantity Yellow Insulating Sleeving (known as Sistoflex), size 15 mm. inside diameter, in perfect condition, 3d. yd., carriage paid, sample upon application. —Box 1868, c/o The Electrical Review.

LEAD-covered and Armoured Cables, P.I. and V.I.R., various special lines at low prices.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7020

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

LIGHTING Plant, comprising 9-b.h.p. Ruston Hornsby horizontal petrol/paraffin engine, with magneto, direct coupled to Crompton & Co. Ltd. 4.5-kW shunt wound generator, 370 r.p.m., cont. rating, 100/150 v., 45/30 amps.: 56-cell Tudor battery, type L.V.C., 9-102 v., max. discharge 57.3 amps. Can be viewed by appointment about 10 miles from Birkenhead.—Economic Electric Co. (L'pool) Ltd., 127a, Orton Road, Birkenhead. 1873

MANUFACTURERS can offer supplies of best quality Toilet Rolls. Samples and prices on request. Apply —M. Taylor, Unity Works, Heddon Street, London, W.1. Telephone Nos. Regent 4271-2-3-4. 1896

MASSON Scott London Heavy Duty Hogging Machine for grinding bones, thermoplastics, wood, etc., fitted with 30" dia. × 15" wide vee-shaped rotor with 12 cutting blades, speed 1,250 r.p.m., vee-rope-driven from 60-h.p. Mather & Platt double squirrel cage motor, 400/440 volts, 3-phase, 50 cycles, 1,425 r.p.m., with starter. All new 1942, capacity 3/5 tons per hour.—Newman Industries Limited, Yate, Bristol. 1818

MOTOR Generator Sets and Convertors, all sizes and voltages from ¼ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, City Road, London, N.1. Telephone, Clerkenwell 5512, 5513 & 5514. 28

MOTORISED ½" Bench Drilling Machine, 13 speeds, £12 2s. 6d.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 51

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

PHONE 98 Staines. 60-kW Crude Oil Set, 220 vo. D.C.; 7/9-kW Crude Oil Set, 110 vc. D.C.; 35-kW Tangye ditto, 220 vo. D.C.; Weir Service Pump, 6,300 gals. per hour; 30-h.p. National Oil Engine; Fuel Oil Tank, 28′ × 6′ 6″.—Harry H. Gardam & Co. Ltd., Staines. 60

PORCELAIN Cleats, 2 and 3 groove, various sizes ex stock, price list.—Edwardes Brcs., 20, Blackfriars Road, London, S.E.1. 7021

PORCELAIN Insulators, various sizes in stock, galv. spindles.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7022

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

RECONDITIONED Electric Welder available for immediate sale. Apply—Warsop Petrol Drill & Tools Ltd., Cathedral Chambers, Peacock Lane, Leicester. 1890

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

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

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

SPECIAL line, Bell and Telephone Wires, also screened wires, large quantity, cheap.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7023

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

SWITCH and Fuse Units, Conduits and fittings, works requirements stocked.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7024

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

THREE 570-kVA Furnace Transformers, 11,000/65 volts, single-phase, with standard tappings to work in a transformer group giving a total output of 1,710 kVA, 3-phase, 50 cycles. These have done very little work, are in first-class condition, and can be seen by appointment at British Sugar Corporation Ltd., Beet Sugar Factory, Colwick, Nottingham. 1892

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

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

T.R.S. Cables and Flexibles, Welding Cables, supplied to M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7025

5-kVA Motor Alternators, date 1939, input 100 volt D.C., output 5 kVA, 230/1/50, 22 amps.; two available.—Electric Machinery Co. (M/cr) Ltd., New Islington, Ancoats, Manchester. 1800

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

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

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

30 E.A.C., size 1A, 3-phase Auto Switches, push button control with single-phasing preventor for motors up to 1 h.p. What offers?—Box 7012, c/o The Electrical Review.

62.5-kW Belliss/Peebles Vertical Enclosed Steam Generating Set, compound, 160 lbs. steam, direct coupled to Alternator, 440 volts, 3-phase, 50 periods, neutral out., with direct coupled exciter, all mounted on C.I. bedplate, control switchgear; 17-kW Steam Generating Set, 120 lbs. steam, 220 volts D.C. Generator; 6-kW Motor Generator Set, 1,000 amps., 0.6 volts, new A.C. Motor; Two 250-amp. Plastic Arc Welding Sets, 30/70 volts, 1,450 r.p.m., direct coupled to new 10-h.p. A.C. Motors, 440 volts, 3-phase, 50 periods, complete control switchgear. Apply—F. S. Slater & Co., 34, Princes Way, Team Trading Estate, Gateshead-on-Tyne. 6969

100 yards 19/.018, 4-core, Rubber-insulated Tough Rubber Sheath Screen Trailing Cable, 600 volts.—Thomas Cowman & Sons Ltd., Asfordby, near Melton Mowbray. 1846

80-kW, 220-v., 350-revs. S.I., two ped. brgs., on bedplate.—Greenhalgh Bros., Burton's Field Mill, Atherton, nr. Manchester. 1865

100-h.p., 400/3/50, S.R., 730-revs., Louvre Vent., B.T.H. (ball bearings), with Ellison O.I. gear.—Greenhalgh Bros., Burtons Field Mill, Atherton, M/cr. 1889

125-kVA English Electric Alternator with built-on Exciter, 1,000 r.p.m., output 400/230 volts, 3-phase, 50 cycles, 4-wire, at 0.8 power factor, complete with J. G. Statter Control Panel, new 1941. Further details on application to—Dynamo & Motor Repairs Ltd., Wembley Park, Middlesex. Telephone, Wembley 3121 (4 lines). 1893

160-kW, 500-volts, 700-revs. S.I., two ped. brgs., on bedplate.—Greenhalgh Bros., Burton's Field Mill, Atherton, nr. Manchester. 1864

250-kVA Alternator, 400 volts, 3-phase, 50 cycles, 750 revs., with direct-coupled exciter; also two 250-kW Rotary Converters, with transformers and switchgear, input 6,600 volts, 3-phase, 50 cycles, output 420/210 volts D.C.—Midland Counties Electrical Engineering Co. Ltd., Grice Street, Spon Lane, West Bromwich. 36

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

400 kW Rotary Convertor, Metropolitan Vickers, 240-volt D.C. output, with 3-phase transformer, complete with pony motor, booster and exciter.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 1856

ARTICLES WANTED

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

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

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

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

ONE 4-wire, 400-volts, 3-phase, 50-cycles Alternator, with direct coupled exciter, 3-bearing machine, 200 kVA, speed 500-600-750, if possible complete with control switchboard.—Box 67, c/o The Electrical Review.

STACKPOLL Potentiometers wanted, type J.N.A.R., 50106 log. law, ½ meg. carbon type. Any quantity acceptable; 10,000 required.—Box 1844, c/o The Electrical Review.

URGENTLY wanted, Cochran or self-conditioned Economic Boiler, 3,500/4,500 lbs. evaporation, 120 lbs. pressure. Must be modern and first-class condition.—Box 1858, c/o The Electrical Review.

VACUUM Cleaners, 5,000 urgently required. Good continuous contracts offered. Will manufacturers or wholesalers with supplies available communicate with—Brooks & Bohm Ltd., 90, Victoria Street, London, S.W.1. Victoria 9550. 1823

WANTED, Elliot C. W. or Weston Dynameter Watt, Volt and Ampere Meters.—Allen Electric, 67, Loampit Vale, S.E.13. 7008

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

WORK WANTED AND OFFERED

CUT your inspection and assembly costs and obtain guaranteed times of deliveries by sending your orders for Small Precision Parts (Auto Work) to—Walter Denis Contacts Ltd., Walden Works, St. Annes-on-Sea. Tel. 1517. (On A.I.D. Part I, Admiralty & M.O.S. Lists.) 1880

ELECTRICAL Measuring Instruments skilfully repaired and recalibrated. — Electrical Instrument Repair Service, "Stanimede," Forlease Road, Maidenhead. 6970

MACHINING Work, for Centre Lathes up to 6½ in. centres and medium-sized milling (good grade work preferred).—The London Electric Firm, Croydon. Uplands 4871. 56

REPAIRS: Clocks, Electric Clocks, Clockwork Controllers for public lighting, control and time switches, exposure meters and every kind of clockwork appliance repaired and overhauled. Inquiries welcomed.—J. W. & R. E. Hughes (Clockwork Engineers), 58, Victoria Street, London, S.W.1. Phone, Victoria 0134. 66

WOULD firms in the London area able to carry out complete overhauling and reconditioning of D.C. and A.C. Motors, sizes from ¼ h.p. up to 20 h.p., please communicate with the advertiser?—Box 1826, c/o The Electrical Review.

AGENCIES

AGENCIES required, South of England, including the London area: (a) Cables; (b) Small Switchgear; (c) Transformers; or any lines suitable for distribution for wholesalers' business.—Box 40, c/o The Electrical Review.

AGENCIES required for London, South of England, for the following: (1) Domestic electrical appliances; (2) Brass electrical accessories, switch plugs, etc.; (3) Conduit. Advertisers have clientele with every wholesaler in the territory mentioned. Immediate turnover can be guaranteed. Either commission or buying basis. Post-war arrangements considered. — Box 64, c/o The Electrical Review.

AGENT, Sales Representative, technical or others, electrical or general engineering, West of Scotland, etc.—Box 7011, c/o The Electrical Review.

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

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

NEWLY formed limited company in Eire, comprising members of well-known Irish technical and distributing firms, with connections in Northern Ireland, desire to contact British manufacturers in the following: Textile and allied machinery, flour milling machinery, machine tools and saw milling machinery, agricultural and dairy machinery, road making and building machinery, electrical machinery and equipment, general engineering requisites and small tools. Subscribers are prepared to offer erection and maintenance service. Enquiries to—Box M.I., Eason's Advertising Service, Dublin. 1881

TO manufacturing electricians: Advertiser, works trained and travelling Lancashire regularly, seeks a post-war agency to sell Cookers, Bowl Fires, etc. Address—Box 6976, c/o The Electrical Review.

BUSINESSES FOR SALE AND WANTED

FOR sale, due to owner's illness, small Electrical Contracting business in Outer London area, holding M.o.W. licence. Reasonable offer acceptable.—Box 7005, c/o The Electrical Review.

BUSINESS OPPORTUNITIES

IRONFOUNDERS in Milands producing high-class work have capacity for several tons weekly available to Engineers disposed to consider amalgamation or purchase outright. Very successful business.—Box 6949, c/o The Electrical Review.

PARTNERSHIPS

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

PATENT NOTICES

ELECTROLYTIC RECORDING IN FACSIMILE TELEGRAPHY

THE proprietor of Letters Patent No. 531501, relating to the above matter, is desirous of entering into negotiations for sale of, or issue of licences under, the patent. Enquiries to—Forrester, Ketley & Co., Chartered Patent Agents, 88-90, Chancery Lane, London, W.C.2.

1874

IT is desired to secure the full commercial development in the United Kingdom of British Patent No. 479344, which relates to Muffle Furnaces intended for use in brazing together tool tips and shanks, either by way of the grant of licences or otherwise on terms acceptable to the patentee. Interested parties desiring copies of the patent specifications and further particulars should apply to—Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, London, W.C.2. 1869

MISCELLANEOUS

ADVERTISER seeks to place substantial orders for export in the following lines:—3 and 4 light electr. Pendants, Wood and Metal, Table Lamps and Bedside Lamps ditto; Glass Bowls 12" and 14" complete; Glass Shades 6"; Glass Dishes 8"; Bakelite Accessories such as Holders, 5-amp. Switches, Sockets, Plugs, Ceiling Roses, etc., Domestic Appliances of all kinds; Cables and Flex, Lamps, Tape, Novelties, Bell-Transformers, Fires and others. Offers, with illustrations in triplicate, will be appreciated.—Box 1894, c/o The Electrical Review.

BATTERY Chargers Modernised. Your old Charger made like new by specialists. Conversion from valve to metal rectification. Send for interesting leaflet "Q.D." on this service.—Runbaken Electrical Products, Manchester, 1. 45

PHOTOGRAPHY. A photograph says more than a thousand words. Realistic photographs for catalogues, brochures and general reproduction purposes for present and after-the-war uses. Records made of present work, premises, etc.—Miles & Kaye Ltd., Industrial Photographers, 100, Southampton Row, London, W.C.1. Telephone, HOLborn 6858. Established over 50 years. 1702

EDUCATIONAL NOTICES

LATEST A.M.I.E.E. RESULTS

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

The B.I.E.T. tutorial organisation is waiting to assist you either with a short specialist course or complete training for a recognised examination.

We have available a large full-time staff of instructors, while the efficiency of our extensive organisation is a byword among engineers.

WE GUARANTEE—"NO PASS—NO FEE"

May we send a copy of "ENGINEERING OPPORTUNITIES"? Containing a great deal of useful advice and detailed information on over 200 Home-Study Courses and examinations, this handbook is of very real value to the ambitious engineer.

Our highly informative handbook will be sent FREE and without obligation on request.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY.

Established 1927—over 200,000 students.

12, Shakespeare House, 17, 18 & 19, Stratford Place, Oxford Street, London, W.1.

33

Great Possibilities for TECHNICALLY QUALIFIED ENGINEERS

Key Men in War-Time and Afterwards

THE finest posts and the great majority of posts in Great Britain in this war are technical. The same will be the case when the war is over. The vast increase in mechanisation now being applied to war purposes will then be suitably utilised in reconstruction, and in trade and commerce. Take a recognised Engineering Qualification through home-study with the T.I.G.B., whose Students have gained 35 **FIRST PLACES** in the A.M.Inst.C.E., A.M.I.E.E., A.M.I.Mech.E., A.F.R.Ae.S., etc., examinations. Write to-day for "The Engineer's Guide to Success," containing the world's widest choice of engineering Courses—over 200—covering all branches: Electrical, Aeronautical, Mechanical, Wireless, etc.

THE TECHNOLOGICAL INSTITUTE OF GT. BRITAIN

35, Temple Bar House, London, E.C.4. 77

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this Journal should not be taken as an indication that they are necessarily available for export

Index to Advertisers

(*Continued on page* 82)

Index to Advertisers

(*Continued from page* 80)

Printed in Great Britain at THE CHAPEL BIVER PRESS, Andover, Hants, and published by ELECTRICAL REVIEW, LIMITED, at Dorset House, Stamford Street, London, S.E.1.

ELECTRICAL REVIEW

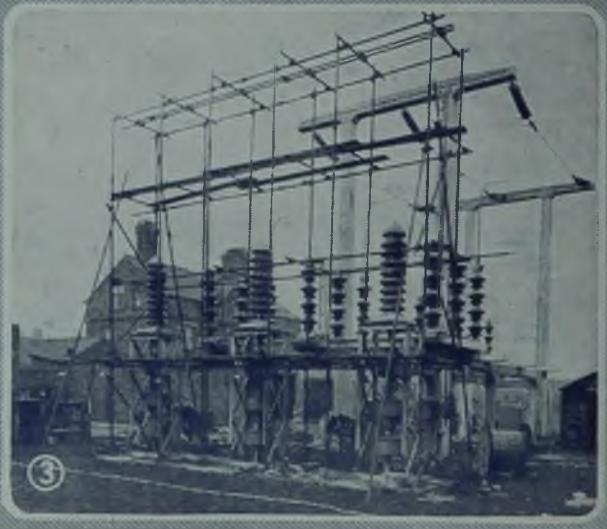
TERMINATIONS FOR 132 kV. GAS CUSHION CABLES

(1) Applying lead wire to the paper stress cone.

(2) Lowering the internal pressure assembly into position.

(3) A circuit termination prior to removal of the shelter scaffolding.

These terminations are part of a HENLEY 132 kV. Gas Cushion Cable contract recently completed. The contract included the manufacture and laying of 6,760 yards of 132 kV. single-core cable, also the construction and installation of all joints, terminations, etc. The complete transmission system is now in commission.



HENLEY

SUPER-TENSION CABLE INSTALLATIONS

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