

ELECTRICAL REVIEW

FOUNDED
1872

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JUNE 8, 1945

9d. WEEKLY



Coiling a length of many miles of H.A.I.S. Cable outside the HENLEY Cable Factory to await shipment.

The HENLEY Straight Through Lead Press. Most of the lead alloy tubing used for H.A.I.S. cable has been produced on presses of this type.

CABLE FOR OPERATION "PLUTO"

THE PETROL PIPE - LINES THAT MADE V.E. POSSIBLE!



Never before has the cable-making industry been called upon to undertake a task of such magnitude as was involved in the production of the cable for operation "PLUTO," the petrol pipe-lines that made V.E. possible. The HENLEY Straight Through Lead Press that successfully produced the largest portion of the lead alloy tubing for this cable is also used for sheathing Henley Cables.

HENLEY CABLES
FAMOUS FOR OVER A CENTURY

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PHONE: DORKING 3241 (10 LINES)
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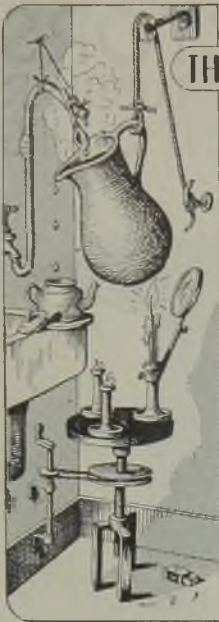
Resistances

ARMS OF THE OHM'S LAW

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DIMMERS — REGULATORS (Field, Shunt, Voltage) — RESISTANCES (Arc Lamp, Charging, Regulating, Sliding) — RHEOSTATS — ELEMENTS and SPIRALS, ASBESTOS WOVEN RESISTANCE NETS AND GRIDS

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Telegrams: "WILOHM" Willenhall. Telephone: Willenhall 494-495

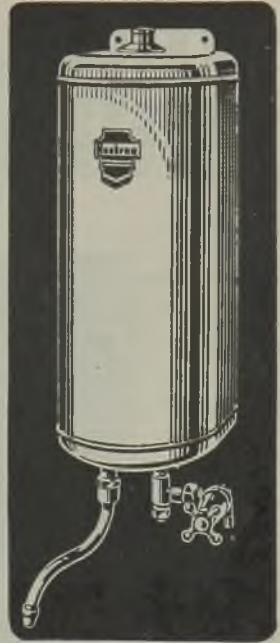


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One may obtain a given result by a round-about method or the SAME result on more straightforward lines.

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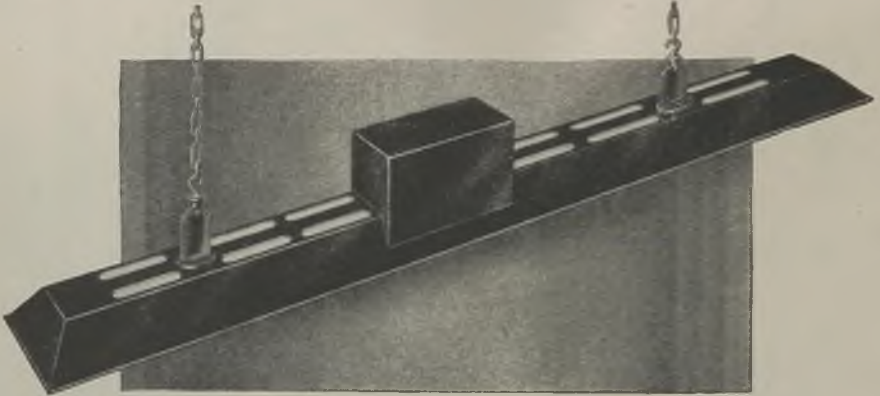
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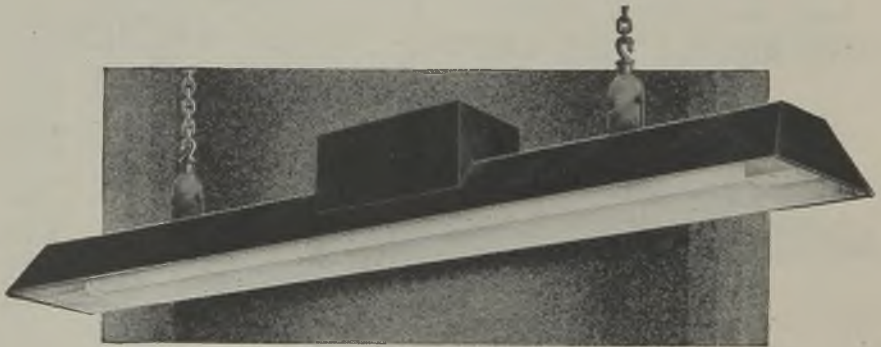
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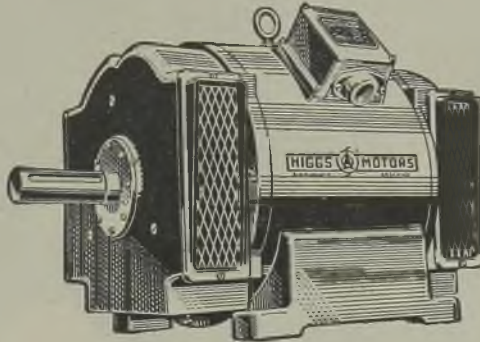
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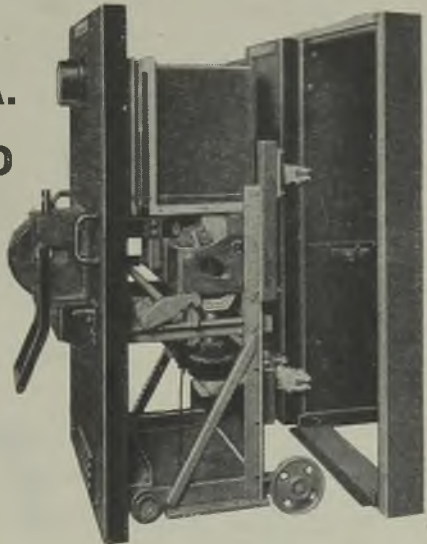


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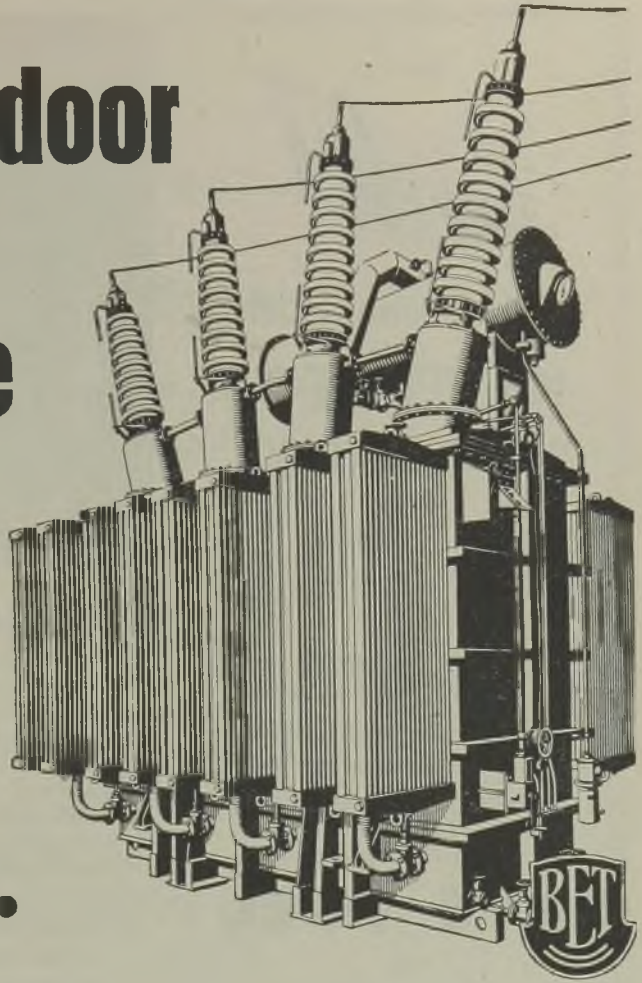
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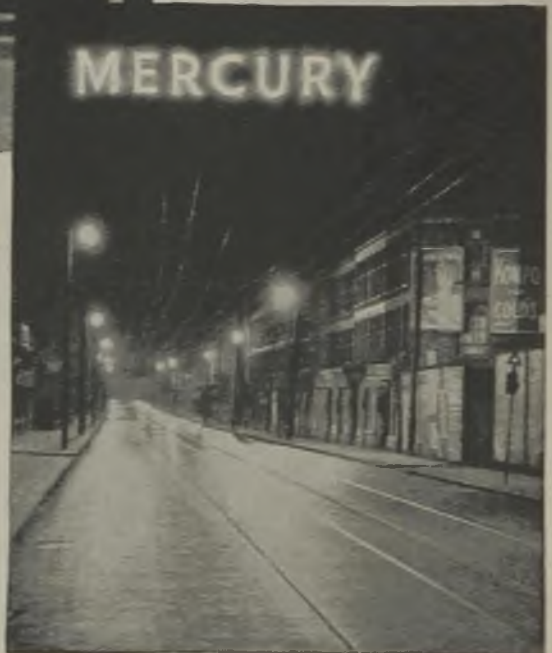


PLANNED
Street Lighting
 for
PEACE

July 15!

After nearly six years, the lights go up again!

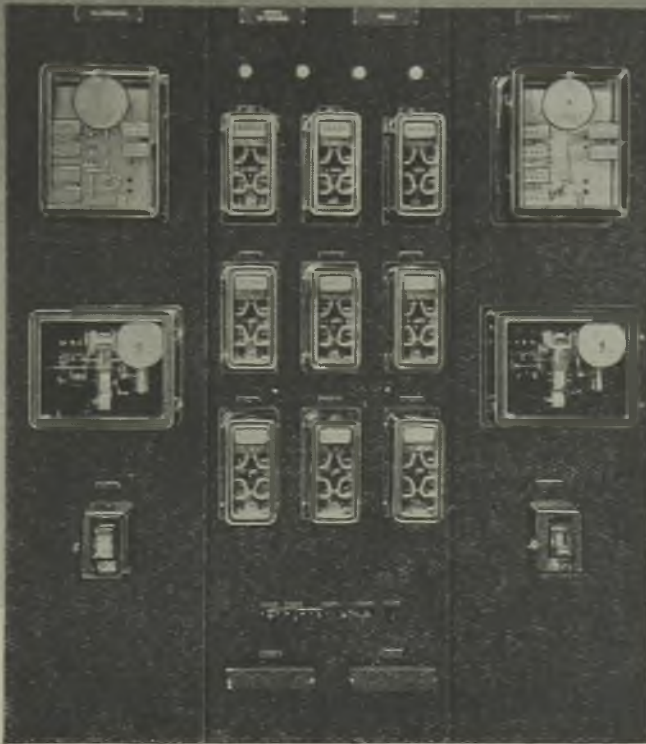
Eleco's 40 years' experience is at your disposal and a complete range of Fittings proved in service for Tungsten, Mercury and Sodium Discharge Lamps will be available. Catalogue on request.



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The experience gained in many years of dealing with the problems of summation and maximum demand metering is at your service.

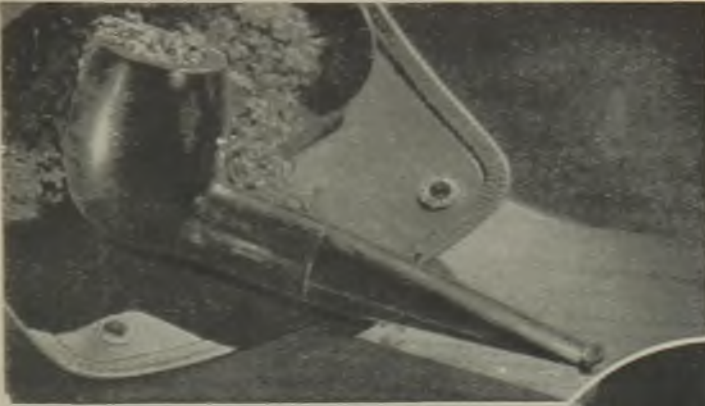
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They can give the
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Osram



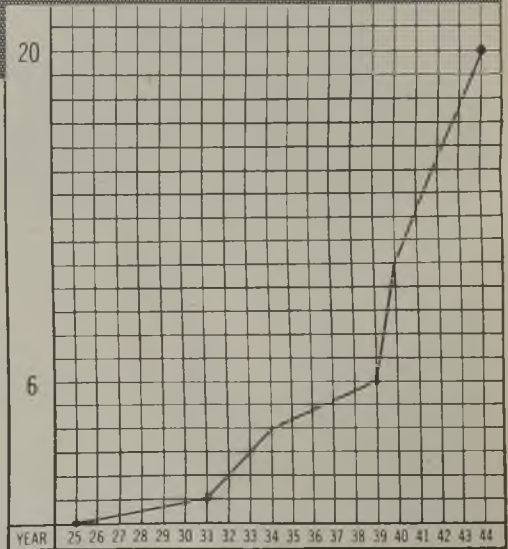
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All over the World



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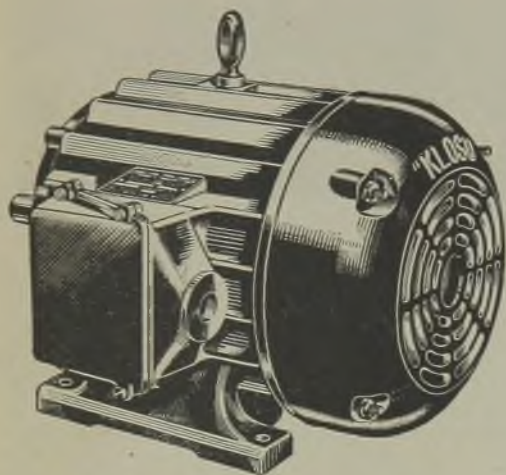
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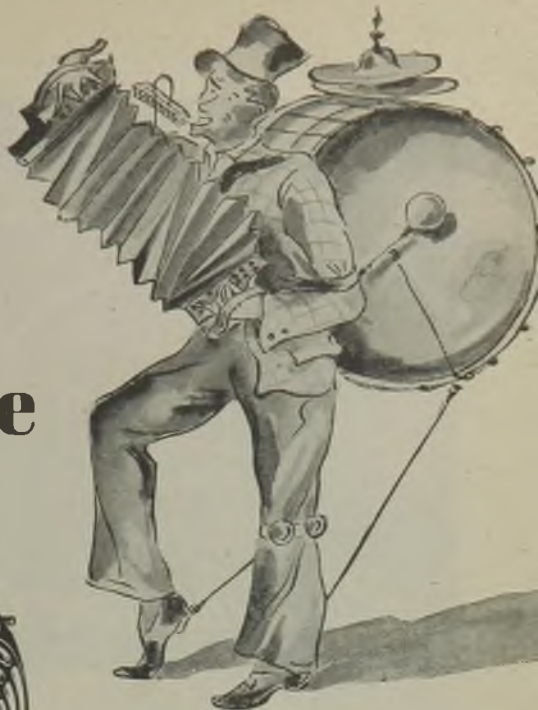
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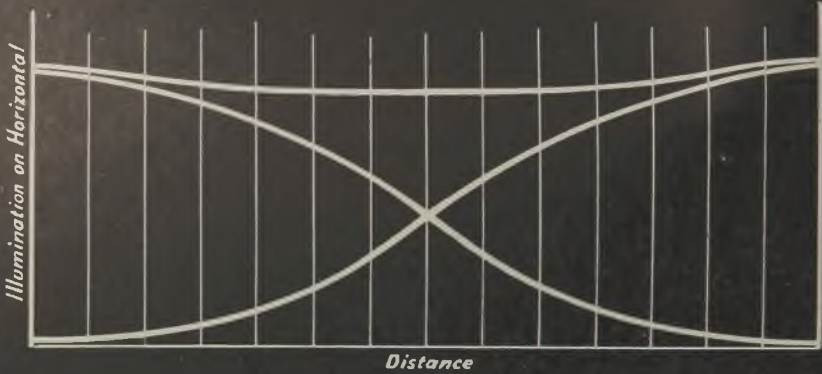


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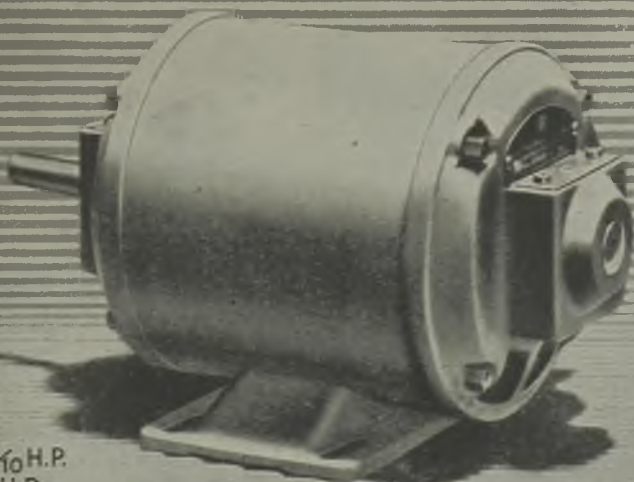
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The illustration shows a Brush 10,000 kVA transformer fitted with on-load tap changing equipment operated at a point remote from the transformer.

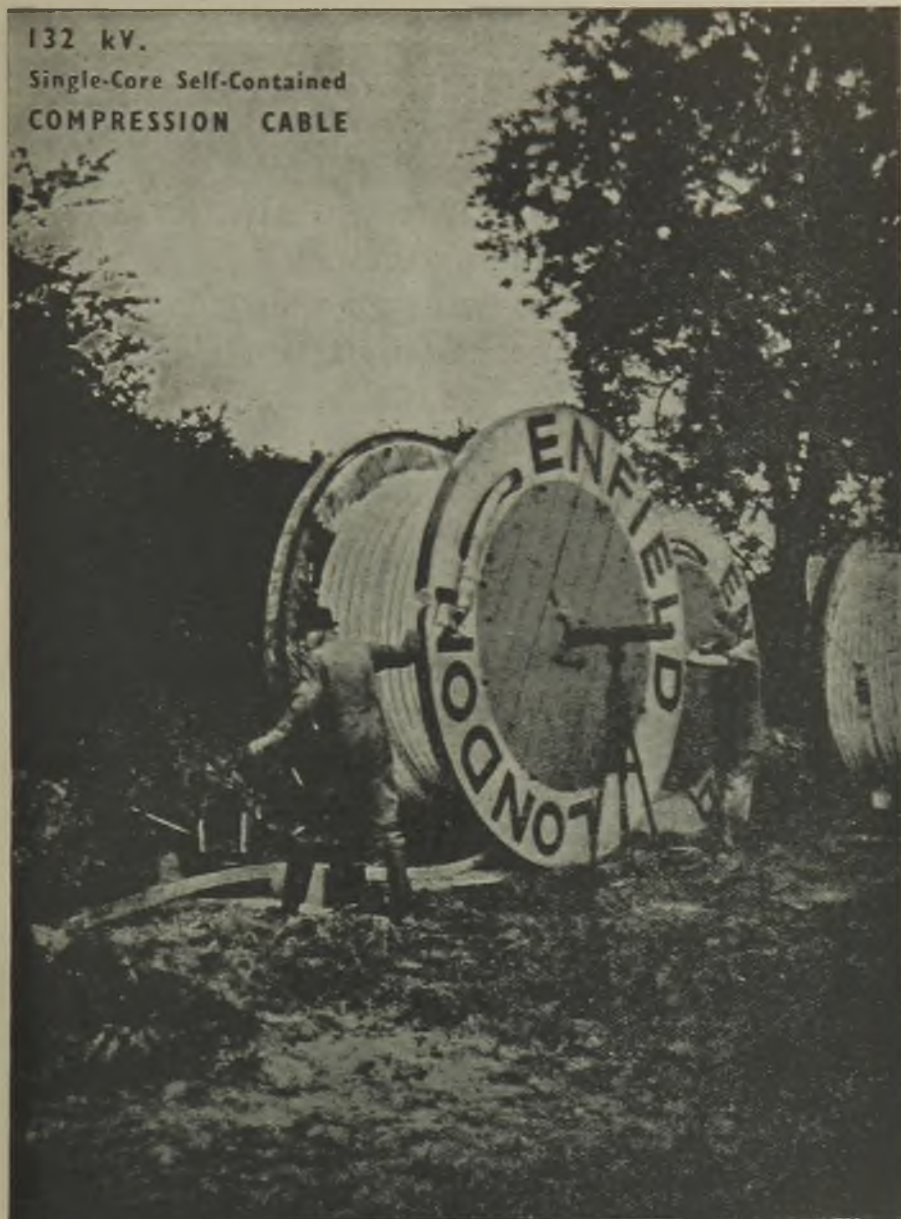
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COMPRESSION CABLE



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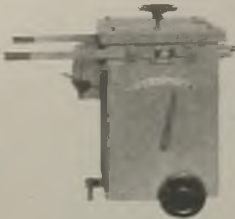
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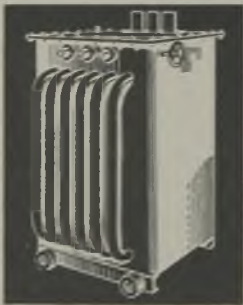
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PROTECTED-CAGE

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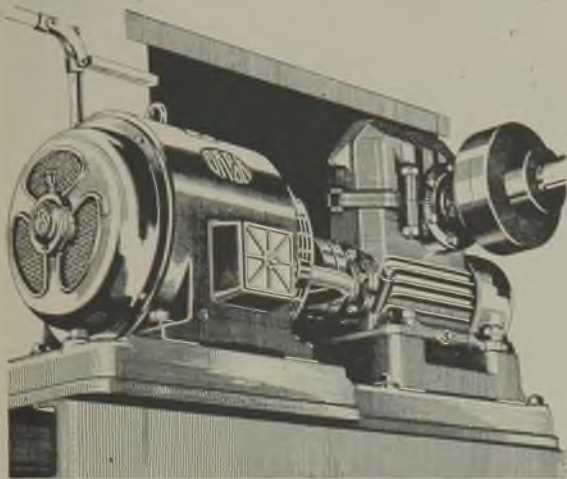
CONSTRUCTION

Cast-iron stator and endshields, double cotton covered windings, wound in mica-lined slots impregnated and baked after winding.

Rotor is dynamically balanced and carried on ball and roller bearings.

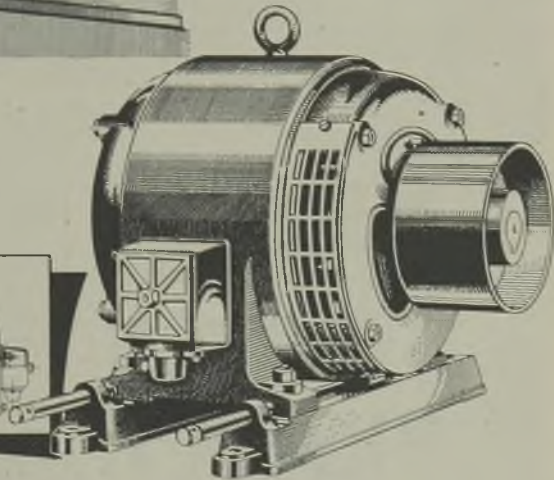
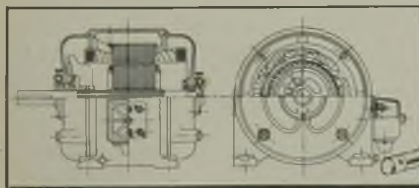
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Suitable for any voltage or phase on alternating current supply, at speeds of 3000, 1500, 1000, 750, 600, 500 or 375 r.p.m., with possible combinations of two, four or six of these speeds.

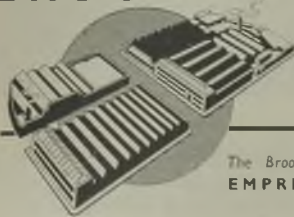


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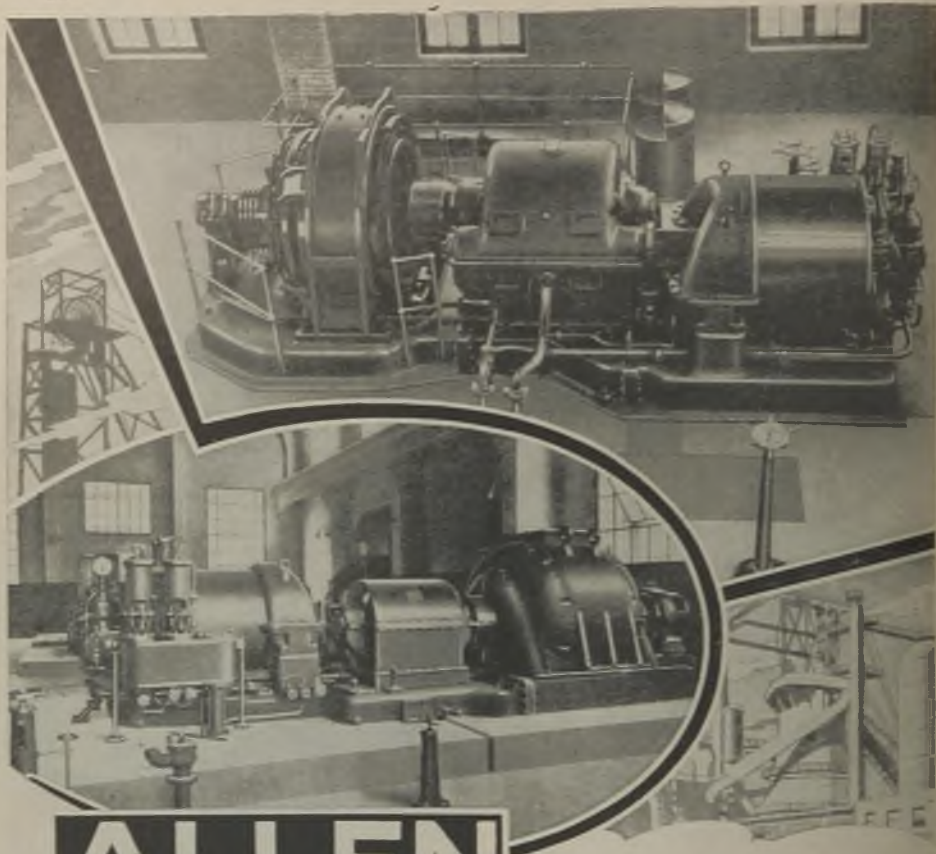


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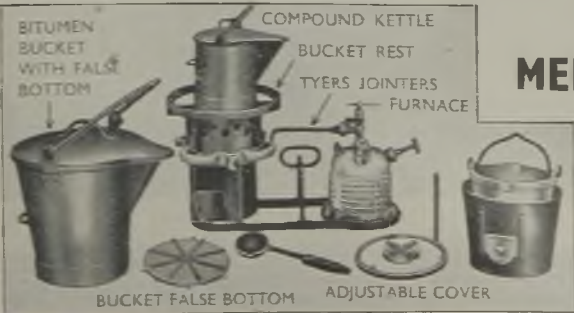
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WEIR TURBO-FEED PUMPS

are built in single or multi-stage types for the highest pressures and temperatures. Designed on thoroughly scientific principles, of the simplest construction, and with few working parts. Combine maximum efficiency with minimum weight and space occupied. Write for Publication No. 35 "Feeding the Modern Boiler."

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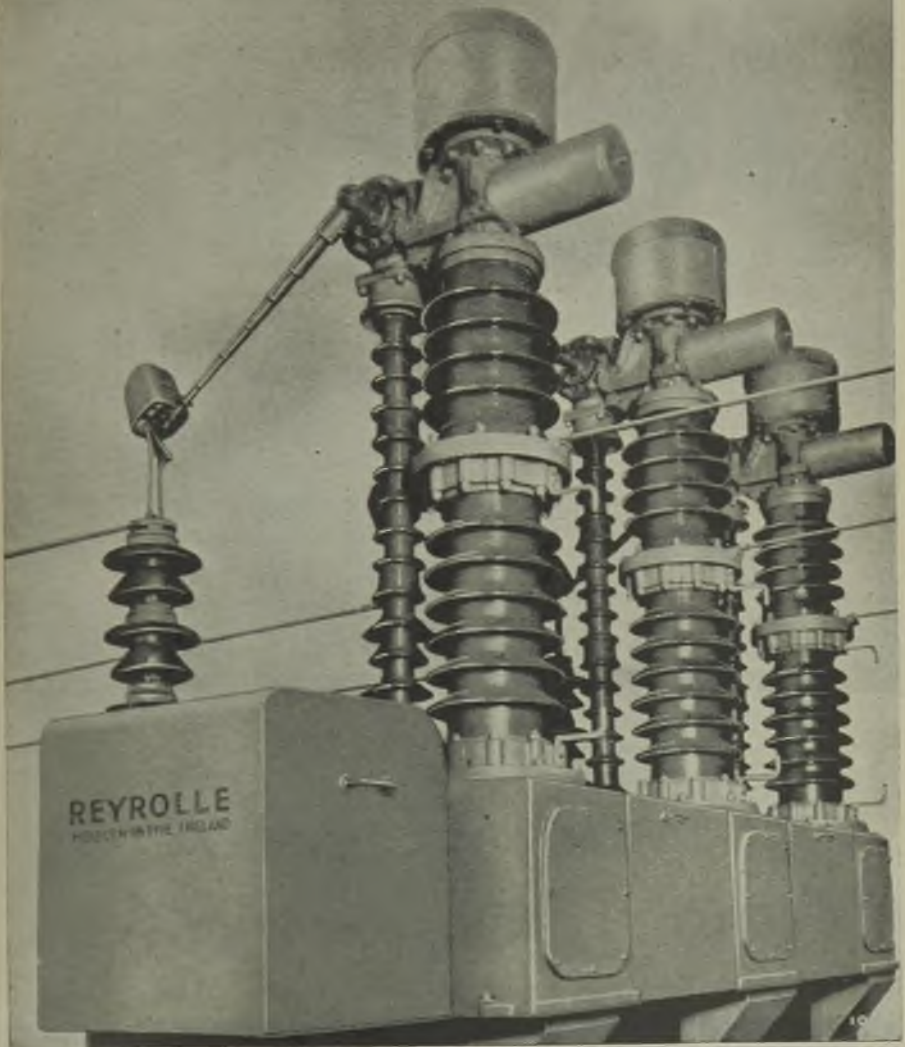
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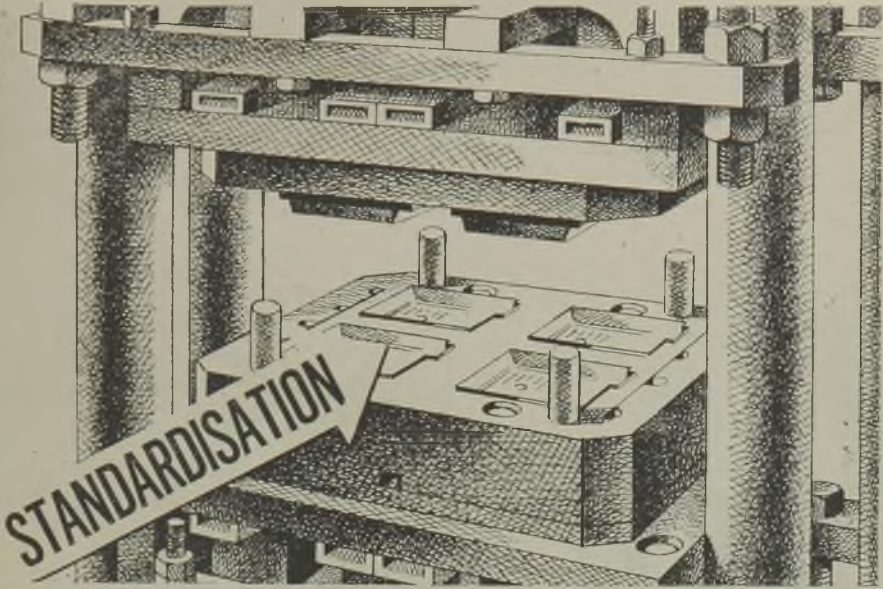
Plant	No. 1		No. 2		No. 3	
	Crude	Treated	Crude	Treated	Crude	Treated
Cations						
Calcium Ca	3.2	-	9.4	-	10.7	-
Magnesium Mg	0.8	-	0.36	-	1.09	-
Sodium Na	0.46	0.23	1.0	0.31	1.66	0.44
Total	4.46	0.23	10.76	0.31	13.45	0.44
Anions						
Carbonate CO ₃	4.2	0.24	12.4	0.29	10.5	0.57
Chloride Cl	1.8	0.06	2.5	0.12	2.84	0.30
Sulphate SO ₄	1.35	-	3.48	0.03	11.95	-
Nitrate NO ₃	-	-	-	-	1.15	-
Total	7.35	0.30	18.38	0.44	26.44	0.87
Total ions in solution	11.81	0.53	29.14	0.75	39.89	1.31
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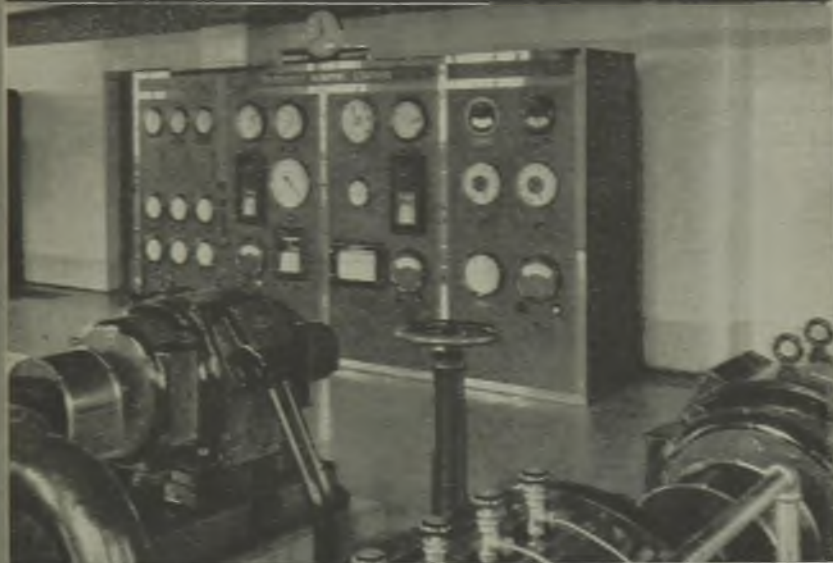
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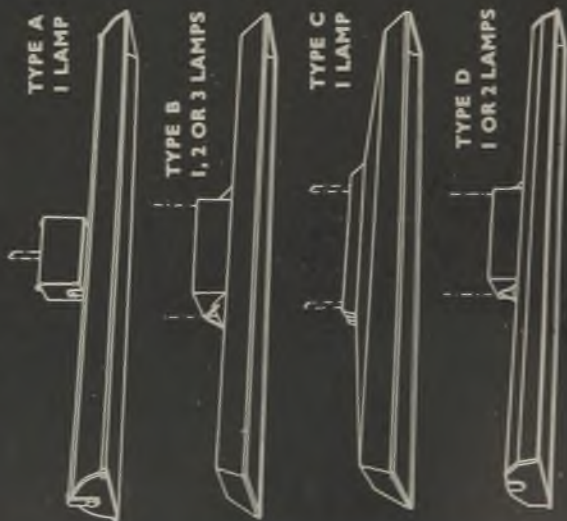
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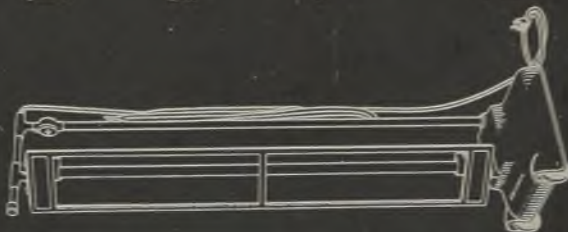


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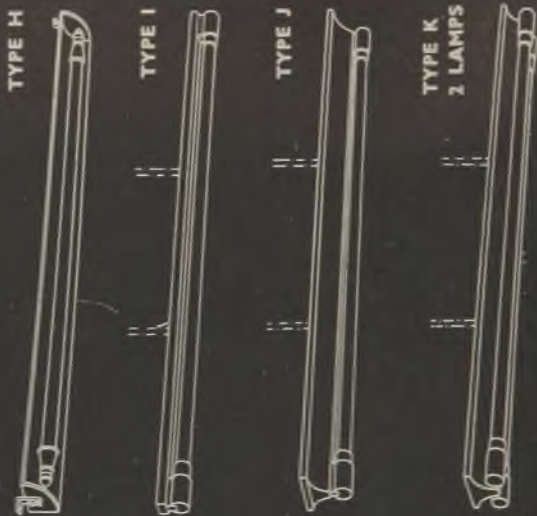
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ELECTRICAL REVIEW

June 8, 1945

Contents:—

	Page
Editorial.—Fuel and Power . . .	815
Control of the Grid . . .	817
Views on the News . . .	822
Coal and Electricity . . .	823
Correspondence . . .	825
Swedish Plant for Eire . . .	826
Forthcoming Events . . .	826
Personal and Social . . .	827
Buoyant Cable . . .	829
Bakeland Memorial Lecture . . .	832
Commerce and Industry . . .	833
Localising L.V. Cable Faults . . .	836
Manchester Exhibition . . .	837

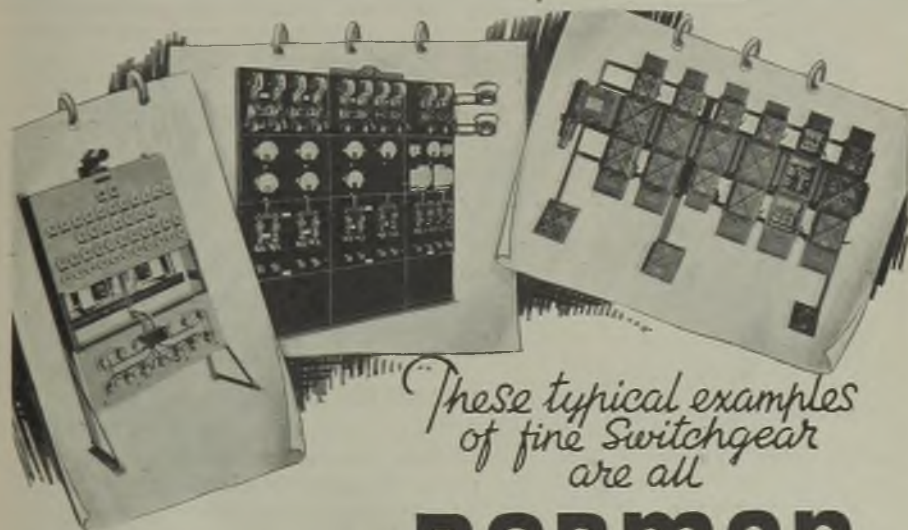
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<i>Contents continued</i> —	Page
Electrical Contact Springs . . .	838
Manufacturers' War Work—V . . .	839
Birmingham Training Scheme . . .	841
I.M.E.A. Notes . . .	841
Heat on Tap . . .	842
Electricity Supply . . .	843
Financial Section . . .	844
U.S. and Canadian Patents. By "Pagent" . . .	847
New Patents . . .	849
Contract Information . . .	850
<i>Classified Advertisements</i> . . .	71
<i>Index to Advertisers</i> . . .	80

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Vol. CXXXVI. No. 3524.

JUNE 8, 1945

9d. WEEKLY

Fuel and Power

Points from Ministry's Statistical Digest

MANY aspects of the coal industry are covered in the Statistical Digest prepared by the Ministry of Fuel and Power, and reviewed in this issue. The tables also provide a rough and ready comparison of the gas and electricity supply industries. So much has been written and said about coal during the war that extended reference to the production of the electricity supply industry's raw material is unnecessary. It is worth noting, however, that the output of saleable coal fell from 227 million tons in 1938 to 184 million in 1944 and that, accompanying a reduction in the average number of men employed from 781,700 to 641,600 (effective), there has been a fall in output per wage earner per annum from 290.4 to 259.2 tons. This has occurred in spite of an increase in the proportion of coal cut by machinery from 59 to 72 per cent. and loaded and conveyed by machinery from 54 to 69 per cent. In this connection there has been a rise from 2,229,335 to 2,485,101 HP in the amount of electrical equipment employed.

Power Stations' Coal

Contrary to the general impression, there was actually a slight increase in the ratio of cleaned coal to the total output, from 45.4 to 46.6 per cent.; this proportion is stated to be higher when applied to coal suitable for cleaning. As regards supplies to electricity works, the total is given as 23,489 million tons of which 2,364 million was graded and 5,280 million washed (slacks and smalls): about a third of the opencast coal went to power stations.

Slacks and smalls constituted about 76 per cent. of the total coal supplied.

A noteworthy point is that during the war the quantity of coal supplied to electricity works overtook the gasworks total. In 1913, 18 million tons was carbonised at gasworks and 6 million tons was used at electricity works. By 1938 the respective quantities had become 19 and 15 million tons; in 1940 the figures reached parity at 18 million tons; and in 1944 the gasworks total was 21 million and that for power stations 24 million.

Sales and Revenue

Further comparison of the gas and electricity supply industries shows that the number of gas consumers actually decreased from 11,215,000 in 1938 to 11,199,000 in 1943 (1944 figures not available). At the same time the number of electricity consumers increased from 10,101,000 to 10,681,000 (10,780,000 in 1943-44). While the sales of gas rose from 1,530 million therms in 1938 to 1,767 million (provisional) in 1944 (15½ per cent.), the total of electricity sold went from 20,793 million kWh to 31,832 million (53 per cent. increase.)

As regards revenue, that from gas was 41½ per cent. higher in 1942 than in 1938, at £97,836,000. The corresponding increase for electricity was about 40 per cent., indicating a reduction in price. It can be calculated from another set of figures that the average revenue per kWh fell from 1.04d. in 1938-39 to 1.01d. in 1942-43.

Some idea of the comparatively higher degree of co-ordination in the electricity

supply industry may be gained from the fact that while there are 345 authorised electricity undertakings, the number of gasworks is treble this (1,049). In both industries a few very large undertakings are responsible for the larger part of the total production. In the case of gas the 61 works in the three largest classes produced about 68 per cent. of the total output in 1943; 56 electricity undertakings provided 82 per cent. of the 1944 output.

It seems to us the continuation of the present **National Grid Control** method of operating the grid as a single unit, brought about mainly by wartime conditions, is a perfectly logical development for normal times. Although the generating stations connected to each area section of the grid were, before the war, of sufficient capacity to deal with the various area loads it is reasonable to assume that the co-ordination of generation from the broadest economic aspect can only be fully realised with the whole grid system connected as one unit. There is little doubt that plant shortage alone will dictate operation on a national basis for some years, but we believe that the permanent establishment of the wider control is officially regarded as desirable.

Fault Localisation LOOP tests have been largely employed in locating faults in distributors because usually only the ends of cables are available. Proportionality methods do not give accuracies that approach those obtainable by the other means that can be employed in the more comfortable and elastic conditions of the cable factory (notably the "search" methods), which were described by Mr. J. H. Savage in the practical paper he presented before the I.E.E. Transmission Section last week. The implications of some of these methods are likely to be of yet wider significance and electronics may in the future come to the aid of the harassed mains engineer.

Generous Training Scheme OLDER members of the electrical industry will consider to-day's young aspirants a good deal luckier than they were. In numerous directions assistance and encouragement are being given to an extent un-

dreamed of a few years ago. Some of the opportunities offered by leading electrical manufacturers were set out in the series of articles on education and training which we published a year or so ago and in this issue we mention a scheme recently instituted by the Birmingham Electric Supply Department by which young men can secure a thorough training in electricity supply work and be paid enough to keep them while they are being taught. The interest of the Birmingham chief engineer and manager (Mr. F. W. Lawton) in the subject was shown in the paper that he read early last year before the Midland Section of the Junior Institution of Engineers in which he outlined the necessary qualifications of the electric power engineer.

Correct Perspective PUBLIC interest in scientific potentialities is no doubt a sign of social health, but zeal for technical progress needs to be tempered by an appreciation of hard engineering and economic facts. If time and effort are wasted on schemes that are foredoomed to failure, there is the danger—as Professor R. O. Kapp points out in the lecture reported in this issue—that less ambitious but more practicable developments will be missed. The attraction of hot water on tap from public mains has recently been discovered by the lay Press, in which estimates have appeared of the large amounts of coal that would be saved if the production of hot water were everywhere combined with the generation of electricity.

Restricted District Heating PERHAPS the very limitations to which Professor Kapp refers may in due course favour a cautious extension of district heating in this country. In a few selected areas, where the subsoil is not congested by existing public services, it may be possible to install special plant for the combined generation of heat and electricity located near the load. This would not entail drastic modifications in the design and siting of base-load stations at the expense of industrial consumers requiring power and direct electric heating. Nor should the energy to be supplied or absorbed by the grid in varying quantities at poor diversity factor, in order to maintain the heat-electricity ratio at unity, be large enough to cause serious difficulty.



Control of the Grid

Underground National and Area Switching and Loading Centres

ANOTHER fairly widely-known wartime "secret" has now been "disclosed." This is the existence of subterranean national and area control centres of the Central Electricity Board. One of the first major electricity supply developments of the war was to bring the grid into operation as a single unit, in place of the separate operation of each of the nine area systems, and to do this effectively additional tie lines were erected between the various adjacent area systems throughout the country.

In the first place the national control was effected by the staff of the South-East England and East England areas control centre near the Bankside power station of the City of London Electric Lighting Co., Ltd. Almost complete

devastation around this centre and the incapacitation of one of the two emergency control rooms which had been installed before the war made it vitally necessary to secure safer accommodation.

The desirability of going underground led to the speedy and helpful co-operation of London Transport, who offered the use of two disused lift shafts at one of the stations of the London Underground Railways (illustrated above). It was soon seen that with suitable reconstruction accommodation could be provided and work was put in hand in October, 1940, and in March, 1941, Bankside was completely vacated and a national

control room was put into commission. In well under a year from the commencement of



The equipment in the national control room is mainly in the form of a complete grid diagram setting out the various area schemes and inter-connecting tie lines

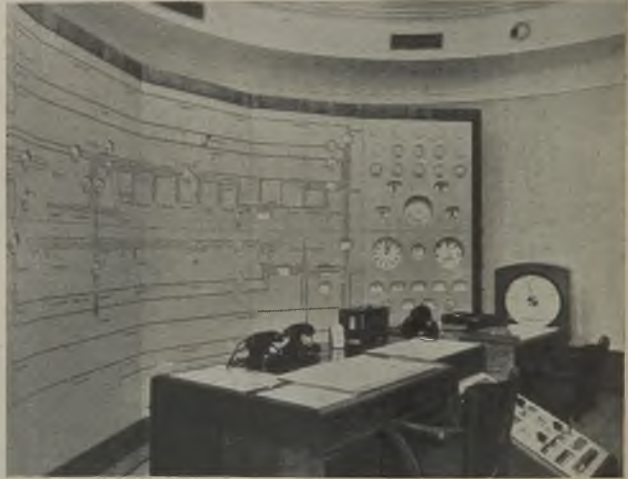
the work the new control room for the South-East England area was commissioned.

Thirteen rooms were constructed in the two shafts, while an original exit passage from the lifts to the station platforms now serves as a gallery for the centre's electricity distribution equipment and communication control apparatus. The two shafts were originally 23 ft. in diameter and 120 ft. deep, and they have been lined with 18 in. of reinforced concrete as protection against side blast from deep penetration bombs. Protection against direct hits is provided in each shaft by a "bomb stopper" consisting of 12 ft. of reinforced concrete on three slabs separated by 9 ft. of air space and 14 ft. of blast-absorbing ballast, giving the stopper an overall length of 35 ft. Another specially designed bomb stopper protects the access stairway which was the original emergency exit for the station, and a further one protects a fourth shaft which supplies ventilating air to the Underground system.

In each main shaft a total of 1,563 tons of reinforced concrete is used, including 80 tons of steel reinforcing rods. The whole of the "structure" below the level of the bomb stoppers is air conditioned, and the ventilating

scheme includes cotton-wool dust filters and special poison-gas filters. The whole of the ventilation plant is installed at the base of one of the main shafts.

To facilitate our description of the communications system for the complete installation, we will deal with the area control rooms first. Because of the limitation set by the shaft diameters there are two control rooms proper, but this is a very convenient arrangement, because one room is devoted to switching control and the other to loading



The area loading control room houses a diagram of the area system with only the detail required for loading purposes

control. They are connected by a passage about 8 ft. long which links the two shafts.

In the area switching control room a main system diagram, which was transferred from Bankside, now occupies almost the whole of the available wall space, *i.e.*, it nearly forms a cylinder, although in its older setting it was arranged in one vertical plane. This



In the area switching control room is a cylindrically disposed main system diagram, transferred from Bankside, where it was arranged in one vertical plane



Calculator boards are used to check the duties imposed on the equipment with different switching arrangements, duties likely to be imposed on new switchgear, and for forecasting the distribution of load

change in its shape was rendered possible by the fortunate flexibility of its construction, in that it consists of over 41,000 inch squares of plastic material mounted on vertical steel strips, each 6 in. wide. By means of various symbols engraved on the squares the diagram has been constructed and can be rearranged to show the disposition of all the circuits and switchgear in the area at any one time.

Switch-operation alarm lamps are fitted to the diagram and suitable labels can be fixed to indicate earth faults on apparatus under maintenance, apparatus "covered" by permit-to-work cards, and other special requirements. The control engineers do not effect any direct operations which are carried out only as the result of their exclusive telephoned instructions under the permit-to-work system.

The loading control room houses another diagram of the area system with only the detail required for loading purposes. Indicating loading instruments are incorporated in the diagram, and other instruments for indicating generator loads, frequency and time errors are recessed into panels flanking the diagram. This is sign-written on metal-faced plywood and small permanent magnets indicate line outage conditions.

In a central position in front of the diagram is a two-position loading desk which carries a routine instructor, by means of which instructions can be sent to the more important generating stations, often in "bulk," for picking up, dropping off, or, in emergency, shedding load.

To overcome the disadvantages of the engineers being unable to "feel" the weather by being underground, light-intensity indicating and recording instruments are fitted to the loading desk and are actuated by light cells installed above and above ground.

To provide the extensive and reliable communications essential to the control system a comprehensive network of private lines is rented from the Post Office. These lines radiate from the control centre to the

most important points in the area system, such as switching stations, while other lines serve for automatic indication of circuit-



Original exit passage from the lifts to the station platforms now serving as an apparatus gallery

breaker positions, feeder and transformer loading, etc.

A stand-by emergency system of telephony employs magneto signalling, the circuits being so arranged that either end can call the other

"on maintenance," even although the called party may not then have changed over. The telephone system provides communication with 27 automatic exchanges in the outlying substations and 28 cordless telephone boards at other substations and power stations; collective alarms of switch operations; indications of load transfers over 38 main feeders; transmission of routine loading signals to 25 major power stations; and the receiving of frequency indications. The private rented lines are supplemented by a separate communication system provided by "spares" in the multi-core protective-gear cables, connection to this system being made via a cable specially laid through the

mainly by polarised DC, but in some cases voice-frequency signalling is dictated by the circuit characteristics. Most of the voice-



Ventilation plant is installed at the base of one of the main shafts

frequency equipments are of the four-channel type and were transferred from the original control room, while a few three-channel equipments were specially made for the new control room with receivers and transmitters mounted on standard Post Office jack-in bases. The signalling apparatus used for setting up telephone calls is also employed for the transmission of routine instructions from the loading control desk.

The continuous feeder and generated load indications are effected on the same lines as those employed for signalling and communication purposes. The modulated signals of the load indications are separated off by means of filters to enable speech and load signalling to proceed simultaneously. In most cases a band from 1,900 c/s upwards is employed for load indications, but in some instances the load-indicating signals encroach on the



Almost complete devastation around the Bankside control centre made it vitally necessary to secure safer accommodation. Bankside power-station chimneys rising from damaged buildings on left—earlier area control station below St. Paul's dome on right

railway tunnel to the nearest station on the London area 66-kV grid.

Signalling on the Post Office lines is

from 1,900 c/s upwards is employed for load indications, but in some instances the load-indicating signals encroach on the

speech band where interruption of the load indications during telephone conversations can be tolerated. The two systems employ either voice frequency signals, generated by a photo-electric transmitter associated with a wattmeter transmitter, or by the counting of pulses initiated by watt-hour transmitters over a given period of time measured by the control room master clock.

A separate room is set apart for network calculations, and it houses short-circuit, load-flow and universal calculating boards which consist of "networks" of resistances to represent the actual circuit reactances, loads, etc., on the area system. The resistances are mounted at the backs of the boards and interconnection is by metal strips and jacks, plugs and cords arranged at the front of the board as system diagrams. All the measurements on the short-circuit calculator are made on a central instrument desk with suitable plug and cord interconnections. The universal calculating board can be used by itself or in conjunction with one of the other calculators, and interconnection of the calculators is effected by suitable bus-bars. The calculators are used to check the duties imposed on the equipment with different switching arrangements, duties likely to be imposed on new switchgear, and for forecasting the distribution of load.

Inter-area Operation

The national control is much simpler for it is concerned mainly with inter-area operation in such a way as to provide for load transfers between the areas on a pre-arranged programme, which is reversed weekly in the light of the latest information as to plant availability and relative generating costs in the respective areas. We must not lose sight, however, of the important advantages afforded by inter-area operation under abnormal conditions, such as those met with during the war years, with particular reference to the bulk transmission of load from one part of the country to another as the result of the transfer of industry, and of the substantial savings in the transport of coal at difficult times.

The equipment in the national control room is consequently simpler and is mainly in the form of a complete grid diagram setting out the various area schemes and the interconnecting tie lines, together with frequency and time-error indicators and recorders and indicating and recording meters for most of the tie lines. Control is

exercised mainly by teleprinter communication with the area control centres at Glasgow, Newcastle, Manchester, Leeds, Birmingham, London and Bristol. A separate teleprinter communicates with its associated area, but by means of suitable interconnections instructions to any number of centres may be sent simultaneously in one operation.

The continuous load indications for the feeders connecting the South-East area and the Mid-East Central England and South-Western areas are repeated on indicating instruments and recorders in the national control room, and the national control engineer also employs the South-East area manual telephone exchange for communication with the engineers controlling the South-East England area and for communication on the Post Office public telephone system. Entirely separate telegraph circuits are used between the national control and the six control rooms of all the areas other than the South-East one. Continuous load indications for inter-area feeders are transmitted to national control over separate private rented telegraph circuits.

News from Australia

THE Sydney County Council has decided to provide for the installation of additional boiler and generating plant at the Pyrmont power station by duplicating contracts already placed. These include contracts with International Combustion (A/asia) Pty., Ltd., for steam generating plant and with the Australian General Electric Pty., Ltd., for a 50,000-kW turbo-alternator. The value of these contracts is approximately £1,286,850.

Important changes in electricity supply organisation in Queensland are the subject of legislation now before the State Parliament. The proposals, which follow the line of recommendations contained in the last annual report of the State Electricity Commission, would empower the Commission to plan and co-ordinate the supply of electricity throughout the State; establish transmission lines; construct generating stations; sell electricity in bulk; and control prices. The State would be sub-divided into sixteen regions each under the control of a board and manager.

Reference to this matter is made in the annual report of the City Electric Light Co., Ltd. (Brisbane). The directors state that since the close of the financial year (January 31st last) the Queensland Government has introduced two far-reaching Bills dealing with the development and control of electricity supply throughout the State, namely, a Bill to amend the State Electricity Commission Acts of 1937-1941 and the Electric Light and Power Acts, 1896 to 1939, and a Regional Electric Authorities' Bill. The company's rights under its agreement with the Commission have, it is stated, been expressly protected.

Views on the News

Reflections on Current Topics

DURING his ten minutes in the "Your Questions Answered" series of the B.B.C. on Friday last week, Mr. Harold Hobson, chairman of the Central Electricity Board, probably did much to correct popular misapprehensions about the grid. In addition to coping with such queries as to why the 132-kV system cannot be tapped to give individual farm supplies, Mr. Hobson showed that the Board, although established by and responsible, through the Minister of Fuel and Power, to Parliament, is not a Government Department and functions on commercial lines and, moreover, has no jurisdiction over distribution and retail prices. Among other points made was that the Board, as standing for electricity supply from the public mains, takes its own medicine in renting telephone circuits for its control system from the G.P.O. of which it is the biggest customer in this way. Incidentally, it was shown that the major proportion of supply undertakings are publicly owned. It is especially important just now when political decisions may be made that affect the future of electricity supply that the public should be authoritatively informed of the essential facts. Opportunities might well be afforded to representatives of electricity distributors to contribute to the same series.

* * *

Is it not time that architects and builders gave a little more consideration to the location of substations in building schemes? I know that this is an old grievance but it still seems to be the practice to assign any odd corner of a building for substations, irrespective of its convenience or general suitability. Certainly in new housing much more trouble is being taken in the location of the house service units, so there may be some hope of an improvement in the attitude regarding substations also. Consultation with the supply authority or electrical contractor in the early stages of a scheme both eliminates difficulties later and saves a great deal of trouble and expense.

* * *

I wonder how many people realise just how much the increases in the price of coal since the beginning of the war are affecting their electricity accounts. I do not mean only the increases in charges that have been made (these in any case are insignificant in comparison with the increased coal prices) but also the reduced prices they would otherwise have been enjoying by this time. The position was brought home to me forcibly by Mr. W. P. Lilwall, borough electrical engineer and manager of Fleetwood

and this year's president of the I.M.E.A., when he told me a few days ago that the advance in the price of coal from 17s. 4½d. to 47s. 6d. a ton is costing his undertaking about £29,000 a year, and as the population of Fleetwood is about 25,000 this represents £1 2s. 3d. a head for every man, woman and child. Translated into terms of electricity charges, this means that instead of the tariffs having been increased by 15 per cent., they could, if the price of coal had remained unchanged, have been lowered by as much as 20 per cent.

* * *

A few weeks ago I referred to reports of the new kind of electric bus, said to have been devised in Russia, which relies for its propulsion on some undivulged and seemingly abnormal inductive effect. Impressed by these claims a municipal councillor of Aberdeen urges in a local paper that the war-worn tramways system should be scrapped instead of being renewed. The Geogi Baba system, he states, would entail only the laying under the main roads of cables carrying high-frequency currents which would be transmitted to the vehicles; batteries charged by this means would be enough to drive them through all the side streets as well. Pending the installation of such a system, he suggests that a fleet of oil-driven buses should be employed. The dangerous practical aspect of such unformulated ideas is that they may actually delay progress. The natural successor to the tramcar is the trolley-bus. Aberdonians, however, are proverbially not the most likely people to incur the somewhat greater expenditure on a modern trolley-bus system if they thought it might be superseded soon.

* * *

"Contact" (the staff journal of Central London Electricity, Ltd.) reports that a consumer, who had recently been rehousing by the local council, called at one of the company's showrooms to say that she had no adequate means of heating water for the bath, apart from a device which she had rigged up. An inspection revealed that the lady, whose bathroom was remote from the kitchen, had strung yards of flex between the two apartments and had used her kettle as an immersion heater by suspending it from the ceiling so that it was submerged, with the connections just out of the water. The consumer said that although this arrangement took nearly six hours to do its work it was not too dear. The company was able to replace this extraordinary fit-up by a wash-boiler.—REFLECTOR.

Coal and Electricity

Ministry of Fuel Statistics

■ AST week we referred briefly to the Statistical Digest issued by the Ministry of Fuel and Power for the year 1944 and reproduced a table showing the consumption of electricity and the revenue obtained by supply authorities. The Digest (Cmd. 6639) is obtainable from the Stationery Office at 1s. 6d. Altogether there are sixty-nine tables covering various aspects of the coal-mining and associated industries; some of these are now reproduced and others are summarised.

Table 2, which deals with primary and secondary sources of fuel and power in Great Britain, shows that the total output of coal in 1944 was 185.4 million tons. Of this, 15.4 million tons was used at collieries or for the transport of coal and coke; 20.1 million tons was carbonised at coke ovens and 20.7 million at gasworks; and 24.0 million was used for generating electricity by authorised undertakings and railway and transport authorities.

NUMBER OF UNDERTAKERS, ELECTRICITY GENERATED AND MATERIALS USED (Table 16)

	1938	1939	1940	1941	1942	1943	1944
<i>Number of authorised electricity undertakers (at March 31st)—</i>							
Public authorities	378	373	373	374	374	374	375
Companies	213	208	205	202	201	200	198
Total	591	581	578	576	575	574	573*
<i>Electricity generated (million kWh)</i>							
By steam plants (from coal, coke and oil)—							
Authorised undertakings:							
Public authorities	13,093	14,289	15,921	17,935	19,569	20,191	21,442
Companies	10,118	10,966	11,880	13,465	14,882	15,344	15,651
Railway and transport authorities	1,335	1,323	1,202	1,216	1,248	1,265	1,285
Total	24,546	26,578	29,003	32,616	35,699	36,800	38,378
By oil engines—							
Authorised undertakings:							
Public authorities	27	25	26	25	23	21	25
Companies	30	26	31	32	23	17	20
Total	57	51	57	57	46	38	45
By gas engines—Total (public authorities)	3	3	3	3	2	2	3
By water power—							
Authorised undertakings:							
Public authorities	7	7	6	6	7	6	6
Companies	981	975	794	825	1,090	1,323	1,170
Total	988	982	800	831	1,097	1,329	1,176
By destructor plant, waste heat, etc.—							
Authorised undertakings:							
Public authorities	13	16	15	8	6	5	4
Companies	100	102	97	61	52	42	42
Railway and transport authorities	1	1	1	1	1	1	1
Total	114	119	113	70	59	48	47
Total—Authorised undertakings:							
Public authorities	13,143	14,340	15,971	17,977	19,607	20,225	21,480
Companies	11,229	12,069	12,802	14,383	16,047	16,726	16,883
Railway and transport authorities	1,336	1,324	1,203	1,217	1,249	1,266	1,286
Total	25,708	27,733	29,976	33,577	36,903	38,217	39,649
<i>Materials used for generating electricity (thous. tons)—</i>							
Coal	14,927	15,925	18,112	20,435	22,283	22,599	24,074
Coke	183	235	258	275	320	318	337
Coke and coke breeze	20	19	26	20	18	14	18

*Number of stations (owned by authorised undertakers) generating electricity during 1944 was 345. There were also fourteen generating stations operated by railway and transport authorities.

The course of mechanisation is indicated by Tables 7 and 8. Although the quantity of coal cut by machinery in 1944 was the lowest for seven years, the proportion of the total steadily rose from 59 per cent. in 1938 to 72 per cent. The same is shown for coal loaded and conveyed by machinery; the proportion increased from 54 per cent. in 1938 to 69 per cent. in 1944. As regards electrical equipment, Table 34 gives the number of mines at which this equipment was installed at June 30th, 1944, as 1,394, compared with 1,412 at June 30th, 1938. Nevertheless the number of electric motors installed rose from 55,555 to 65,326 and the aggregate HP from 2,229,335 (1,190,358 below ground) to 2,485,101 (1,333,937 below ground.) In the mines, the greatest increases occurred in haulage (from 474,177 to 520,251 HP), pumping (from 431,722 to 449,471 HP), conveyors and loaders (from 70,767 to 102,337 HP), and coal-cutting machines (from 170,512 to 199,801 HP). Above

these and they sold only 32.2 million therms. In the three lowest classes, up to 100,000 therms, there were 328 undertakings which were responsible for only 12.7 million therms. The number of people employed fell from 124,689 in 1938 to 102,060 in 1943.

Electricity supply is dealt with in four tables. Nos. 16 (slightly abbreviated) and 17 are reproduced; No. 19 appeared in our last issue. Table 18 deals with employment and shows that the total number of people employed was reduced from 120,731 at March 31st, 1938, to 89,944 at January 1st, 1944; the number of female employees increased from 7,111 to 14,182. The total capacity of generating plant installed at the end of the year 1943-44 is given as 11,974,000 kW and the aggregate value of the individual maximum loads on generating stations during 1944 as 10,435,000 kW.

The total amount of coal sent to electricity works from each area is set out in Table 45. It shows that the total for all coalfields was 23,489,400 tons, about half of which (11,616,000 tons) comprised dry slacks and smalls; there was also 5,280,000 tons of washed slacks and smalls, 2,363,000 tons of graded coal, and 2,259,000 tons of opencast coal. The total amount of coal of all grades distributed to gas undertakings was 20,746,800 tons.

CLASSIFICATION OF GENERATING STATIONS (1944)
(Table 17)

Group (kWh generated)	Number of stations	Generated by each group (thousand kWh)
Up to 50,000	38	630
50,001 to 100,000	16	1,061
100,001 - 250,000	27	4,741
250,001 - 500,000	17	6,185
500,001 - 1,000,000	16	12,077
1,000,001 - 2,500,000	35	56,365
2,500,001 - 5,000,000	21	79,514
5,000,001 - 10,000,000	20	138,626
10,000,001 - 25,000,000	30	495,501
25,000,001 - 50,000,000	22	692,396
50,000,001 - 100,000,000	22	1,690,964
100,000,001 - 200,000,000	24	3,654,151
200,000,001 - 500,000,000	33	10,480,648
500,000,001 - 1,000,000,000	16	11,042,359
Over 1,000,000,000	7	10,007,568
Total	345	58,363,146

ground, motors used in winding increased from 174,646 to 200,409 HP; for ventilation from 128,321 to 138,856 HP; for haulage purposes from 89,225 to 94,525 HP; and for coal cleaning and screening from 227,607 to 252,046 HP. Miscellaneous uses accounted for 465,328 HP, against 419,172 HP in 1938. Table 67 analyses these figures for the different mining areas.

Tables 12 to 15 contain statistics relating to the gas industry and show that output available increased from 1,659 million therms in 1938 to 1,924 million 1944 (provisional figure). The total sale of gas for 1943 is given in Table 13 as 1,683.9 million therms; there were 1,049 separate undertakings. This table reveals that of the total ten undertakings selling over 25 million therms each were responsible for 640.2 million therms. The largest number of undertakings was in the 100,001-250,000 therm class; there were 246 of

Electronic Cookers

Some American Comments

MANUFACTURERS of orthodox electric cookers need not, it seems, worry unduly at the moment about being put out of business by the development of the electronic cooker. Despite the great speeding up of the cooking process, results are, to say the least, somewhat patchy, different foods placed in a high-frequency oven responding in entirely different and sometimes unexpected ways. Tests mentioned in *Electrical Merchandising* show that a thoroughly mixed sausage cooks pretty well but with steaks (apparently still obtainable in America) the fat burns before the lean is cooked. Chicken bones char before the outside is done, while experiments on bread produced a loaf "with the crust on the inside." No wonder the journal described it as "inside out cooking." Also it is pointed out that caramelising of sugar and the searing of steaks have much to do with the flavour. In case the would-be user of the new cooker is not yet sufficiently discouraged it is mentioned too that a 5 to 10-kW equipment would be required as a substitute for the present cooker and, with a 50 per cent. efficiency this would require an input of 20 kW, for which the average home is not wired. Some idea of the cost can be gained from the fact that a 500-W apparatus costs nearly \$1,000.

CORRESPONDENCE

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

Circuit Diagrams

STANDARDISATION of catalogue sizes is being advocated by your correspondents, but I believe that standard circuit diagrams would be as widely appreciated. I have had to use numerous manufacturers' diagrams for the connection of electrical equipment and some are a veritable maze.

Only a few manufacturers supply a schematic arrangement with the complete wiring diagram, and I know of only two that can be read easily by the labour available to-day. In these all the switches in the control circuit operated by any one closing coil are arranged vertically above and or below that coil. The main load circuit connections, to the switches and external circuits are given in a separate schematic diagram. It is also an advantage to have the contactor sequences tabulated in the same way as for DC traction equipment.

All these methods are used by different firms to a greater or lesser degree, and standardisation would be only a matter of choosing and collating the most promising.

Chesterfield.

A. JONES.

Non-earthed Appliances

IN spite of "Reflector's" somewhat sarcastic remarks on the E.C.A.'s proposal to warn consumers of the danger in using non-earthed appliances, the problem remains one of major importance, and, if electricity is to be chosen as the universal source of pleasure in the home, its only drawback—that sinister danger of shock—must be eliminated. So long as accidents occur and receive the inevitable publicity in the daily press, the consumer will treat electricity with a suspicion which is not exactly to the advantage of the electrical trade.

The idea of issuing a warning by means of water-transfers on the consumer's appliance after repair is, perhaps, a little unfortunate. The consumer, who for practical purposes must be considered ignorant of electrical matters, will tend to see the business end first. To be effective, a suggestion of this nature calls for a less obtrusive approach and it must be backed by sound reason. The consumer will appreciate and read with interest an official note, signed by the contractor, explaining to him in basic terms why earthing is necessary and advising him in a polite way to have his appliance made safe.

To rule out the suggestion that this is "just a business trick," the note could take the form of an official advice from the Electrical Contractors' Association to users

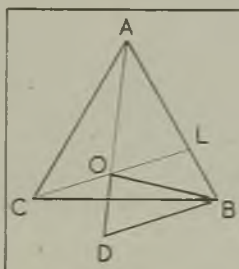
of electricity, submitted and signed by one of its members. This would not only serve the purpose of a justifiable warning, but it would also indicate to the consumer that he is receiving a reliable service.

Aylesbury.

F. S. ROSE.

Unbalanced Resistance Star Network

THE graphical construction for the solution of an unbalanced three-phase star resistance network given by Mr. Russell in the *Electrical Review* of May 25th, may be proved



more simply as follows: The sides of the equilateral triangle $A B C$ represent the line voltages. If O is the star point, then the phase voltages V_a, V_b, V_c are to scale respectively OA, OB, OC , i.e. $V_a = \alpha.OA, V_b = \alpha.OB$ and $V_c = \alpha.OC$. Produce CO to cut AB at L . Choose the current scale so that OB also represents the phase current I_b and $I_b = \beta.OB$. Draw BD parallel to OC to cut AO produced at D ; then the respective phase currents are DO, OB, BD , and $I_c = \beta.BD, I_a = \beta.DO$. The triangles AOL and ADB are similar; hence

$$\frac{AL}{LB} = \frac{AO}{OD} = \frac{\alpha AO}{\beta OD} = \frac{V_a}{I_b} = \frac{R_a}{R_b}$$

and similarly for the other sides.

It may be pointed out too, that the construction applies not merely to a network of resistances but also to any impedances of equal power factor. This follows at once from the above proof, since if the impedances are unchanged in value the triangle DOB remains the same in size, being merely turned through the power-factor angle.

Aberdeen.

E. WILKINSON, Ph.D.

I.E.E. Western Centre

THIS year's annual meeting and summer outing of the Western Centre of the Institution of Electrical Engineers are to be held on June 23rd. The outing will take the form of a visit of inspection to the engine factory of the Bristol Aeroplane Co., Ltd. It is hoped to arrange several types of conducted tours according to the requirements of the visitors, including tours of a purely engineering nature. Luncheon and tea will be provided and the charge per head, including transport, will be 12s.

Swedish Plant for Eire

IT has been reported in the daily press that a contract for the supply of heavy boiler equipment for a steam-operated peat-burning electricity generating plant at Portarlinton, Eire, valued at £70,000, has been given to a Swedish firm, the Stal Turbine Works, which is associated with A.S.E.A.

Inquiries made by our Dublin Correspondent in authoritative quarters establish that an order for a £70,000 turbo-generator for the new Clonsast turf-burning station was placed last year by the Electricity Supply Board with Asea Electric, Ltd., London. A part of this equipment is being manufactured in Sweden by an associated company and early delivery is expected.

In January last Mr. Sean Lemass, Minister of Industry and Commerce, thus epitomised the three stages of future power development: (1) The first step was the completion of the Liffey scheme. The plant for this was ordered from a firm in Great Britain and most of it had been delivered. A part of the scheme—Golden Falls—was in production. The delivery of the remainder of the equipment was expected at an early date. (2) The second step would be the bringing into production of the Clonsast station. The orders for the plant "were placed quite recently in Sweden." The capacity of the proposed station at Clonsast at its fullest development will be 24,000 kW (the installed capacity of the Shannon has been increased to 85,000 kW). It will consist of two 12,000-kW units, one of which will be installed at the beginning and the other when the mechanical equipment for the production of turf from the Clonsast bog to the extent required is available. (3) The third step in the post-war development will be the Erne. There are then two further extensions, of the Shannon and the Liffey, both comparatively small in respect of output and, after that, a further turf station. Replying to Deputies, who asked where the further turf station was likely to be located, Mr. Lemass said he could not say. So far as the E.S.B. was concerned "it can be any place in which there is a bog suitable for mechanised production of turf and an adequate water supply."

As regards the statement attributed to an English paper that the Eire Government has planned to spend more than £80,000,000 on electrification, it should be remembered that during the second reading of the Electrification Bill, Mr. Lemass estimated the total cost of the various projects at approximately £40,000,000. A few Deputies suggested that more than this, i.e., up to £60,000,000—might be spent "by order of the Minister." Mr. Lemass, correcting this misapprehension, made it clear that the Bill to start with only committed the Exchequer to advance to the E.S.B. £7,500,000 for generation and £5,000,000 for electrification purposes.

Erne Development Contract

The Electricity Supply Board is inviting tenders for the construction of a tail race for the River Erne development at Ballyshannon, Co. Donegal. The work comprises excavation of a channel, approximately 50 ft. wide, 20 ft. deep, and 4,200 ft. long in the bed of the river at Ballyshannon, and involves the removal and disposal of approximately 155,000 cu. yd. of rock and 50,000 cu. yd. of gravel or boulder clay. Forms

of tender, etc., are available from Mr. Patrick J. Dempsey, Secretary, Electricity Supply Board, 60-62, Upper Mount Street, Dublin, on deposit of 5 guineas which will be returned on receipt of a bona fide tender. Tenders must be received not later than July 30th.

"Operation Pluto"

THE Director-General of the Petroleum Warfare Department (Major-General Sir D. Banks) has conveyed his thanks to the County of London Electric Supply Co. and the Folkestone Electricity Supply Co. for the part which they played in the cross-Channel oil pipe-line scheme (described in our last issue).

The two companies designed the complicated l.v. networks at the coastal pumping stations and designed and installed the h.v. work. In addition the whole of the electrical installation at the special factory established in connection with the scheme was carried out by the companies.

Johnson & Phillips, Ltd., inform us that, besides supplying cable-laying machinery for "Operation Pluto," as mentioned in last week's *Electrical Review*, the company also made considerable quantities of the "Hais" cable employed.

The *Financial News* says that Switzerland is investigating the possibility of constructing an oil pipe-line network similar to that from England to the Continent, according to the Swiss Press. It is believed that an industrial bank in Switzerland will finance the project and will place orders for the equipment with English firms.

Forthcoming Events

Wednesday, June 13th.—London.—At Lighting Service Bureau, 2, Savoy Hill, 2 p.m. Associated Municipal Electrical Engineers. Annual general meeting.

Thursday, June 14th.—London.—Kingsway Hall, 10 a.m. Incorporated Municipal Electrical Association. Fiftieth annual ordinary general meeting.

Saturday, June 16th.—London.—Comedy Restaurant, Panton Street, S.W.1. Association of Supervising Electrical Engineers (N.W. London Branch). Annual luncheon.

Stratford-on-Avon.—I.E.E. South Midland Students' Section. Summer outing to see "Twelfth Night."

Tuesday, June 19th.—London.—Connaught Rooms, 5.30 for 6 p.m. I.E.E. Transmission Section. Informal dinner (tickets, 12s. 6d.).

Wednesday, June 20th.—London.—Waldorf Hotel. Fan and Allied Manufacturers' Association, 1 p.m. Luncheon, 2.15 p.m. Annual general meeting.

Wednesday and Thursday, July 11th and 12th.—London.—At Institution of Civil Engineers, 10.30 a.m. Iron and Steel Institute. Annual general meeting (postponed from May 9th and 10th).

Friday, July 27th.—Manchester.—Reynolds' Hall, College of Technology, 6.30 p.m. Institution of Electronics (North-West Branch). Lecture on "Rectifiers and Invertors," by Dr. F. Feinberg.

PERSONAL and SOCIAL

News of Men and Women of the Industry

CERTIFICATES and awards gained by students, apprentices and trainees under the Philips Mitcham Works industrial training scheme distributed recently by Mr. Chuter Ede, Parliamentary Secretary to the Ministry of Education. In the course of his speech Mr. Ede praised the training scheme and said that the Ministry of Education was watching the experiment with very great interest. He noticed from the lists that some had taken their degrees while still working in the factory and he regarded that as a contribution not merely to industry but to education as well. Mr. Ede was introduced by Mr. S. S. Eriks (managing director of the Philips Group) who was supported by Mr. T. E. Goldup, director; Mr. F. A. Kloppert, works director, Mullard Radio Valve Co.; Mr. van der Zee, works manager; Mr. G. A. Taylor, training supervisor, Mitcham Works; and Mr. H. A. Warren, Principal of Croydon Polytechnic.



Mr. Chuter Ede presenting certificates and awards to Philips trainees. Mr. S. S. Eriks (managing director, Philips Group) is seen on the right

In his report for 1944, Mr. Taylor recorded that steady progress had been made in the indentured apprenticeship course for craftsmen. An important part of the work had been the organisation and direction of technical studies not only for indentured and unindentured apprentices, but for other employees who wished to improve their technical knowledge. There was inaugurated during the year a day continuation school for juniors (14-16 years).

Mr. H. Warren, M.Sc., M.I.E.E., director of research and engineering to the British Thomson-Houston Co., Ltd., has been appointed managing director of the company upon the retirement of Mr. H. N. Sporborg.

Mr. H. F. J. Thompson, general manager and engineer of the Battersea Electricity Department, who was eligible to retire on pension three years ago, is retiring on September 30th.

Mr. P. M. Shears, sales engineer to the Hackney Electricity Department, retired last week after about thirty-four years with the undertaking.



Mr. P. M. Shears

After spending many years in New Zealand, Mr. Shears went to Hackney in 1911 and since that time has been responsible for extensive development work in the industrial and domestic fields. At a gathering of over a hundred of his colleagues, the borough electrical engineer (Mr. E. A. Mills) presented Mr. Shears with two travelling valises, a fountain pen and a

cheque and referred to his valuable work in advancing the cause of electricity during his long service. Other colleagues also paid tributes

and Mr. Shears in thanking them recounted some of the trials and difficulties which he had encountered in his earlier days.

Mr. A. B. Thompson has been appointed representative of Moffats, Ltd., Blackburn, and stockist and wholesaler for Northern Ireland. Mr. Thompson has had a great deal of engineering experience. His temporary office is at 9, Donegall Square South, Belfast, but new showrooms and offices will shortly be opened in Bedford Street, Belfast, near the City Hall.



Mr. A. B. Thompson

Dr. F. W. G. White, M.Sc., chief of the radio-physics division of the Council for Scientific and Industrial Research in Sydney, N.S.W., has been appointed assistant executive officer of the Council. Dr. White was formerly Professor of Physics at the Canterbury University College of New Zealand University.

Mr. Harold Hobson, chairman of the Central Electricity Board is leaving this week-end for a visit to the United States and Canada, where he will study recent electricity supply developments. He expects to be away for about a month.

Colonel J. C. Chaytor has been appointed a director of the North Somerset Electric Supply Co., Ltd.

Mr. T. R. Thomas, B.Sc., M.I.E.E., has been elected president of the South Wales Branch of

the Association of Mining Electrical and Mechanical Engineers for 1945-46. Mr. T. G. Dash, A.M.I.E.E., is first vice-president and Mr. E. W. Cooper, A.M.I.E.E., second vice-president.

Sir George E. Bailey, C.B.E., whose appointment as managing director of Associated Electrical Industries, Ltd., was reported in our last issue, has been chairman of the Metropolitan-Vickers Electrical Co., Ltd., since March last year. Sir George was president of the Engineering and Allied Employers' National Federation from 1940 to 1943 and he became Trustee to the Federation in 1943. He was also President of the Institution of Production Engineers from 1939 to 1942. Other offices which Sir George Bailey has filled include

the presidency of the Manchester District Engineering Employers' Association in 1926 and 1927 and member of the Beveridge Committee on Skilled Men in the Services, 1941. He is also president of the Manchester Engineering Council, hon. treasurer of the Manchester District Engineering Employers' Association and a member of the North Western Regional Board (Ministry of Production). During the war in Europe he was chairman of the Local Reconstruction Panel (Manchester Area) Emergency Services Organisation and a member of the Industrial Panels of the Ministries of Labour and Production. The honorary degree of M.Sc. was conferred on him by the Manchester University in 1942. He was knighted last year.

Mr. H. W. Hull has been appointed commercial assistant to the St. Pancras Electricity and Public Lighting Department at a basic salary of £450.

Mr. A. J. Bousfield has resigned from the position of power house superintendent of the Ford Motor Co., which he has held since 1931. He is succeeded by his assistant, Mr. J. J. Young, Associate I.E.E.

Mr. A. E. Jepson retired on May 31st after forty years' service with the General Electric Co. Ltd., for nine of which he has been manager in London of the Switchgear and Instrument Department.

The York City Council is advertising for a deputy city electrical engineer at a commencing salary of £771. The vacancy was caused by the recent death of Mr. E. M. Pearson.

Obituary

Mr. W. A. Pearman, general manager and secretary of London Power Co., Ltd., died at

his home at Esher, after a short illness, on May 30th, aged seventy-two. Mr. Pearman served the electricity supply industry in London for fifty-four years, having joined the Westminster Electric Supply Corporation in April, 1891. On the formation of the London Power Co., Ltd., in 1927, he was appointed general manager and secretary.



The late
Mr. W. A. Pearman

Mr. J. F. M. Bennett, A.M.I.E.E., whose death on May 26th, is announced, was from 1923 to 1933 a partner in a firm of electrical manufacturers, before which he was outside superintendent to the Metropolitan Electric Tramways. From 1894 to 1902 he was with the Electric Construction Co., Ltd. He studied engineering at the Finsbury Technical College and was apprenticed to the mechanical engineer to the Ipswich Corporation.

Americans and British Industry

Present Conditions and Future Prospects

SINCE the introduction by this country of a general tariff on manufactured goods in 1932, many American concerns have commenced manufacturing here or have contemplated doing so. The most successful arrangement adopted by these concerns was the assembly of parts imported from the United States. The war has made considerable alteration in the conditions which permitted this, and the present and possible future position is studied in a pamphlet, "American Participation in British Industry," published by the American Chamber of Commerce in London, Aldwych House, W.C.2.

This says that until there is a reasonable prospect of improved foreign exchange, particularly dollars, it is unlikely that unrestricted importation of manufactured goods will be allowed. British manufacturers will expect to be given time to re-establish themselves before new competitors are allowed in the field and it is anticipated that the British authorities will encourage the establishment of new manufac-

turing enterprises, especially if they result in decreased imports, thereby saving foreign exchange. The pamphlet reviews the position with regard to control of industry and labour. The form which businesses opened up by Americans in this country may take and the subject of taxation are also dealt with.

The conclusion is reached that while the restrictions which have been mentioned will continue for a time it would be unwise to assume that they will be a permanent feature of British Government policy. "Important sections of British opinion are fully convinced that no country stands to gain more from a free flow of international trade and a general lowering of barriers. Therefore any post-war restrictive measures should be regarded as temporary expedients to meet an emergency situation and constant pressure will be exerted towards their removal as soon as there is reasonable prospect of balancing Britain's external payments and receipts on current account."



Buoyant Cables

Electrical Detonation of Undersea Magnetic Mines

ONE of the magnetically-detonated sea mines sown by enemy surface craft or dropped by parachute from low-flying aircraft was uncovered by the receding tide on the Shoeburyness sand flats in the Thames Estuary during the night of November 22nd, 1939. Technicians from H.M.S. Vernon thus had their

first opportunity of preparing special non-magnetic tools for dismantling the mine, and thus revealing its mechanism and permitting calculation of the strength and duration of the electromagnetic field needed to "fire" the mine.

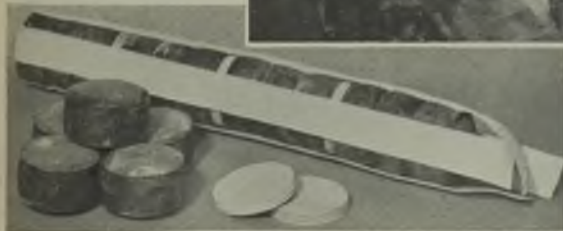
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of low-flying aircraft of the Wellington type fitted with a large metal loop intended to produce a magnetic field of sufficient intensity to explode any mines lying beneath as the aircraft flew low over the water. But a far more effective method proved to be the towage of an electrically energised cable, at first rendered buoyant by crude floats, but soon improved upon by collaboration between the Admiralty and makers of electric power cables.

The German mine of this particular type



Assembling buoyant cable centres and (left) the component parts comprising inflated rubber elements, wood reinforcing discs and longitudinal strengthening tapes



the submerged mines themselves. One of the attempts to destroy them was by means

is satisfactory only in relatively shallow water; it is detonated by the movement of a delicately-balanced magnetic needle, which is deflected by the approach of any considerable mass of ferrous material, such

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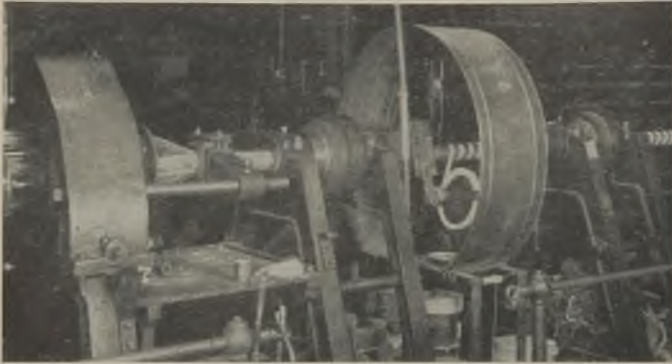
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as the hull of a ship. It explodes on the sea-bottom, but by reason of the fact that the path of least resistance to submarine pressure is vertically upward, the violence of

cable manufacturers were in a position to undertake its production. By the end of that month several experimental designs had been prepared and a small sample of the



Applying conductor wires to the buoyant centre

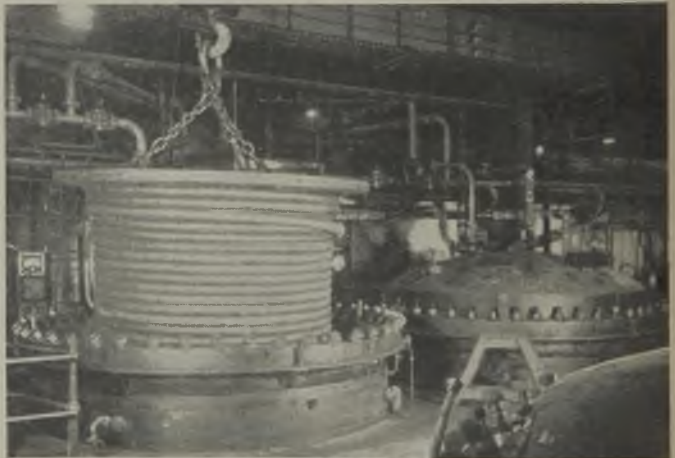
an explosion immediately beneath the keel will frequently "break the back" of the ship.

Normal methods of "sweeping" sea mines are of no avail in this case, since the magnetic mine cannot be raised from the sea-bed. But the "Double L" (longitudinal) sweep has proved to be an effective means of creating a sufficiently powerful magnetic field within the radius of sensitivity of the submerged mine to cause it to explode harmlessly behind the sweeping ships, which are provided with "de-gaussing" belts.

The sweeping ships proceed on a parallel course, each towing a long "tail" of self-buoyant cable. The power is generated in the towing ships, stored momentarily in a manner not yet fully explained and passed through the buoyant cables in a succession of surges, the current of several thousand amperes passing through the sea water between the parallel conductors, thus completing the AC circuit.

When, by the middle of December, 1939, the Admiralty called for a conductor capable of floating on the surface of the sea very few

building-up of a potentially satisfactory product while arrangements were being made for its manufacture on a production scale. Meanwhile on Christmas Day, 1939, Dr. P. Dunsheath (director and chief engineer) conceived the idea of utilising cylindrical "tennis balls" as the core of a buoyant cable. By the middle of January, 1940, that modified design had been found satisfactory and an order was received for a number of complete sets. A fortnight later the first



Cable entering curing vessel

production length was delivered and from that date onward, although some detailed

most promising was manufactured by W. T. Henley's Telegraph Works Co., Ltd. The following day an order was received from the Admiralty for a length suitable for sea trials, which was to be delivered not later than January 10th, 1940; actually it was made available in six days.

The earlier designs were not necessarily the best, since existing machinery had to be adapted to the

modifications in the design have been made, the construction of buoyant cable in Henley's factories has been continuously carried on.

The cable itself incorporates a number of ingenious features. It has to be flexible, float on the surface of the water and contain a fairly large cross-sectional area of copper in order to carry the large current necessary to detonate the mine satisfactorily. The Henley design was achieved by mobilising the combined resources of the Henley cable factories and Henley's Tyre & Rubber Co. In peacetime the latter produced very large quantities of tennis balls and the machinery for that purpose was rapidly adapted to make many millions of inflated cylindrical rubber



Preparing end terminations on a pair of finished cables

satisfactory operation. As time went on and the Admiralty was able to bring other types of vessel into service for this class of minesweeping, the types of buoyant cable supplied resolved themselves into three patterns for use by fleet minesweepers, trawlers and drifters. The main variant was not in the cable itself, but in the lengths employed, since they had to be modified to a considerable extent to suit the speeds of



Electrode tails in course of assembly

elements which, together with suitable reinforcement, formed a buoyant centre on which the conductor wires and their insulation could be built, resulting in a cable of approximately $3\frac{1}{2}$ in. diameter.

During the war years many hundreds of complete sets, involving over 1,000,000 yd. of cable, have been constructed and put into



Applying covering to complete electrodes

vessels being used for dealing with the mines.

The combined resources of those firms which had been able to undertake this work initially were insufficient to meet all requirements. Consequently Henley's and Callender's Cable and Construction Co., Ltd., which had also developed satisfactory designs of cable based on the materials and facilities available in its own factories, were both requested to furnish details of their respective designs to other interested cable makers on both sides of the Atlantic.

The production of the buoyant cable itself does not represent the whole story. Two lengths, one short and one long, are used behind each of the minesweeping vessels in service. In addition, however, means had to be provided to enable the current in the conductor to leave and return in accordance with the stated requirements of the Admiralty. That involved the manufacture of large quantities of copper electrodes and the necessary fittings.

In the early part of 1941 a further demand was received from the Admiralty for an entirely different type of buoyant cable, of much smaller sectional area for an entirely different purpose. In this case Henley's were able to provide samples within a few

days, as it so happened that one of the original designs initially prepared for the main buoyant cable was readily adaptable. In this case rubber elements are not employed, but buoyancy is obtained by stranding the conductor on to a fairly large diameter steel spiral having plugs inserted at intervals so that the cable centre does not become completely flooded in the event of damage to the external sheath. This type of cable is not towed behind a vessel but is intended to be manhandled and used in the form of a complete loop, so that end-fittings in this case are not of great importance.

In the earlier months of 1944 an entirely new service requirement arose which had to be satisfied in addition to the continued production of the large buoyant cable. The supply of these cables was very urgently required and for this reason after due consideration it was decided not to adopt the inflated elements, but to modify an alternative design of the large-sized cable which had been produced in some quantity, employing cork cylinders and expanded rubber. Although the service demands for this type were not so great as for the main cable, all essential requirements were rapidly met and gave complete satisfaction.

Baekeland Memorial Lecture

THE first of the Baekeland memorial lectures arranged by the Society of Chemical Industry was delivered in London on May 30th. MR. H. V. POTTER, who told the story of the inventor's life rather than his scientific and industrial achievements, remarked that few men had invented two entirely new materials and lived to see the names they gave to them become household words throughout the world.

Dr. Leo Hendrik Baekeland, inventor of "Velox" photographic paper and "Bakelite" synthetic resins, combined business ability with scientific achievement and, last year, died a millionaire at the age of eighty.

After a brilliant school and university career Baekeland came from his home town, Ghent in Belgium, to this country looking for greater scope. Having visited the Universities of London, Oxford and Edinburgh, he tried his fortune in the United States where he continued his research, particularly into photographic printing papers. After ten years, in spite of various vicissitudes, he invented a gaslight printing paper "Velox" which employed silver

chloride and established a small business to manufacture the paper. His paper became a serious competitor to the Eastman-Kodak paper, and eventually Baekeland sold out to Eastman-Kodak. Speaking of the deal years later, he said he obtained his million dollars.

At that time, 1899, he purchased a substantial house at Yonkers on the Hudson River where, after a refresher course in electro-chemistry in Germany, he established a new laboratory. After some successful work on the Townsend cell, he interested himself in the chemical reaction between phenol and formaldehyde. He discovered that by using small amounts of alkali as an accelerator, particularly ammonia which acted as a catalyst, he could control the process by spreading the reaction time and check the reaction at any stage by cooling. After five years' work, he filed his famous patent in the U.S.A. in February, 1907. Baekeland gave the name "Bakelite" to this new synthetic resin, and came to the conclusion that if it was to be successfully applied to industry it would be necessary to make the initial product himself and teach others, starting with a select few whose work he could watch.

Baekeland's sound financial position as a result of his "Velox" activities enabled him to establish his new "Bakelite" business in 1910 on a very solid basis. His work stimulated further research in this branch of chemical science, and he undoubtedly established the basis of the present plastics industry.



Dr. L. H. Baekeland

COMMERCE and INDUSTRY

Industrial Development Areas. Export Trade Research.

Import Licensing of Machinery

THE Board of Trade is now prepared to consider applications to import machinery and plant needed for the production of civilian type goods for the export trade, or required for important home consumption, where such machinery and plant cannot be obtained from home sources. The applications should be made to the Import Licensing Department, 1-6, Tavistock Square, London, W.C.1.

All-electric Aluminium Kitchen

The all-electric kitchen designed by Mr. Ernest R. Gilbert for middle-class homes (see *Electrical Review*, December 29th) is now on view at Selfridge's, Oxford Street, W.1, as part of an exhibition (open until June 30th) organised by the Aluminium Development Association to demonstrate recent progress made by the aluminium industry.

Comments on the design and equipment of the kitchen were made last week by "Reflector" in "Views on the News."

A brochure issued in connection with the exhibit invites visitors to place in order of importance the various features of the kitchen, e.g. cooker, dish-washer, refrigerator, waste disposal unit, ventilation, clothes washer, drying cupboard and dining alcove, and to suggest additional time- and labour-saving improvements. The "Poplar" kitchen in aluminium is another feature of the exhibition, as well as an aluminium washing-machine (Universal Boilers & Engineering Co.).

Location of Industry

Last week the Distribution of Industry Bill passed through the committee stage in the House of Commons after the deletion of Clause 9. This clause aimed at giving the Board of Trade power to prohibit the erection or extension of industrial buildings in areas where the Board considered that this was prejudicial to the proper distribution of industry throughout the country. Among the remaining clauses of the Bill is one empowering the Board to acquire land in "development areas" and prepare sites for the provision of factories and other industrial buildings. The Board may also make loans to non-profit-making trading or industrial estate companies and the Treasury may give financial

assistance to industrial undertakings in these areas by means of annual grants or loans. The development areas specified are North-Eastern, West Cumberland, South Wales and Monmouthshire and Scottish.

Power Stations for Russia

Orders now in process of delivery through the agency of the United Kingdom Commercial Cpn., Ltd., cover ninety-nine electric power plants with a total capacity of 750,000 kW. Thirty-three permanent stations from 1,000 to 25,000 kW have been ordered, and eleven producing 102,000 kW have already been delivered. In addition ten hydro-electric plants are being supplied, with a capacity of 55,000 kW.



All-electric aluminium kitchen now on view at Selfridge's

Of fifty-six mobile stations ordered, twenty-three are already in Russian hands producing 67,000 kW, the remainder being in process of manufacture or delivery. These mobile stations, of varying capacity from 1,000 to 5,000 kW, comprise trains of railway wagons consisting of a boiler unit, a power unit and one or more standard wagons carrying spares and accessories. The axle load is limited to 18 tons and the overall length of such a train may be 200 ft. Deliveries already planned total more than 100,000 tons weight of material.

New Philips Factory

It was reported to Hamilton Town Council at its last meeting that representatives of Philips Lamps, Ltd., had been inquiring into the possibility of erecting what would virtually be an

extension of the factory at present under construction at Wellhall Road. They had been given particulars with regard to the ground which they wished to acquire and other information. It had been made clear that the housing of the key men who would require to be brought to Hamilton was a matter of great importance. The Town Clerk reported that he had since had a communication from the Department of Health in which the opinion was expressed that everything should be done to assist the company to set up the factory in view of its long-term importance to Hamilton and to Scottish industry generally. The Department would be prepared to make an additional allocation of temporary houses. The Council agreed to accept this offer.

B.E.T.R.O. Registered

The British Export Trade Research Organisation was registered on May 18th as a company limited by guarantee, without share capital. Its objects are to conduct research, and to collect, exchange, publish and report on statistics and information (including those made available by the British and other Governments) relating to overseas trade, including transport services, communications, power supply, distribution, marketing, advertising, insurance and financial and other services; to promote, assist and encourage export trade, etc. The first members of the Council are I. Cooper (chairman), L. C. Gamage (deputy chairman), N. Moore (hon. treasurer), F. C. Burstall, W. H. F. Emmett, C. J. Harrison, G. Harrison, H. H. de B. Monk and G. M. Samuelson. The registered office is at Georgian House, Bury Street, St. James's, S.W.1.

The Need for Export Trade

Speaking at a luncheon of the American Chamber of Commerce in London last week, Sir Clive Baillieu, president of the Federation of British Industries, pointed out that in order to obtain essential food and raw materials Great Britain must export, whereas export trade was for the United States a means of maintaining employment and an outlet for her factories. British industry sought no privileged position. World prosperity was indivisible. British industry believed that private enterprise provided the best basis for a prosperous national economy. If we were to regain our export trade we must give full scope to the qualities of initiative, the spirit of adventure and readiness to meet changing demands and conditions which no State-controlled system could develop. But private enterprise must no longer wait upon Government direction; it must develop vigorously its own plans and ideas. It would be for the Government of the day to accept or reject them, or to say how far they did or did not conform to the requirements of national policy.

Manufacturing in India

An agreement has been completed between Kirloskar Brothers, one of the best-known engineering works in India, and British Oil Engines (Export), Ltd., acting on behalf of Mirlees, Bickerton & Day, Ltd., Petters, Ltd., J. & H. McLaren, Ltd., and Oil Engines (Coventry), Ltd. The engines manufactured by Fielding & Platt, Ltd., and sold under the name of "Petter-Fielding" are also included

in the agreement. Under the agreement, Kirloskar Brothers will extend their existing modern plant to enable them to manufacture every type of oil engine, ranging from 1½ to 1,500 BHP. Provision has been made for the exchange of technical information between the parties and for the training of Indian personnel in the factories represented by the group. Kirloskar Brothers have also entered into a similar agreement with the Brush Electrical Engineering Co. for the manufacture and sale of its electrical products in India.

The Scope of Plastics

At a luncheon given by the Institute of the Plastics Industry on May 31st at Grosvenor House, Lord Woolton, the principal guest, spoke of the chief incentives to progress in industry, which, he said, were by no means limited to the "profit motive," but included a natural wish to produce superior goods under conditions of free enterprise and to provide scope for men of capacity and integrity. He urged that more regard should be paid to things that unite than to those that divide.

Major S. Mohr referred to the vast and somewhat indefinite field covered by "plastics," mentioning that while twenty years ago the term embraced only four or five types, it now included more than a hundred, as a result of the joint work of physicists, chemists and engineers. Plastics was not just "ersatz" material but something that would be a great help to Lord Woolton in his reconstruction programme, provided materials and labour, particularly the latter, were made available. The membership of the Institute (the technical side of the Federation) was now 1,500—three times the pre-war figure. There would be a need to attract bright young men to the industry and he regarded it as a happy omen that Lord Woolton had been elected Chancellor of Manchester University. Mr. H. H. Lusty (chairman London and District Section), who presided, welcomed the immediate past-president Sir Arthur Fleming, the occasion presenting the first opportunity for the members as a whole to express their pleasure at the honour conferred on him by the King earlier in the year.

Contributory Negligence

A second interim report on the subject of contributory negligence prepared by the Departmental Committee on Alternative Remedies appointed by Mr. Herbert Morrison last year has been issued as a White Paper (Cmd. 6642). In its first report the Committee recommended that actions by workmen against their employers should be excluded from the new Bill to amend the law of contributory negligence in workmen's compensation, it having been argued that if the amended law were applied to such actions a heavy burden would be imposed on employers; that the number of workmen's actions would increase; and that the actions which now failed would in part succeed.

In the second report it is recommended that actions by workmen against their employers should not be excluded. The Committee recognised that an additional burden would be imposed on employers by applying the amended law to such actions, but says it can be argued that the burden is not likely to be heavy. Where an employer has been negligent and a workman

has been injured, no Court applying the existing law is anxious to hold that the workman's claim is defeated by his contributory negligence. The workman's conduct is judged leniently, and actions succeed even when the workman has been guilty of some imprudent act. If the law is amended, the Committee states that it would expect reduced damages to be awarded in some cases where to-day, the defence of contributory negligence being rejected, the workman's claim wholly succeeds. If the law of contributory negligence is amended, it should be applied immediately to actions brought by workmen against their employers and not be postponed until the introduction of the National Insurance Scheme and the repeal of the Workmen's Compensation Acts.

Selling Prices of Raw Mica

In order to bring its selling prices of mica more closely into line with its current purchase costs, the Ministry of Supply has increased the prices at which mica is sold by its agents, Mica Distributors, Ltd., for United Kingdom consumption. The prices of all mica, except splittings and scrap (for grinding), have been raised by 50 per cent. on recent levels; the prices of mica splittings have been raised by 33½ per cent.; prices of scrap (for grinding) remain unchanged. Any inquiries concerning these prices should be addressed to Mica Distributors, Ltd., Provincial House, 98-106, Cannon Street, London, E.C.4, or to the Ministry of Supply, Mica Control, Euston House, Eversholt Street, London, N.W.1.

Developing Tool Exports

To develop export sales the British Engineers' Small Tools & Equipment Co., Ltd. ("Bestec"), Buckingham House, Buckingham Street, London, W.C.2, has been formed by a group of precision engineering companies, including the Brooke Tool Manufacturing Co.; the Coventry Gauge & Tool Co.; A. A. Jones & Shipman; F. Pratt & Co.; Taylor, Taylor & Hobson; and E. R. Watts & Son. Mr. H. H. Harley, chairman and managing director of the Coventry Gauge & Tool Co. is chairman. While the company offers a complete export sales service, members retain their own goodwill and identity in overseas markets.

Training for Careers

To assist in the resettlement of men and women released from the Forces or other forms of war service who possess qualifications or latent capacity for "higher appointments," the Ministry of Labour and National Service has prepared a general handbook and a series of pamphlets entitled "Careers for Men and Women," giving information about professions and callings for which further education or training beyond the secondary school standard is normally necessary. Details are given of the training required for each career and the prospects of employment after training. With regard to electrical engineering it is stated that it is expected that the demand for qualified electrical engineers will be substantially greater than before the war. The inflated demand for electrical engineers on the radio side may be expected to decline, but this decrease will be more than counterbalanced by the continued expansion in other branches of electrical

engineering. It is suggested that some of those who have received specialised training in the radio side during the war should turn to the other branches of electrical engineering, such as power supply.

A revised leaflet has also been issued explaining the Further Education and Training Scheme under which financial assistance may be provided to enable suitably qualified men and women who have been engaged on work of national importance to undertake or continue further education or training.

Coal Production and Prices

In the House of Commons on May 29th Major Lloyd George, Minister of Fuel and Power, moved the approval of the Coal (Charges) (Amendment) (No. 1) Order which increases the levy on the price of coal by 3s. per ton. He said that the Government had decided that a central authority should be appointed by the Ministry of Fuel and Power to insist that the necessary measures for improving the efficiency of the industry should be taken. It was the policy to preserve the incentive of free enterprise, at the same time safeguarding industry from political interference with its day-to-day management. The authority would also see that the essential improvements recommended in the Reid Report were carried out.

Trade with South Africa

One of our subscribers informs us of the opening of a retail and distributive business in South Africa with headquarters in Durban. He is proceeding to Durban shortly and wishes to obtain an agency or sole importers' business in respect of household equipment and appliances. We shall be glad to pass on any communications from readers.

Steel-Tank Rectifiers

With reference to the report on the discussion under the above heading in the *Electrical Review* of June 1st, Mr. J. L. North has pointed out that his remarks related to high-voltage grid-controlled glass-bulb rectifiers only and that the number installed for broadcasting in 1938 was two and not one. The description of these as "water-cooled" was due to a clerical error.

Trade Publications

British Insulated Cables, Ltd., Prescot, Lancs.—Illustrated pocket-size booklet (M.117) in stiff cover specifying the tools and materials used for, and describing in detail the method of, repairing colliery trailing cables containing multi-cores which are individually screened, including the final use of a B.I. electric vulcaniser.

Trade Announcement

The Leeds and Birmingham service offices of Benjamin Electric, Ltd., have recently been removed to new and more convenient premises at 49, Basinghall Street, Leeds, 1, and 9 & 10, Victoria Buildings, 5, Corporation Street, Birmingham, 2.

Change of Name

As was foreshadowed in the company's last annual report, the Enfield Cable Works, Ltd., has changed its name to Enfield Cables, Ltd.

Localising L.V. Cable Faults

Discussion on Mr. J. H. Savage's Paper

OPENING the discussion on the localisation of faults in low voltage cables (MR. J. H. SAVAGE's paper on the subject was summarised in our issue of May 11th) at the Transmission Section of the Institution of Electrical Engineers last week, DR. P. DUNSEATH (W. T. Henley's Telegraph Works Co., Ltd.) remarked that the methods described were ingenious and novel. At one time, with the loop test, one was satisfied with an accuracy within hundreds of yards on long lengths of cable, but the author got within an inch—a great advantage in cable manufacturing works. There might possibly be other applications of the inversion of the Wheatstone bridge, apart from cable testing.

MAJOR L. G. DUMFORD (Ministry of Supply) said that while the spark test was becoming very much more popular in cable factories, it was only an empirical test. B.S.7 catered for only certain types of rubber insulated cables; there should be a comprehensive investigation into spark testing before it was extended to other sizes and types. It would not be correct to adopt the test without modification to new types of synthetic rubber cables.

Evidence of Accuracy

MR. J. G. PARK (Northmet Power Co.) said that the methods described had possibilities when applied to power mains when there was no external fault evidence. In 72 fault locations on 11-kV and 33-kV cables, he had found the degree of accuracy of localisation to be 0.12 per cent. of the fault position, expressed as a percentage of the length.

MR. A. J. GOOD (Johnson & Phillips) showed some slides relating to twin cables and said that the balanced capacity method was only suitable for such cables.

MR. D. P. SAYERS (Birmingham) said that his experience of search coil methods had never been very satisfactory on a city distribution system owing to pipes in the neighbourhood. In Birmingham the fall-of-potential method had been employed, but using rectifiers instead of batteries, with more satisfactory results. A troublesome type of fault was the high resistance fault on 33-kV cables and he asked if the author had used the Goodings flashmeter test, with which he himself had had good results on several occasions.

MR. F. S. SMITH (Callender's) emphasised the need for standardising the names of the various fault localising methods. The author did not make a proper distinction between "fall of potential" and "drop in sheath" tests. The author's fig. 9 was really the inverted form of "search-electrode con-

ductor break locator" and not the normal method. The distinction between them was that in the former the source of testing supply was applied between the faulty conductor and earth, whereas in the inverted form the detector was in this position. The author might have made reference to the inverted form of Murray-loop test as it was suited to factory work. A fairly accurate location could be obtained on a high resistance fault, thus limiting the length which had to be explored by probing the sheath. Inverted forms of test were suitable only for factory testing.

MR. T. R. SCOTT (Standard Telephones & Cables) remarked that wave reflection methods were proving extremely interesting for investigating faults of the dead-short or high-resistance types; with skilled operators and skilled interpretation they would save a great deal of trouble. A little native ingenuity had often proved more efficacious in locating faults than intricate devices.

DR. A. ROSEN (Siemens Bros. & Co.) said a case had been mentioned where the accuracy of localisation was ± 1 per cent. in a submarine cable and the impression was given that it was intentional. While agreeing that it was very useful to be able to detect a fault with that degree of accuracy, the real point was how it was going to be repaired. It would be very nice to be able to supplement the more usual methods adopted on l.v. cables by some method which was independent of the measurement of length because at present, when one gave instructions for the cable to be sawn through, there were always doubts whether the right place had been located.

Author's Reply

The Author, replying to the discussion, said it was the fact that spark testing had proved itself during the war. The main reason why it had not been adopted on a large scale was that it meant a rather large winding gear. There was also a mechanical problem in the design of the electrode, but there was one "in the offing" which it was hoped would be more efficient. He had used the balanced capacity method a good deal, but a method which could only be used on twin cables was not much good in a cable factory and therefore he thought the alternative method described in the paper was the better. The Goodings flashmeter was rather outside the scope of the paper. No modification of the Murray loop test could do what could be done with correct search methods, which could also be used on buried cables.

Manchester Exhibition

E.D.A. Display Adaptable to Locality

ON May 29th the North West England and N. Wales Area of E.D.A. opened an "Electricity Looks Forward" exhibition at the Kendal Milne Store, Manchester. The exhibition will continue until June 19th, when it will be dismantled for a tour in the north-west country commencing with Chester on July 12th. Provision has been made to expand the industrial portion of the exhibition and limit the agricultural, or *vice versa*, according to the character of the town in which it is staged. Co-operating in the exhibition are 22 supply authorities and about 60 electrical firms.

Four full-scale electric kitchens are on view, together with a kitchen-bathroom unit and advance models of various domestic appliances. In addition, sections are devoted to new equipment for farm and factory, including a good deal of plant suitable for industrial and school canteens. Two of the kitchens were constructed by the St. Helens Corporation Electricity Department, and an all-steel kitchen produced by Moffats, Ltd., in conjunction with the Blackburn Electricity Department, is built up in units.

The new "North-West Kitchen," embodies the ideas of many of the 4,000 housewives who indicated their preferences in the questionnaire undertaken by the E.D.A. North West Area a few months ago. In a space of 95 sq. ft. are installed a 4-cu. ft. refrigerator, vertical type cooker (with oven thermostat), kettle and over-sink water-heater. A circulator-type immersion heater is fitted into the bathroom hot-water cylinder. A utility room accommodates a washing machine and drying cabinet.

The range of electric farming exhibits on view include a hammer-mill, steriliser, milking machine, water pump, milk cooling unit, bottle-washing plant, and electrode boilers. The main features of a section devoted to electric baking and canteen equipment are a double deck baking oven, cake mixer, pie press with electrically heated platen, two-pan fish fryer, steaming oven, etc. Chief amongst the industrial exhibits is a high-frequency (12-15 million cycles per second) furnace employed for plastic moulding. An electric-cum-mechanical device

for converting high speed rotary into slow speed reciprocating motion, electric contact heating devices, space heating units, arc-welding equipment and portable tools are also to be seen.



Combined kitchen-bathroom unit

In a small room labelled "Generation-Distribution" are exhibits lent by the C.E.B. and a large map showing the positions of thirty-two generating stations in the North Western area is accompanied by a diagram illustrating the fact that the projected generating capacity in 1948, will be 67 per cent. greater than it was in 1939. There is also a model of a 30,000-kW set.

Lord Brabazon opened the exhibition and other speakers at the opening ceremony were Ald. Sir W. Walker, Mr. R. A. S. Thwaites, Mr. C. D. Taite and Mr. W. H. Metcalfe.



The agricultural section of the "Electricity Looks Forward" Exhibition

Electrical Contact Springs

Choice of the Best Materials

INTRODUCING a discussion on contact springs at a meeting of the Radio Section of the Institution of Electrical Engineers last month DR. L. B. HUNT and DR. H. G. TAYLOR pointed out that the characteristics on which the design of a spring was based were generally the pressure required to secure a satisfactory contact and the amplitude of the movement from the unstressed position. The materials most often used were nickel-silver, phosphor-bronze or beryllium-copper; and sometimes cadmium-copper, chromium-copper or brass were used. The limiting features were the stress induced in the material and whether it would withstand the corrosion conditions which existed. For static loads it was possible to compare materials on the basis of their proof stress, which gave a permanent set of 0.1 per cent., though the working stress should be less.

Degree of "Springiness"

"Springiness" depended on the ratio of maximum safe operating stress to modulus of elasticity. For this reason copper alloys with a modulus less than two-thirds of that of steel were in many cases more suitable. Beryllium-copper was the most springy of the possible materials, followed by phosphor-bronze. Copper was the least springy, owing to its low proof stress.

Precipitation-hardening alloys, such as beryllium-copper, had the advantage that their best properties were produced by heat treatment and any necessary forming could be done first. With non-heatable alloys on the other hand, the degree of forming was limited by the permissible sacrifice of spring properties. The minimum permissible radius of right-angled bends varied with the type of material, with its hardness, and with the direction of the bend with respect to the direction of rolling of the material. A summary of a large series of tests was given in a paper by the openers entitled "Electrical Contact Springs" published in the *Journal*, 1945, Vol. 92, Part III, p. 38.

In many cases the material of which a contact spring was made was suitable for the actual contact, but where pressures were light and a very low contact resistance was required, special materials must be employed. Platinum, rhodium and gold gave complete resistance to tarnishing. For particular circumstances, silver was a valuable contact material, but it was unsuitable in the presence of sulphur compounds. Electro-deposition of contact materials was widely used and was the only practicable way of using rhodium,

in addition to being entirely free from tarnishing at ordinary temperatures, possessed remarkable wear-resisting properties.

The discussion which followed made it apparent that the current practice of leaving the choice of alloy composition and cold-working temper to the judgment of the metal manufacturer, after showing him drawings of the part to be produced, did not altogether find favour with component manufacturers, who called for more detailed methods of specifying physical properties in order that tests might be devised to check the uniformity of successive batches of raw material. The metallurgists, on the other hand, thought that tests of modulus, proof stress and Vickers hardness were sufficient to control the product.

Difficulties in working some of the modern spring alloys were discussed; for example, change of shape during heat treatment and the possible deterioration of silver plating on re-entrant surfaces which had to be plated before forming and heat treatment. The former might be overcome by "nesting" and wiring parts which would fit together to give mutual support; otherwise jigs would have to be devised. Normally, the temperature required for heat treatment should not affect silver plating; if it did, the solution was to use bimetallic strip.

Platinum as Standard

The performance of platinum in relay contacts could still be regarded as the standard by which other metals should be judged. Gold alloys with silver, nickel or zirconium had been used in enemy countries, but were in the nature of a substitute. In high-speed telegraph relays a palladium-copper alloy gave greater freedom from cratering and pick-up. This alloy also gave good results in contact with nickel-chromium wire. Rhodium-plated phosphor bronze or beryllium-copper contact arms were also successful in this application. Rhodium was an excellent contact material for use in r.f. circuits in which a low and uniform contact was essential. Platinum and palladium had been used, but were inferior to rhodium from the point of view of mechanical wear. Silver-to-silver contacts were useful when good wiping action could be provided. For slide-wire contacts rhodium-to-rhodium or rhodium-to-silver gave good results.

The chairman, Mr. H. L. Kirke, said that the subject, although somewhat specialised, was of first importance as there were few operations in radio engineering which did not involve the use of spring contacts.

Manufacturers' War Work—V

High Level of Production at Hebburn

Sound-locators, guns, fire-control apparatus, tank sprockets, Bailey-bridge parts, rocket projectors, remote-control apparatus, pre-fabricated wireless cabins and astrographs are only a few of the items produced by A. Reyrolle & Co., Ltd., during the war years.

WORK on Reyrolle's first weapon of war, an anti-aircraft sound-locator, began as far back as 1937. Production started in 1938 and continued until 1941, when there was a change-over to the "GL" type of equipment, which incorporated an early form of radiolocation. Another pre-war contract was for the No. 3 predictor for the Bofors 40-mm. gun. Between 1940 and 1945 upwards of 1,600 of these were produced, and so impressed was the Ministry of Supply by the system used that when it was faced with the need for an urgent general expansion of production it decided to adopt the Reyrolle methods complete, and asked the company to prepare a 10-volume treatise to enable a number of sub-contractors to manufacture on the same lines. Copies of the treatise were also sent overseas to assist production in Canada and Australia. Later, work was done on the No. 7 predictor.

For the past three years there has been a large production of 2-in. "Magslips," an instrument used in practically every form of fire-control equipment. Another item of fire-control apparatus developed and produced at Hebburn was a time-of-flight indicator for use in coastal-defence gunnery. The purpose of the indicator is to assist in the observation of the fall of shot, and it incorporates a number of electric time-delay mechanisms similar to those used in some of the Reyrolle protective apparatus.



2-in. bomb-thrower

Within three years of receiving its first contract for Bofors 40-mm. gun-mountings in 1940, the company assembled and completed ready for operation no fewer than 1,580 equipments. In 1941, at the request of I.C.I., the company started producing the Blacker bombard spigot mortars, and also

took an active part in the production of smoke-bomb throwers for tanks, 8,000 being made, and of 20-mm. universal mountings, for which plant was set up capable of turning out 500 a month. Later, production of twin six-pounder A.A. mountings was begun.

In connection with Bofors guns, about sixty special instructional 40-mm. mountings were made for training gunners both in Great Britain and overseas. Apart from manufacturing the complete equipments referred to above, the company undertook sub-



Time-of-flight indicator

contracts for the machining of parts for a number of other gun-mountings, for example, cradles for the 17-pounder and legs for the 4.5/5.5-in. gun howitzer.

By manufacturing a large and varied number of components, the company has also contributed in no small way to the production of armoured fighting vehicles. Flame-cutting and flame-hardening technique was successfully developed for making sprockets of tanks and other track vehicles, over 100,000 of various types having been produced.

The welding department has turned out several thousands of fabricated track-adjusters, track-adjuster supports, and bogie-wheels, together with a varied assortment of brake levers, accelerator pedals, ammunition boxes and other articles, and the machine shops have handled a large variety of parts, the chief of which are tank turrets, tank-turret racer-tracks, bogie frames, and revolver-ports.

Bailey-bridge parts have also formed an appreciable proportion of the load in the

fabricating department during the last three years. In addition to large quantities of end-posts, some hundreds of thousands of flame-cut and machined components have

Remote power-control equipment for naval mountings covers another range of products on which the company is busily engaged, and the equipment which is being manufactured is applicable to a number of types of gun mountings. Most of the contracts include the testing and commissioning of the equipment aboard ship.

As an important contribution by the company to the anti-U-



All-welded steel cradle for two-pounder pom-poms in course of manufacture

boat campaign, over fifty complete prefabricated wireless cabins for installation in frigates and corvettes have been assembled, sound-proofed and equipped ready for use. The completed cabins weigh about 15 tons each, and are split in halves for transport purposes.

been supplied on sub-contract to other companies for welding up with complete bridge units.

As an example of a rush job, the production of a 2-in. rocket projector, firing sixteen rockets at a time, may be mentioned. Arrangements had been made by the Admiralty for a Midland manufacturer to make the apparatus, but his factory was put out of action by bombing, and all the blueprints, etc., were lost. Within three and a half weeks of the designer's

At the request of the Admiralty, the company has initiated and maintained an organisation to deal with repair of equipment from ships undergoing refit. The facilities

A typical collection of pumps and other machinery from the damaged engine-room of one of H.M. ships, as received for repair



arrival at Hebburn the first equipment was being tried out on the range.

Reyrolle's facilities for work of high precision and quality were also utilised in making parts associated with naval gun mountings. As sub-contractor to gun-mounting manufacturers, the company has made sighting equipment for 4.5-in. twin mountings, training-receiver drives for 5.25-in. and 6-in. mountings, and gun-loading hoist cages for 14-in. mountings, and, as main contractor, it holds a contract for the overhaul and conversion from hand to power operation of a number of 4-barrel two-pounder pom-pom equipments, in connection with which it is of special interest that Reyrolle's designed and manufacture the all-welded cradle now being used.

provided are designed to handle the repair of specialised equipment outside the scope of the ordinary shipyard, such as would in normal times be returned to the makers. Originally, the organisation was intended to deal only with repairs of switchgear, but it was subsequently extended to include repairs of electric motors and generators, a mechanical repair section to overhaul pumps, compressors, and other engine-room

auxiliaries, and a section handling meters and instruments. The organisation now deals with practically anything that can be reasonably easily handled, and about 400 items ranging from desk fans to submarine motors, Diesel engines up to 150 HP, turbines, pumps, compressors, switchboards, starters, etc., are always under repair. The average time taken for a repair is about six weeks, a remarkable achievement when one considers the condition some of the apparatus is in after lengthy periods of submersion in sea-water.

For the Ministry of Aircraft Production the company has produced over 20,000 astrographs (an aid to navigation by the stars), some thousands of scanners (a radar instrument used when bombing through cloud), and large numbers of gyro gun sights, a special sub-factory being entirely engaged on the production of the last-mentioned item. Another sub-factory has been largely concerned with the production of variable pitch propeller hubs.

The company has achieved all this in addition to maintaining, at not much below pre-war level, an output of its normal products, which in themselves have played no small part in the maintenance and distribution of electricity supplies during the war years. In addition to meeting orders from supply authorities, the company has supplied large quantities of equipment to Government Departments for installation in dockyards, factories, airfields, and the like, throughout the world.

Birmingham Training Scheme

Power Engineers and Craftsmen

AS the largest municipal electricity supply undertaking the Birmingham Electric Supply Department represents the best possible training school for the electric power engineer; its activities range over a very wide field of civil, electrical and mechanical engineering subjects. Mr. F. W. Lawton, the chief engineer and manager of the Department, has sent us a brochure in which is described the way in which the advantages thus presented are to be put to the fullest use for the training of young men for employment in the electricity supply industry.

The scheme which has just been instituted caters for three classes of student:—Trade apprentices (elementary or primary school boys who wish to be trained for artisan employment); student trainees (boys of good secondary school standard who may ultimately take up positions on the engineering staff); and graduate trainees (young men with university degrees, or equivalent qualifications who may be regarded as potential candidates for the higher technical and administrative posts). The Department does not guarantee permanent employment at the conclusion of the training period, but undertakes to make every effort to fill suitable vacancies from apprentices and trainees who have successfully completed their course of training.

No fees or premiums are required from entrants; on the contrary they are paid during their training period on approved scales and enjoy the conditions laid down by the D.J.I.C. and the City Council. During the course apprentices and student trainees are granted one day a week or its equivalent for the purpose of attending instruction at a recognised college and they are expected to devote at least one night per week to this. If boys show the necessary aptitude they may be transferred to a higher class.

The brochure gives details of the courses which extend over five years for apprentices and student trainees and normally over three years for graduate trainees. The payments made during training are on a very generous scale. In addition brief illustrated particulars are given of the various departments of the undertaking.

I.M.E.A. Notes

Next Annual Convention

IT is stated in the May *I.M.E.A. Journal* that the Council of the Incorporated Municipal Electrical Association is to resume the holding of its annual conventions now that the war in Europe is over. It is hoped to hold the next one in 1946 under the presidency of Alderman Sir William Walker.

Domestic Appliances.—Representatives of the Association and B.E.A.M.A. recently interviewed the Minister of Works (Mr. Duncan Sandys) with a view to securing the release of labour to ensure the production of electrical appliances for installation in houses to be erected under the Government's housing scheme.

Maximum Demand Time.—The Central England Centre has drawn attention to the case of an undertaking whose maximum demand occurred in January at a time when the frequency was 2 or 3 per cent. below normal. The m.d. indicators are controlled by synchronous clocks and the undertaking claims that its bulk suppliers should make an adjustment in the account. As the subject is one which it is thought should be dealt with nationally it is to be considered by the Council's Bulk Supply Committee.

Coal and Charges.—In view of the recent further increase in the price of coal the Council proposes to wait upon the Electricity Commissioners with a view to securing permission for undertakings to make equivalent increases in the charges for electricity.

Coal Disputes.—As a result of recent discussions on the question of determining disputes relating to the price, quality, etc., of coal a committee (the Utilities Coal, Joint Committee) has been set up by the Conjoint Conference of Public Utility Associations and the Mining Association to deal with disputes.

Electro-Deposition Memoranda

The following Armament Research Department Electro-Deposition Memoranda are now released for publication:—No. 7.—Glossary of trade names for coating processes; No. 8.—Methods of analysis of nickel depositing baths. Copies can be obtained from the C.S.A.R. Liaison Officer, c/o S.T.A.M., R.1043 Shell-Mex House, Strand, W.C.2.

Heat on Tap

Hot-water Supplies from Public Mains

IN a public lunch-hour lecture delivered at University College, London, on May 29th, Professor R. O. Kapp discussed the advantages and difficulties of instituting systems of hot-water supplies from public mains. Advantages were reduction of drudgery, smoke abatement and coal preservation. The first two he regarded as the more important. Of 240 million tons of coal produced in this country in 1937, 12 million was used for the railways and 37 million for domestic heating (Egerton) mostly in open grates, which together were mainly responsible for discharging 3 million tons of soot annually into the air.

Adequate reduction of smoke nuisance would entail the burning of coal in large furnaces, where removal of particles and noxious fumes was practicable, and distributing heat in the form of hot water or steam. The large boilers employed would have an efficiency of about 80 per cent., but heat losses in distribution would reduce the overall figure to about 70 per cent.

Still greater economy would be gained if the generation of heat and electricity were combined, but this could be done only through lowering the efficiency of electricity generation. The exhaust from the turbines would then be taken for heating purposes at a higher temperature than the 100 deg. F. or so at which it now passed to the condenser at about 1/30th of atmospheric pressure, warming sixty times its own weight of cooling water to 75 deg. Less of the heat in the steam would then be converted into electrical energy. The reduction in output of electrical energy per lb. of coal would be only about 1/10 or 1/9 of the energy gain available for district heating and there would be a saving in coal of roughly one-third if heat and electricity were produced from a combined station.

On the basis of 37 million tons of coal used for domestic heating plus 15 million tons supplied as electricity in 1937, a total of 52 million tons would have been consumed at an average efficiency of about 25 per cent. Had central heating been furnished from a boiler in each house the efficiency would have been about 55 per cent. and about 20 million tons would have been saved. A further saving of

4 million tons would have accrued through the adoption of large boilers and heating networks. If electricity generating stations had taken over the district heating to their full capacity, there would have been a further saving of one-third of the 15 million tons of coal burned in them. Thus the 52 million tons would have been reduced to 23 million.

District heating would entail the laying of pipes in the street costing, where distances were not great, about £12 per head of population, so that it could be contemplated only for new housing and slum-clearance schemes and where extensive areas had been destroyed by bombing. Hence the total practicable fuel saving would be only a small fraction of the figures previously mentioned.

No data was available as to the amount of heat required under British conditions, so that the best designs of radiators and heat exchangers had still to be ascertained and the first installations would have to be regarded as experimental. Another point was that the tendency to waste heat when on tap might even outweigh savings due to the more efficient use of coal.

Station Near Load

The generating station would have to be close to the district to be heated to avoid prohibitive cost of transmission by pipes. Existing generating plant would not serve, but with the rapid expansion of the electricity supply industry, this objection might not be too serious. A further difficulty was the unknown and fluctuating ratio of heat to electricity demand. Surplus heat could be stored in not very expensive containers, but for short periods only. The most obvious solution would be for combined stations to run as much plant as was required to deal with the heat load and to import from the grid any electricity needed in excess of that generated.

This arrangement implied, however, that the requirements of district heating should determine where electricity should be generated, whereas the C.E.B. programme was governed by relative thermal efficiency of the stations. There would be a small loss of coal on that account in addition to complicating the generating plant programme. Combined generation would also complicate the accountancy of the electricity supply industry, which was at present simpler and more scientific than in most industries. Professor Kapp concluded that district heating should not even be attempted yet for most large cities but that it ought to be tried at once in the few places where it was practicable.



Professor R. O. Kapp

ELECTRICITY SUPPLY

New Ipswich and Preston Stations. Luton Rural Scheme.

Birkenhead.—**COST OF POWER STATION.**—Consultants have informed the Electricity Committee that as the result of a further investigation of the scheme for a proposed new power station on the banks of the River Mersey at Bromborough, they have had to revise the original estimate of £3,500,000. The new estimate is £4,291,000.

Cupar (Fife).—**ELECTRIC LIGHTING.**—The Town Council hopes to have the change from gas to electric lighting for streets and closes completed by next winter. The estimated cost is £6,000.

Edinburgh.—**FLOODLIGHTING GARDENS.**—A £12,000 floodlighting scheme for West Princes Street Gardens is being considered by Edinburgh Corporation.

Ipswich.—**NEW CLIFF QUAY POWER STATION.**—On Monday the Mayor, Alderman S. C. Grimwade, J.P., who is also chairman of the Electric Supply and Transport Committee, will drive the first pile of a new 270,000-kW power station which the Town Council is to erect for the Central Electricity Board on a site downstream of Cliff Quay, on the River Orwell.

Liverpool.—**PROPOSED TARIFF INCREASES.**—The City Council is being asked to approve the following increases in electricity charges: Private houses, consumption over 750 kWh per quarter from 0.3d. to 0.5d. per kWh. Offices, shops, hotels, cafés, licensed premises, over 20,000 kWh per quarter, from 0.4d. to 0.5d. per kWh. Water heating, from 0.3d. to 0.5d. per kWh. Alterations are also proposed in other sections of the tariff.

Loch Sloy.—**HYDRO-ELECTRIC SCHEME.**—The ceremony of cutting the first sod for the North of Scotland Hydro-Electric Board's Loch Sloy scheme is to take place on Monday. It will be performed by Mrs. Johnston, wife of the former Scottish Secretary, and it is expected Mr. Johnston will speak.

The ceremony will mark the beginning of excavation for the foundations of the little power station which will provide electricity for driving tunnels, mixing concrete, and lighting the works and the workmen's camps. It will take place in a field on the west side of the Loch Lomond main road, about $3\frac{1}{2}$ miles by road north of Tarbet.

London.—**CHANGE-OVER.**—While the South-west Electricity Committee is in favour of the principle of changing over the system it does not think that at the present time it should commit itself to a 20-year project as outlined in a report presented some months ago, its attitude being influenced by the uncertainty of the estimated future population based on housing conditions. It feels that a gradual change over would be possible by a series of short-term schemes, say for three years, and has asked the borough electrical engineer to report on the practicability of achieving the change-over in this manner.

Luton.—**ELECTRICITY FOR HAMLETS.**—The Town Council last week approved in principle a

scheme to supply electricity to every community of ten or more houses. Councillor A. W. Gregory said that at present a supply was available in the area to communities comprising 50 dwellings or other premises. The extensions are estimated to cost £400,000 over the next ten years.

WARTIME ACTIVITIES.—A report by the electrical engineer (Mr. C. T. Melling), on wartime activities of his Department was presented to the Council last week. The war factory load in the area is quite considerable, and this is reflected in the large increase in electricity sales. In the year ended March 31st, 1938, industrial supplies totalled 89.9 million kWh, whereas in the year just ended they amounted to approximately 163 million kWh; in the same period total sales rose from 126.7 million to about 220 million kWh. In spite of an increase of approximately 100 per cent. in the cost of coal the domestic consumer buys electricity at as low a price as in 1938, the average for the past year being 1.15d. compared with 1.158d. For industrial supplies the average price last year was 0.76d. against 0.528d. in 1938. Adjustments of tariffs were made in January, 1940, involving small increases in certain domestic and similar tariffs, and the establishment of new and very favourable two-part tariffs for domestic, commercial and industrial supplies. In view of the increased net profit in 1941-42 a rebate was authorised and during the war a total of £223,532 was returned to consumers in this way.

Plymouth.—**MAIN EXTENSIONS.**—The Electricity Committee is to extend mains to the Efford housing estate at a cost of £5,700. Sanction has been received to loans of £9,775 for mains and £12,380 for substation equipment.

Preston.—**NEW RIBBLE POWER STATION.**—Preston's new power station, details of which have not been disclosed for security reasons, although it has been in operation since December, 1942, is planned for an ultimate capacity of 120,000 kW in four sets. The first 30,000-kW set came into operation on December 31st, 1942, and the second in December, 1943. The third and fourth will be commissioned in 1946 and 1947. Nearly £2,000,000 has already been spent on Ribble No. 2 scheme. When completed it will cost almost £4,000,000. The new station has been planned and constructed by Mr. G. A. Robertson, borough electrical engineer.

York.—**LOANS.**—The Corporation Electricity Committee has obtained sanction to borrow £22,942 for buildings, mains and plant, and £400 for supplying Park House Farm, Beningbrough.

Overseas

Egypt.—**ASWAN DAM SCHEME APPROVED.**—Last week the Egyptian Cabinet approved the scheme for the production of hydro-electric power from the Aswan Dam. It is stated that tenders on an international basis are to be called for and that the work will be started within a year; the cost has been estimated at about £E15,000,000.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

British Insulated Callender's Cables, Ltd.—Full details are now available of this new company, which, as announced in our issue of April 27th, has been formed, with a capital of £12,500,000, to amalgamate the businesses of British Insulated Cables, Ltd., and Callender's Cable & Construction Co., Ltd. The chairman of the new company will be Sir Alexander Roger, Mr. T. H. Martin-Harvey and Mr. Charles Pipkin acting as deputy chairmen. The other directors are Mr. D. W. Aldridge, Mr. W. G. Hendrey, Mr. P. V. Hunter, Mr. W. H. McFadzean, Sir Eugene Ramsden and Mr. F. Waine, all of whom with the exception of Sir Eugene Ramsden will undertake executive duties. Major A. L. Chandler, Mr. T. A. Eades, Mr. D. J. Sinclair, Mr. E. Taylor and Mr. B. Welbourn, directors of British Insulated Cables, and Sir Malcolm Fraser and Major-General Sir Frederick Sykes, M.P., directors of Callender's will not join the board of the new company and will receive compensation as follows:—Major Chandler £7,020, Mr. Eades £5,605, Mr. Sinclair £10,525, Mr. Taylor £9,630, Mr. Welbourn £5,365, Sir Malcolm Fraser £28,185, and Sir Frederick Sykes £28,185. In addition, Mr. Martin-Harvey and Mr. Pipkin, who will not hold any executive positions in the new company, will receive compensation of £33,000 each. The total remuneration proposed to be paid to the first directors of the new company, including the salaries of those holding executive offices, will result in a saving of £35,000 per annum compared with the corresponding payments made by both companies in 1943. Both companies have declared an interim dividend of 10 per cent., compared with 5 per cent. in 1944, but it is pointed out that the increased payment does not presuppose an increase in total dividends for the year. Meetings of stockholders of both companies will be held on June 29th.

Newman Industries, Ltd.—The annual general meeting was held on Saturday last. In a review circulated with the report, Mr. A. J. Newman, the chairman and managing director, says that many of the normal peacetime uses for electric motors have either been restricted or entirely prohibited, and large demands are expected as soon as some of the present controls are lifted; many export orders are awaiting the release of materials and labour. The range is now being extended to cover various types of electric fans for the tropics. A specialised plant is being installed under American licence for the production of welded chain cable and the company is also producing special alloy bearings to manufacturers of internal combustion engines. There is a continuous and increasing demand for switchgear.

The London Electric Wire Co. & Smiths, Ltd., reports a net profit for 1944, after provision for taxation, of £96,131 as compared with £97,514 for 1943. To this are added £25,000 (same) from investment reserve and £128,258 brought in. After deducting directors' fees and preference

dividends and allocating £10,000 to general reserve (last year £7,500 and a similar sum to special reserve) it is proposed to maintain the ordinary dividend at 7½ per cent. by a final payment of 5½ per cent., leaving £132,193 to be carried forward.

Marconi International Marine Communication Co., Ltd.—In his speech at the annual meeting (circulated with the report) last week, Admiral H. W. Grant (chairman) said that during the war the company had been able to maintain its production and installation staff at a level which had ensured that no vessel had proceeded to sea lacking any vital item of wireless equipment. They had answered every call made upon them by the Admiralty and had established and maintained additional service depots at many points throughout the world.

Siemens Bros. & Co., Ltd., announce a net profit of £340,041 for the past year, including a sum of £30,000 from taxation reserves not now required (against £314,452, including £83,000 from taxation reserves). A dividend of 7½ per cent. is to be paid on the ordinary shares, less 9s. in the £ tax, the same as for the previous year.

The B.E.T. Electric Supply Co., Ltd., from a net profit of £32,415 (against £31,379) is again paying a dividend of 5 per cent.

Crompton Parkinson, Ltd., are maintaining their interim ordinary and "A" stock dividend at 7½ per cent.

The Cawnpore Electric Supply Corporation, Ltd., has declared a second interim dividend of 3 per cent. on the ordinary stock. This makes up for the smaller distribution in 1943 when only 7 per cent. was paid for the year against 10 per cent. previously.

R. A. Lister & Co., Ltd., propose to pay the usual interim dividend of 5 per cent.

Walsall Conduits, Ltd.—The net profit for 1944 before providing for taxation is £194,999 as compared with £200,123 for the preceding year. It is proposed to maintain the final ordinary dividend at 35 per cent., again making 55 per cent. for the year.

The Plessey Co., Ltd., has announced a first interim dividend of 10 per cent. (same).

The National Electric Construction Co., Ltd., is paying a first and final dividend of 10 per cent. (same).

The East African Power & Lighting Co., Ltd.—Treasury consent having been obtained, 357,083 ordinary shares of 20s. each will shortly be offered to preference and ordinary shareholders.

New Companies

International Refrigerator Co., Ltd.—Private company. Registered May 28th. Capital, £100,000. Objects: To acquire the business of the International Refrigerator Co., Ltd. (in liquidation), and to carry on the business of manufacturers, exporters, importers and repairers of and dealers in electrical refrigerators, wireless apparatus and fittings, electrical and

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mechanical plant and apparatus, etc. Directors: J. F. Stewart, 294, St. James' Court, Buckingham Gate, S.W.1; C. H. Minor, address not stated; R. J. Simpson, 78, Uphill Road, N.W.7; V. J. Radbone, 43, Westminster Gardens, S.W.1; and A. T. Neale, 11, Portland Avenue, New Malden, Surrey. Solicitors: Slaughter & May, 18, Austin Friars, E.C.

Porthminster Engineering, Ltd.—Private company. Registered May 16th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electric and other cables, wires, batteries, dynamos and electrical and wireless apparatus and accessories, etc. Directors: G. R. Saunders, 10, Downfields, Welwyn Garden City, and four others. Solicitors: Wm. Easton & Sons, 43, London Wall, E.C.2.

Lion Switchgear, Ltd.—Private company. Registered May 16th. Capital, £500. Objects: To carry on the business of manufacturers of switchgear, control gear and electrical and engineering apparatus, etc. First directors: E. W. Hobday, 40, Cambridge Crescent, Teddington, and V. Bedgood, 13, Ember Gardens, Thames Ditton. Registered office: 355, Richmond Road, E. Twickenham.

"Solus" Electronic Tubes, Ltd.—Private company. Registered May 25th. Capital, £1,000. Objects: To carry on the business of electronic tube manufacturers, electrical and mechanical engineers, etc. Subscribers: J. H. Jones, and F. M. Peachey, both of 162, Ballards Lane, Finchley, N.3. Registered office: 162, Ballards Lane, Finchley, N.3.

Newey & Eyre Electrical Co., Ltd.—Private company. Registered May 26th. Capital, £6,000. Objects: To carry on the business of designers and manufacturers of and dealers in electrical, radio and television apparatus and accessories, etc. Directors: R. A. Corbett, Foxbrook, Rowington, Warwicks., and E. C. Dolman, Doric House, Druidstone Road, St. Mellons, Mon. Registered office: 45, Westgate Street, Cardiff.

Companies' Returns Statements of Capital

Telephone Manufacturing Co., Ltd.—Capital, £500,000 in 5s. shares. Return dated August 7th (filed November 25th), 1944. 1,540,000 shares taken up. £201,562 10s. paid (6s. 9d. on 200,000, 7s. 6d. on 240,000 and 8s. 9½d. on 100,000 shares). £250,000 considered as paid on 1,000,000 shares. Mortgages and charges: Nil.

Perak River Hydro-Electric Power Co., Ltd.—Capital, £3,500,000 in £1 shares (1,250,000 5 per cent. cumulative preference, 1,750,000 ordinary and 500,000 "A"). Return dated December 14th, 1944. 1,250,000 preference and 1,750,000 ordinary shares taken up. £808,041 paid. £2,191,959 considered as paid. Mortgages and charges: £564,200.

Wall & Attwool, Ltd.—Capital, £5,000 in £1 shares. Return dated December 21st, 1944. All shares taken up. £5,000 paid. Mortgages and charges: £260.

Switchgear Testing Co., Ltd.—Capital, £30,000 in £1 shares. Return dated March 22nd, 1945. All shares taken up. £30,000 paid. Mortgages and charges: Nil.

Crystal Turnlight (Western), Ltd.—Capital, £100 in £1 shares. Return dated December 19th, 1944. All shares taken up. £100 considered as paid. Mortgages and charges: Nil.

Arrow Electric Switches, Ltd.—Capital, £5,000 in £1 shares. Return dated December 28th, 1944. 4,000 shares taken up. £4,000 paid. Mortgages and charges: Nil.

Battery Service (Yorks), Ltd.—Capital, £500 in £1 shares. Return dated October 27th, 1944 (filed February 19th, 1945). All shares taken up. £500 paid. Mortgages and charges: Nil.

Increase of Capital

J. G. Sneath, Ltd.—The nominal capital has been increased by the addition of £4,000 in 4,000 shares of £1, beyond the registered capital, £6,000.

Mortgages and Charges

Air Conditioning & Engineering, Ltd.—Debenture dated April 16th, 1945, to secure all moneys due or to become due from the company and or Cheriot Trust, Ltd., to chargee (Trade Distributors, Ltd., Nottingham), charged on Sherwood House Mellor, Derby, and 12, The Drive, Arden Park, Breddbury, and on the company's undertaking and other property, present and future including uncalled capital. (Subject to prior charge on company's land in favour of the Portman Building Society.)

Pioneer Private Telephone Co., Ltd.—Satisfaction in full on September 23rd, 1942, of charge dated July 20th, 1936, and registered August 6th, 1936, securing £425. (Notice filed May 3rd, 1945.)

Electrical Measuring Instruments Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated April 23rd, 1945, to secure £4,000. Holders: Duraspray, Ltd., 506, Australia House, Strand, W.C.2.

Entwistle & Gass, Ltd.—Satisfaction in full on May 1st, 1945, of trust deed dated April 13th, 1929, and registered April 25th, 1929.

York Shipley, Ltd.—Assignment of contract moneys dated May 7th, 1945, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Receiver Appointed

B. & B. Batteries, Ltd.—F. I. Goodman, 21, Warwick Grove, E.5, was appointed receiver and manager on May 15th, under powers contained in £500 debenture dated February 1st last.

Receiver Released

Wood & Co. (Ipswich), Ltd.—J. B. Sanderson of 17, Museum Street, Ipswich, ceased to act as receiver on March 21st, 1945. (Notice filed May 16th, 1945.)

Liquidations

International Refrigerator Co., Ltd.—Winding-up voluntarily. Liquidator, Mr. W. R. T. Whatmore, 11, Ironmonger Lane, London, E.C. The registration of a new company of the same name is announced in our "New Companies" section.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange markets and prices took about a week to recover from the depression into which they were thrown by Mr. Churchill's announcement of a General Election in July. During the period of depression, a good deal of stock was sold by holders who became apprehensive of the outlook as it might develop were a Labour Government to be returned to power. The selling proceeded to some length, forcing prices down very considerably below the levels reached in April. But the subsequent rally restored the greater part of the fall, and, as prices improved, so fresh buyers came in to take stock at prices which, after the drop, looked attractive. The extensive range of declines shown in the tables published here last week has been corrected to a large extent. Despite the uncertainty felt about the result of the forthcoming election, money continues to flow into the markets.

Home Railway Fluctuations

After sustaining a jolt from the prospect of an early General Election, the Home railway market took a distinct turn for the better. Some of the junior stocks fell sharply, the market at one time presenting an extremely unbefriended appearance. This drew the attention of money on the lookout for a high return, and it brought buyers into the market prepared to run the risk of nationalisation in order to obtain the current yield of 8 to 10 per cent. which the junior stocks afforded at the then prices. It took little buying to turn the aspect of the market, and the recovery which set in went most of the way towards reinstating the previous quotations. Transport "C" Stock was one of the few that suffered hardly at all. Southern Railway stocks gave way, but participated in the later recovery. The 5 per cent. preferred fell to 70½, and recovered to 72½. The 5 per cent preference is lower at 117½.

Manufacturing and Equipment

The purely investment shares in the equipment and manufacturing list have been moving in correspondence with the general trend. British Insulated touched 6 and are now 6½. Callender's fell from 6½ to 6½ and recovered to 61. Henley's, after 29s. 9d. and 26s. 6d., are 27s. 9d. Other shares to follow a similar course were General Electrics, now 94s. 6d., Johnson & Phillips, 73s. 9d., Ever Ready, 41s. 6d., Siemens, 34s. (the dividend on which is again 7½ per cent. for the ninth consecutive year), Tube Investments 5½. A loss of 3s. 6d. left Westinghouse Brake at 76s. 9d. De la Rue came down from 11½ to 10½; the present price is 10½. Metal Industries "B" at 47s. 6d. are 5s. below their recent best and Murex at 95s. have also shed 5s. Shares in a number of telephone equipment companies are mostly lower as compared with

a month ago. Brush went to 9s. 6d. and recovered to 10s. Vactrics at 22s. 6d., Falk Stadelmann at 35s. 6d. and Associated Electricals at 55s. are all better.

Home Electricity Shares

Ordinary shares in electricity companies were shaken by the talk of coal nationalisation. Nearly a score of prices were lowered—a very unusual experience for this section of the industrial market. The shares most affected were those of the London undertakings. The recently-announced rise in the price of coal had little influence upon the market, but the hint of nationalisation affected the quotations unfavourably. The Government announcement that its policy was to retain the coal industry in private hands, brought in buyers, and part of the previous fall was recovered. On balance, however, prices show losses ranging from 1s. to 3s. since the end of April.

Communication Stocks

Amongst the few firm spots, Cable & Wireless ordinary stands out conspicuously. The price rose from 89 to within a point of three figures, only to drop back to 84½, recovering to the present 88½, all within a month. The 5½ per cent. preference has moved but little, keeping close to 114½. One other good spot is Canadian Marconi the price of which has come up from 14s. to 19s. without a pause, and for no ascertainable reason other than support from Montreal. Fairly active dealings have taken place in Oriental Telephones, where the price has fallen back to 56s.

Radio Shares

Considerable liveliness has characterised the radio section. E.M.I. have been undergoing abrupt changes. From being buyers at 38s., the price dropped to 31s. 6d., from which it was lifted to 34s. 6d., partly by bear covering. Cossors at 35s. 6d. are better on the week. Pye deferred maintained their stolid state at 32s. 6d. E. K. Cole went back from 41s. 3d. to 38s., hardening later to 40s. Philco have kept steady at 14s. 6d. Ultra Electrics are 9s.

Newman Industries

The price of Newman Industries dipped to 7s., but revived to 7s. 9d. The annual report showed the profit, before tax, to be £14,000 up, most of which went in increased taxation, this being advanced from £41,000 to £52,300. The company was incorporated to acquire the undertaking, property and assets of a business of electrical and mechanical engineers, etc. The issued capital is £425,000, of which £180,000 is in ordinary shares of a florin each. The company has paid 20 per cent. annually for the past seven years and raised this to 22½ per cent. for the year ended December 31st last. The present price is little short of the highest reached during the past decade, during which period the lowest touched was 2s. in 1940.

U.S. and Canadian Patents

Special Wartime Arrangements

IT is convenient to group together Canada and the United States of America in a discussion of the American patent situation because their patent practice runs very largely on the same lines, although Canada forms part of the British Commonwealth.

The principal features of patent practice in the United States can be briefly summarised as follows:—An American patent is granted for the term of seventeen years from the date of issue, and there are no renewal fees. Only the actual inventor can apply, though he can assign his patent wholly or in part. Provisional specifications are not known, nor are cognate applications or patents of addition. A complete specification must accompany the application in first instance.

The official investigation into novelty covers not only patent specifications and technical literature published in the country but those published abroad as well, and the examiner's requirements for answering his objections are very stringent. A response to an official action has to be filed within six months and no extension of this time is allowed. No technical data relating to patent cases can be sent out of the United States without the Censor's licence first being obtained. This covers American patent specifications. American patent attorneys have been debarred from acting in further patent procedure where the matter relates to enemy or enemy-subject countries.

No Fixed Period

There is no fixed period, such as eighteen months, within which a patent application must be accepted. This is particularly useful where contentious claims, say for complicated electric circuits, have to be dealt with. Subject-matter (invention), as opposed to novelty, is also dealt with by the American office and, indeed, it is frequently the chief bone of contention between inventor and examiner. Where, by reason of the war, an inventor cannot complete the application documents in the usual way by signature and oath, for purposes of examination only the patent office will accept informal documents, but before issue properly validated ones will have to be filed. Any alleviation of the difficult situation caused by the war, which it has been suggested the Commissioner of Patents might take, would be a benevolent action on his part and not statutory.

American claims can be re-examined and widened after issue under certain circumstances and the patent reissued. Final appeal in patent cases is to the Supreme Court.

By "Patent"

The United States is a party to the International Convention, but of course hostilities have made it often impossible to get the American case on the file from abroad within the twelve months allowed by the convention even where Allied and neutral countries are concerned, let alone those countries until recently under German occupation. Legislation corresponding to our Patents, etc., Emergency Act has been before Congress for some time, but has not yet been passed, to deal, for example, with extensions of time for filing arising from the war.

Up to the present where cases from abroad have missed the convention date they have had to be filed as rush cases, which means that the American patent must be the first to issue. This procedure throws a heavy extra expense on the applicant to delay the issue of the basic foreign patent in many cases (e.g. a British patent). It remains to be seen what action will be taken in this connection at a later date.

Canadian System

Canadian practice, as mentioned, follows closely on the lines of that of America, both as to manner of application, form of specification and claims, and reissues. The patent lasts for seventeen years, and there are no renewal fees. Canada does not accept provisional or cognate specifications or patents of addition. The examiner's search is practically confined to Canadian patents, but he may demand the disclosure of what was cited in corresponding foreign cases before the Canadian was filed. Often a Canadian patent is amended to agree with the corresponding American one.

Final appeal in patent cases is to the Privy Council. Canada has an Emergency Act corresponding to the British, whereby amongst other things extensions of time for filing and so on may be granted, because of the war; the time factor is not so oppressive, therefore, either for filing or responding as the relevant provisions are operated. Another difference is that as Canada forms part of the British Commonwealth, it is not obligatory in every case to obtain permission from the British Patent Office before filing in that country, whereas, before filing in the U.S.A. permission must be obtained in all cases. Of course in many cases, involving war material and so on, this sanction must be obtained before a Canadian application is filed.

To return to the U.S.A.: If a secrecy order is issued by the Commissioner of Patents in respect of a U.S. application filed by a British

subject, the latter must tender that invention for the use of the American Government, although before he can make a claim against that Government he must obtain written permission from the British Government. All patent correspondence with America must be first passed by the British Patent Office Censor.

In cases in which the Ministry of Supply, the Ministry of Aircraft Production or the Admiralty are interested, the applicant must agree to hold himself and his successors in title free to grant, on agreed terms, such licences relating to manufacture for war purposes in the U.S.A. as may be required by the Governments of the United Kingdom and the United States. Patents owned by foreigners who cannot exercise their rights by reason of the war may be taken over and operated by the American Government by means of licences. Rights of British subjects in this connection are given the same consideration as are those of Americans. Where the owners of patents are enemies or enemy-subjects, and the patents in question are useful for war purposes the Alien Property Custodian takes charge of them and works them by licence.

In cases in which rights under granted American patents belong to a British subject, that owner may have to grant a licence by order of the British Government authorising the use of that right in the United States; and the British Government may also forbid him to transfer, or to agree to transfer, that right or to agree to supply information to facilitate manufacture in the United States unless he first gets written permission from the British Government. Exceptions are made

to this rule in certain circumstances. In this connection a far-reaching agreement was made in August, 1942, between this country and the United States relating to the interchange of patent rights and information for use in war production.

At present, Section 6 of our Emergency Act is non-operative as regards the United States. This section deals with the Comptroller's power to grant extensions of time as, for example, where cases under the International Convention have been filed late owing to the hostilities.

In American patent legislation there is no provision which corresponds to Section 27 of our Patents Act relating to compulsory licences. According to the system of jurisdiction in America, a patent case may very likely first be heard by some State Court which is but little versed in patent matters. In addition U.S. patent specifications usually end in a number of independent claims that are frequently the reverse of simple. Here there would appear to be opportunities for the oppressive use of patents. There have also been complaints of the pooling of patents detrimental to the public interest. Investigation into such complaints is being conducted by the Temporary National Economic Committee of Congress.

Furthermore the Sherman Anti-Trust Law is being vigorously applied. Where the Courts find that the provisions of this legislation have been contravened, they impose penalties which can be very severe, even to the loss of all patent rights. Where a contract is not being carried out under licence from the patentee, litigation in the Court of Claims may follow.

Telephone Equipment for the Services

DETAILS are given in the *Post Office Electrical Engineers' Journal* by Mr. L. S. Crutch of Siemens Bros. & Co., Ltd., of a five-channel carrier telephone system which has been developed to meet the requirements of the Services. The latest type of terminal equipment, the Mark 2, occupies two bays 2 ft. 10½ in. high by 1 ft. 8½ in. wide by 1 ft. 2½ in. deep, weighing 6 cwt. and occupying 18 cu. ft. The apparatus is mounted on standard P.O. panels with individual and removable dust covers. The left-hand bay carries the common equipment, voice-channel filters and signalling panels and the right-hand bay the modulation and demodulation apparatus and band-pass filters for the four carrier channels. All power for the system is derived from AC mains or accumulators.

The group frequency oscillator can generate either at 35 or 33.8 kc/s and feeds directly into the ring modulator which acts as frequency changer for transfer of the 3-16 kc/s group into the 32-19 kc/s range. It is followed by a low-pass filter which removes the upper side band and attenuates the carrier by some 40 db. Alternative strap connections on the oscillator tuning

unit and the filter provide the correct connections for either 35 or 33.8 kc/s group modulation. The 500-c/s oscillator for signalling is of conventional design and its output is interrupted by the local ringing generator before being fed to signalling panels of which each mount two signalling receivers.

Each carrier circuit comprises a channel unit panel and two band-pass filters, the sending filter for selecting the lower sideband of modulation and receiving filter for selecting the wanted sideband. The channel unit panels are all identical and interchangeable, and with the correct strap connections on the tuning unit, can generate any one of the four frequencies of 6.0, 9.2, 12.5 or 16 kc/s.

To extend the working range between terminals 2-wire and 4-wire repeaters have been provided. A by-pass unit is available for insertion in the route at any point where the voice channel needs to be separated from the carrier channels. Without the use of repeaters the apparatus is designed to operate over about 100 miles for 2-wire circuits and 40 miles (or 55 miles provided the near-end crosstalk is satisfactory) for 4-wire working.

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.

KTIEBOLAGET Gotaverken.—"Power plants." Cognate applications. 18623/43 and 18624/43. November 9th, 1942. (569270.)

Automatic Telephone & Electric Co., Ltd., T. B. D. Terroni and J. R. Cannon.—"Measurement of the transmission characteristics of electrical apparatus." 18722. November 11th, 1943. (569279.)

Becker-Simmonds Manufacturing Co., Ltd.—"Electric torches." 3497. March 3rd, 1943. (569352.)

J. Belitsky.—"Magnetic holding devices." Cognate applications. 9017/43 and 12699/44. June 4th, 1943. (569251.)

T. Bolton & Sons, Ltd., and H. E. Dolphin.—"Electrolytic refining of copper." Cognate applications 4331/41 and 3575/42. April 1st, 1941. (569338.)

British Thomson-Houston Co., Ltd.—"Glass-working apparatus and method." 19495/43. November 21st, 1942. (569293.) "Vitreous compositions." 10670/43. July 1st, 1942. (569308.)

British Thomson-Houston Co., Ltd., and W. Hewitt.—"Dynamo-electric machine systems." 9262. June 9th, 1943. (569252.)

British Thomson-Houston Co., Ltd., and D. J. Mynall.—"Circuit arrangement for producing trains of sinusoidal oscillations." 16433. December 19th, 1941. (569339.)

British Thomson-Houston Co., Ltd., and W. L. Wise.—"Electric relays." 19994. November 30th, 1943. (569299.)

A. C. Cossor, Ltd., and O. H. Davie.—"Generators of frequency modulated oscillations." 18954. November 13th, 1943. (569327.)

J. A. Crabtree & Co., Ltd., and R. W. Morgan.—"Electric tumbler switches." 18953. November 13th, 1943. (569284.)

R. K. Dundas and G. I. Hitchcox.—"Electrical measurement of short time intervals." 19785. November 26th, 1943. (569296.)

Electroflo Meters Co., Ltd., and A. H. Cockett.—"Electrical measuring or recording instruments." 17792. October 28th, 1943. (569321.)

Electroflo Meters Co., Ltd., and A. Smithson.—"Relay or follow-up devices." 11782. July 20th, 1943. (569265.)

Ericsson Telephones, Ltd., and J. Woolley.—"Electromechanical timing arrangements." 17033. October 16th, 1943. (569309.)

D. J. Evans.—"Electrolytic cells." 19539. November 23rd, 1943. (569294.)

General Electric Co., Ltd., H. L. Breadner and C. H. Simms.—"Sealing of electrically conducting leads through vitreous walls." 17580. October 25th, 1943. (569317.)

Jack & Heintz, Inc.—"Brush-lifting mechanism for electric motors." 3355/43. July 11th, 1941. (569351.)

D. Jackson and Pye, Ltd.—"Screening arrangements for radio, television and like apparatus." 18733. November 11th, 1943. (569281.)

Landis & Gyr. Soc. Anon.—"Time switches or the like controlled by clockwork mechanism." 13379/42. November 5th, 1941. (569246.)

"Footstep or bottom bearing chiefly designed for use in electric metering instruments." 4028/44. May 1st, 1943. (569271.) "Device for superposing signal currents on an alternating current power network." 19920/43. December 3rd, 1942. (569297.)

Patentverwertungs-Patelhold & Elektro-Holding Akt.-Ges.—"Piezo-electric device." 19017/43. November 21st, 1942. (569285.)

Radio Corporation of America.—"Frequency modulation reproducing systems." 11267/43. September 23rd, 1942. (569260.)

Radio Transmission Equipment, Ltd., and C. E. G. Bailey.—"Radio receivers for direction finding." 13758. September 2nd, 1940. (569303.)

O. E. Reich.—"Incandescent electric lamp bulbs." 11357. July 13th, 1943. (569263.)

F. Sauter Akt.-Ges. Fabrik Elektr. Apparate.—"Self-starting synchronous electric motors." 13508/42. September 26th, 1941. (569343.)

Siemens Bros. & Co., Ltd., and E. A. Bryan.—"Electromagnetic relays." 16533. October 8th, 1943. (569268.)

Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington.—"Electric discharge tubes." 13664. August 21st, 1943. (569267.)

Sulzer Frères Soc. Anon.—"Steam power plants." 10750/43. July 16th, 1942. (569255.)

Telegraph Construction & Maintenance Co., Ltd., J. N. Dean, F. L. Robinson and J. A. Smith.—"Metal sheathing of cores by extrusion." 18778. November 11th, 1943. (569283.)

Thorn Electrical Industries, Ltd., and F. Barton.—"Electric discharge devices." 19308. November 18th, 1943. (569289.)

R. Townend and Metropolitan-Vickers Electrical Co., Ltd.—"Computing devices for photography." 7967. May 19th, 1943. (569247.)

Westinghouse Brake & Signal Co., Ltd.—"Electrical relays." 17724/43. December 15th, 1942. (569319.)

Wright & Weaire, Ltd., and E. S. Buckley.—"Electric circuit interrupters or vibrators." 17356. October 21st, 1943. (569315.)

TRADE MARKS

THE following applications have been made for British trade marks. Objections may be entered within a month from May 30th.

CAPOTHENE and CAPOVIN. Nos. 633,875 and 633,877 respectively, Class 8. Insulated cables and wires for electrical purposes.—Cables & Plastics, Ltd., 9-13, Newton Road, Leeds.

INSTAHEAT and INSTAHOT. Nos. 633,243-4 respectively, Class 11. Installations for heating and cooking. Also INSTAFREEZE, INSTACOLD and INSTAFRIJ, Nos. 633,245-7 respectively, Class 11. Refrigeration installations.—Leopold Friedman, Avenue Works, Walthamstow Avenue, London, E.C.4.

SEDWAY. No. 633,624, Class 11. Electric lamps.—S. Hathaway & Co., Ltd., 4, Pall Mall, Liverpool, 3.

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.

Amble.—June 14th. Electricity Department. L.v. mains and distributors, feeder pillars and services. (May 18th.)

Australia.—MELBOURNE.—June 30th. City Council. One 15,000-kW steam turbo-alternator and auxiliary plant. Specification from city electrical engineer; tenders to Preece, Cardew & Rider, 8-10, Queen Anne's Gate, Westminster, London, S.W.1.

COMMONWEALTH.—August 7th. P.M.G.'s Department. Automatic switchboard equipment. Sch. C4599 and C4662.

Burnley.—June 20th. Electricity Department. Supply and delivery of transformers and e.h.v. cables. (See this issue.)

Dunbar.—June 9th. Town Council. Supply and installation of street lighting equipment, including poles, lanterns, wiring and control gear. Specs. from burgh surveyor.

Gellygaer.—June 30th. U.D.C. Electricity Department. House service units. (June 1st.)

Littleborough.—June 19th. Electricity Department. 11-kV feeder cables. (June 1st.)

New Zealand.—June 26th. Public Works Department. Carrier current protective relaying and communication equipment for 110-kV lines.

September 18th. One '23,000-BHP turbine and one 16,667-BHP generator for Waitaki power scheme.

Orders Placed

Australia.—Western Australian Government. Accepted. Equipment for six Diesel-electric rail cars (£70,000).—English Electric Co.

Birkenhead.—Town Council. Accepted. Rectifiers for battery charging equipment.—Electric Construction Co.

London.—SOUTHWARK.—Works Committee. Recommended. Street lighting columns: one hundred short columns, cast iron (£546).—Siemens Electric Lamps & Supplies. Eleven tall columns with branch arm (£180) and four tall for central suspension (£136).—Stewarts & Lloyds. Transformer (£302).—British Power Transformer Co. (Although slightly higher than another quotation, acceptance of this tender is recommended because delivery can be given considerably earlier.)

JOINT ELECTRICITY AUTHORITY.—Kiosks (extension of company's existing contract for twelve months).—Crompton Parkinson, Ltd. Meters.—Aron Electricity Meter; Chamberlain & Hookham; and Sangamo Weston.

ST. PANCRAS.—Replacement of damaged street lighting lanterns.—Siemens Electric Lamps & Supplies (£65); B.T.H. (£234); Met.-Vick. (£20); and G.E.C. (£10). Electric tea and coffee set for Town Hall canteen (£145).—Jackson Boilers.

BATTERSEA.—Electricity Committee. Accepted. Time switches (Sangamo Weston) (£209) and Venner Time Switches (£219). Contractors (£113).—Dewhurst & Partner.

Manchester.—Electricity Committee Accepted. Extension of contracts for a further twelve months:—Meters.—Ferranti and Metropolitan-Vickers. Static transformers.—Ferranti. Kettles.—Premier Electric Heaters. Supplies for twelve months:—Street lanterns.—Wardle Engineering Co. Globes for street lanterns.—B.T.H. House-service cut-outs.—Parmiter, Hope & Sugden, and Siemens Electric Lamps & Supplies.

York.—Electricity Committee. Accepted. Repairing 20,000-kW turbine (£27,500).—Brush Electrical Engineering 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.

Birkenhead.—Rebuilding 79 war-damaged houses and 9 flats for T.C.: borough engineer.

Brighouse.—Houses (100), Whinney Hill and Crowtrees Lane, for T.C.; W. A. Jones, architect, 7, Blenheim Terrace, Leeds, 7.

Additions, Woodvale Brass Works, Thornhill Bridge Lane; Woodcock & Booth, brass-founders.

Bury.—Works additions; Bibby & Baron, Ltd., New Bridge Mills, Dumers Lane.

School dining hall, Elton, for E.C.; borough surveyor.

Darlington.—Works additions, Darlington & Simpson Rolling Mills, Ltd. (£500,000); International Construction Co., Ltd., builders, 56, Kingsway, London, W.C.2.

Hereford.—Houses (50), Hunderton estate; borough architect. Flats, Overbury Hall, Overbury Road; Cecil Corey.

Ilford.—Flats (59); borough engineer.

London.—POPLAR.—Flats (24), Bow Road; borough engineer.

SOUTHGATE.—Conversion of 186 Bowes Road for manufacture of electrical parts; Probarts, Ltd.

Alterations and additions, Grassendale Works, Orpington Road; Wallis, Gilbert & Partners.

Maryport.—Houses (196) for the North-Eastern Housing Association, Curzon Street.

Newcastle-on-Tyne.—Factory, Blenheim Street, for E. Baker; Hetherington & Wilson, architects, County Chambers, Westgate Road.

Alterations, Clavering Place, for the British Electrical & Manufacturing Co., Ltd.; E. M. Lawson, architect, Barras Buildings, Barras Bridge.

Northumberland.—Additional electrical services, North Seaton School (£150); county architect, County Hall, Newcastle-on-Tyne.

Wallasey.—Rebuilding 40 war-damaged houses for T.C.; borough architect.

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switchgear, arc and induction furnaces, resistance welding machines, transformers and other equipment. This means a freer hand in meeting the many combinations of mechanical and electrical requirements.

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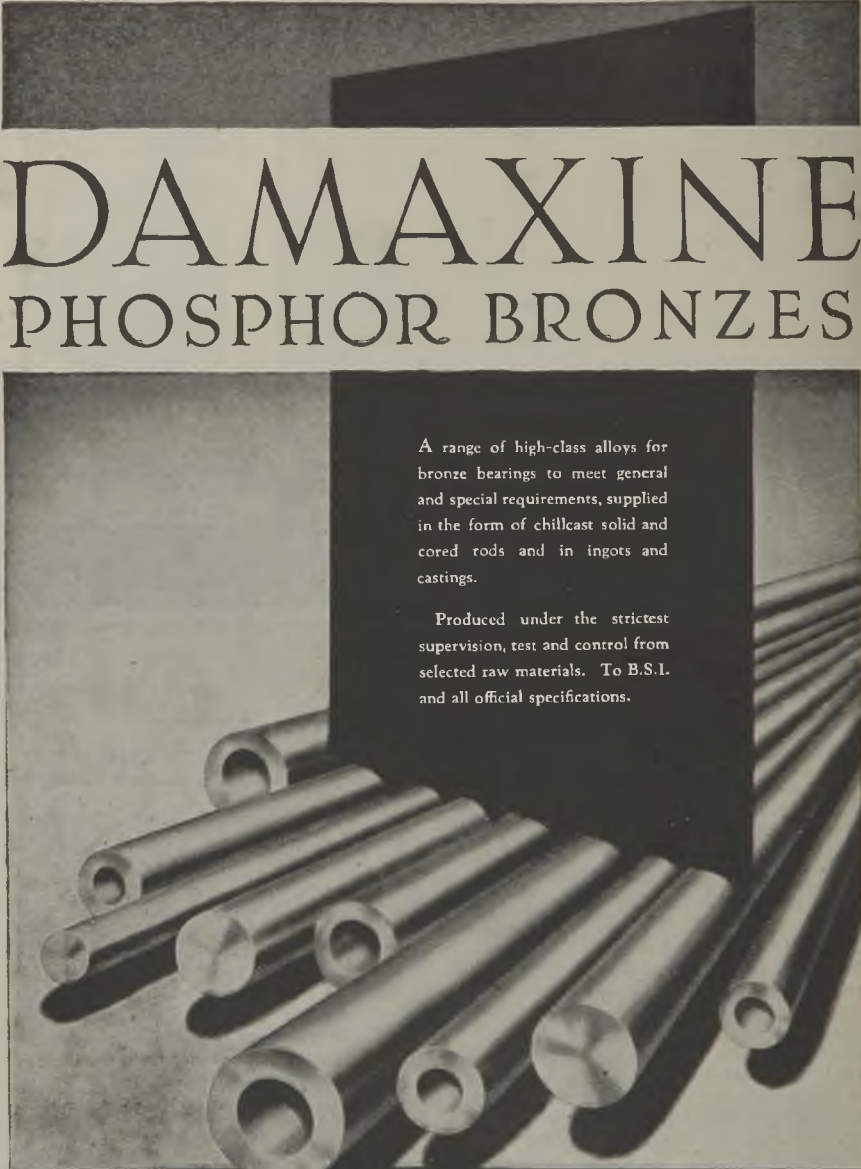
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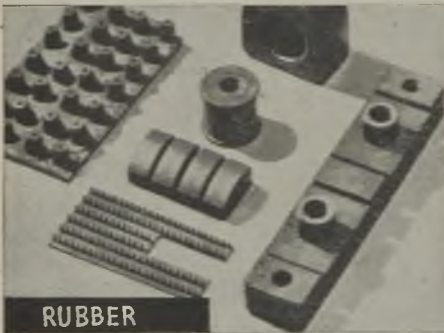
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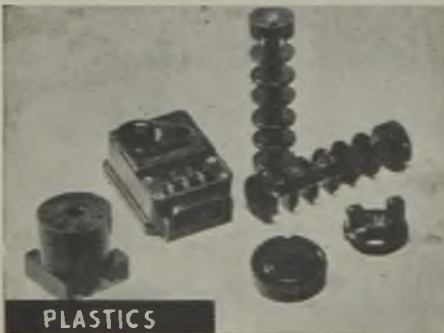
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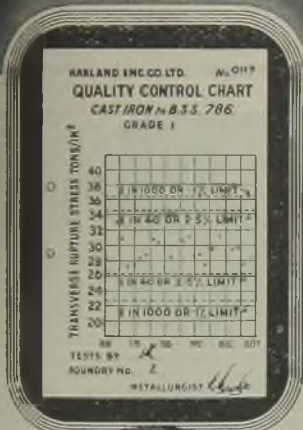
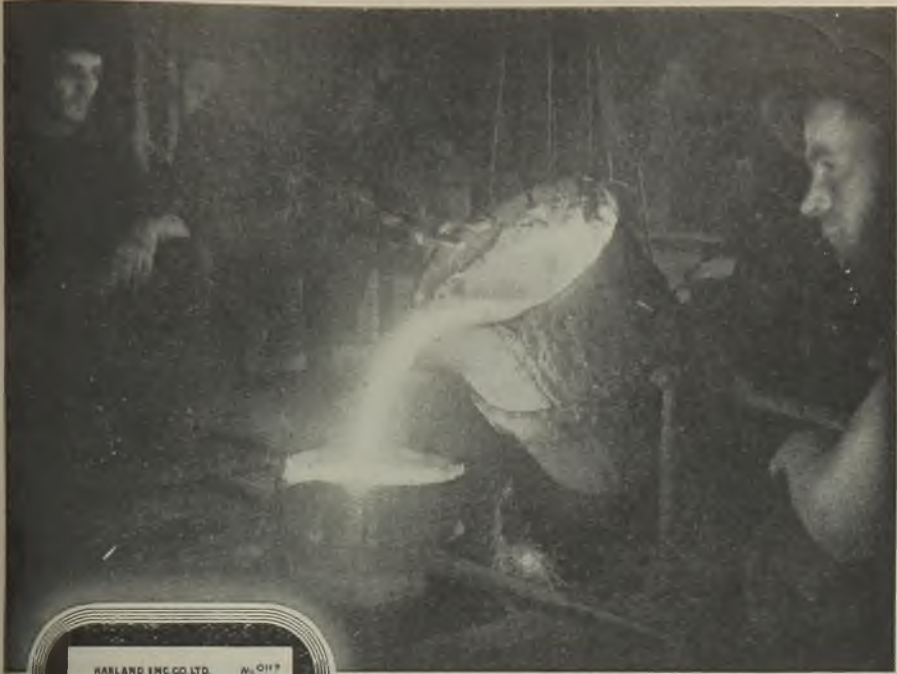
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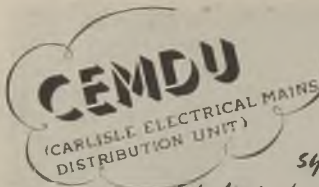
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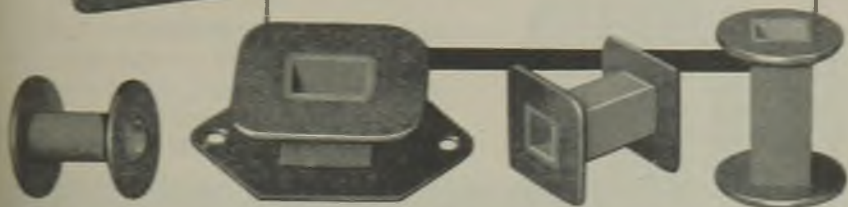
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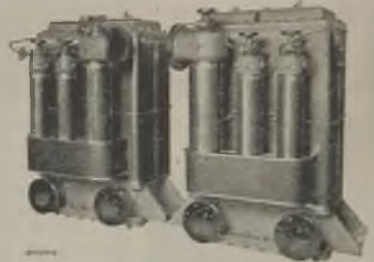
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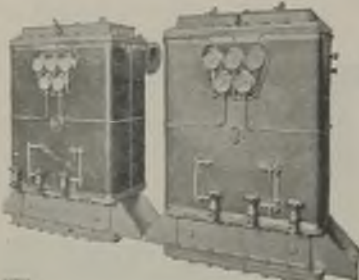
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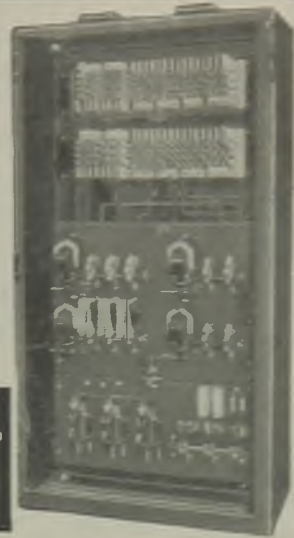
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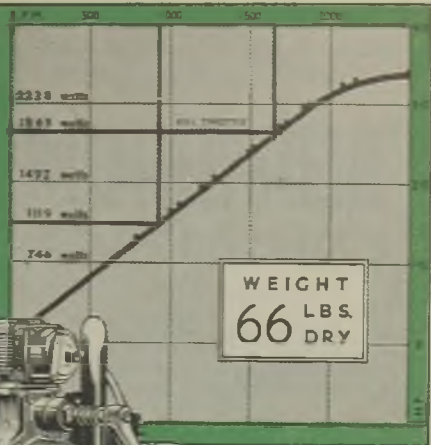
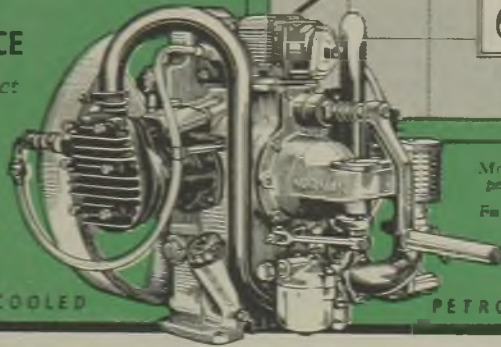
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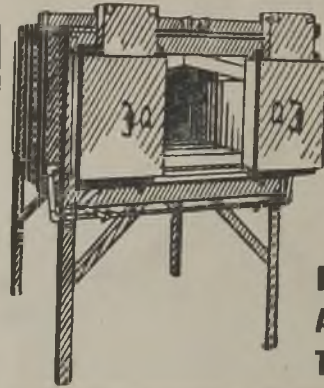
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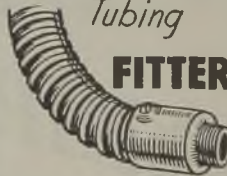
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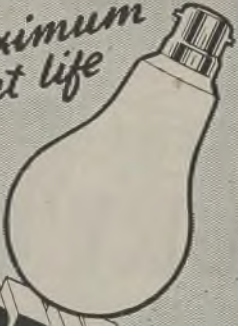
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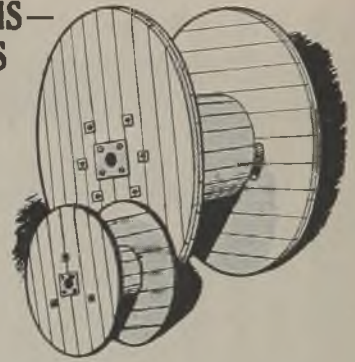
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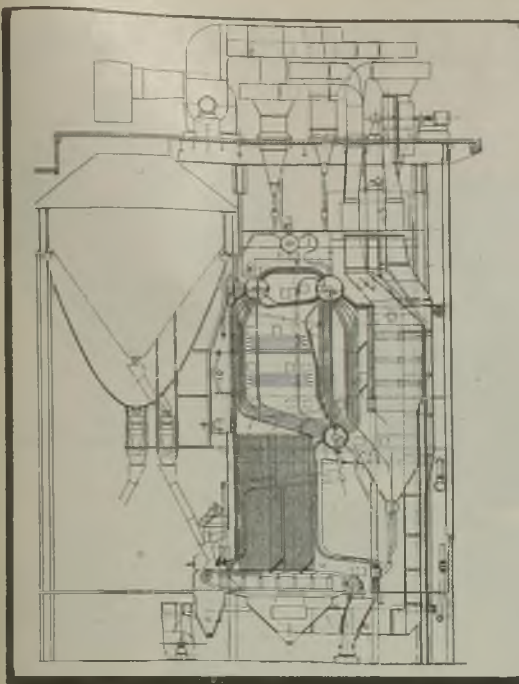
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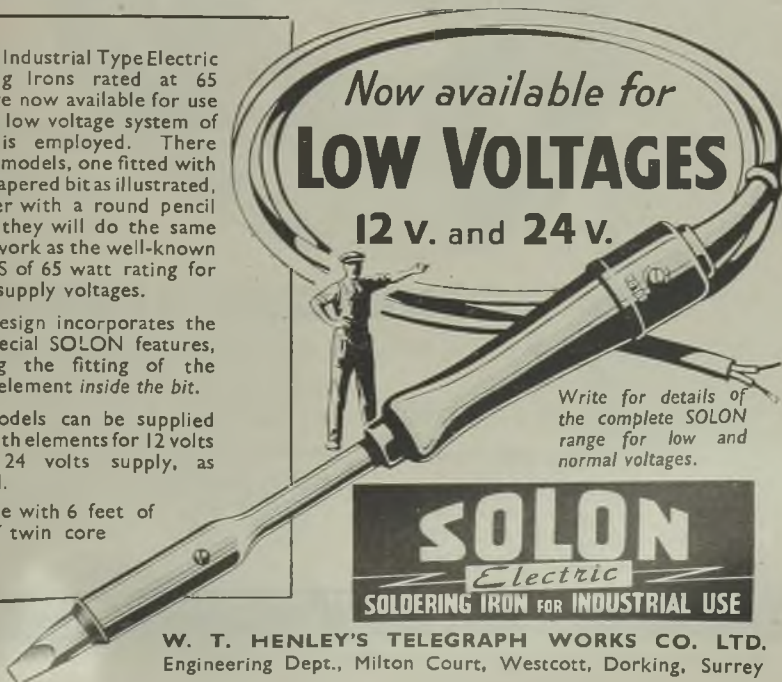
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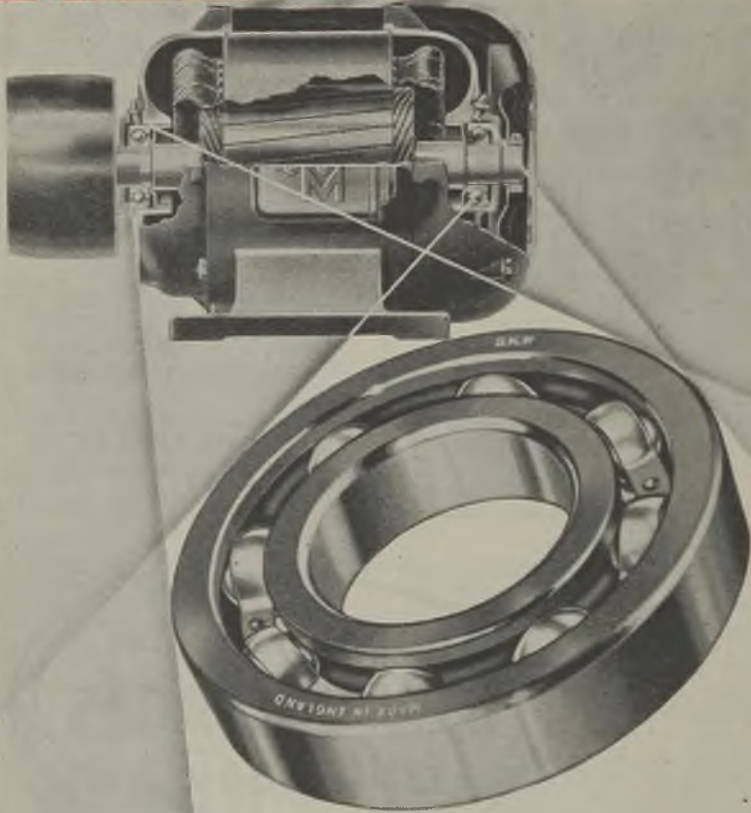
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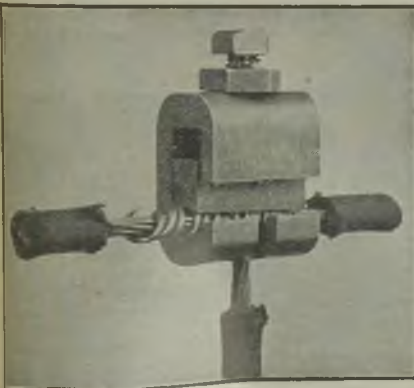
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I N D U S T R Y*

Prototype or large quantities

THE GENERAL ACCESSORIES CO. LTD.

BARTON HILL WORKS
MAZE STREET, BRISTOL 5
ESTABLISHED 1896

**ELECTRIC WIRING
ACCESSORIES
of the Highest Grade**

SPECIALITY:

Patent Non-overhang
WALL SOCKETS
AND
B.E.S.A. PLUGS

**STRAND
RESISTANCES
ARE
UNRIVALLED
FOR THEIR
QUALITY
AND
PERFORMANCE**



APPROVED
BY ALL GOVERNMENT DEPT'S

THE STRAND
ELECTRIC & ENGINEERING CO. LTD.

MANCHESTER

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DUBLIN

THE LARGEST BUYERS OF
HEATING ELEMENTS BUY FROM

Wireohms Ltd.

PEASHILL ROAD
NOTTINGHAM

WHO SUPPLY ALL TYPES OF ELECTRIC
ELEMENTS FOR MANUFACTURERS

Superspeed
SPECIAL

**CORED
SOLDER**

A.I.D. APPROVED

H. J. ENTHOVEN & SONS LTD.

230 THORNTON ROAD, WEST CROYDON, SURREY
THORNTON Heath 2462

Chapter Three

WATERTIGHT FITTINGS

Our Screwed Glass Fitting (60, 100 and 200 W) has, indeed, proved a "R.E.A.L." winner! No steel authorisation is required, and it can be supplied without Mazac top for mounting direct to Standard B.E.S.A. conduit box where headroom is limited. Its outstanding features are:

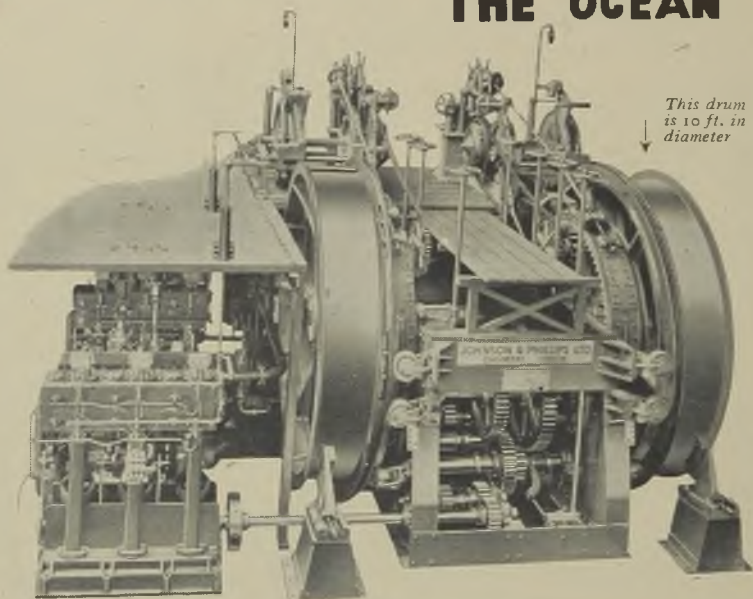
- EXTRA TOUGH QUALITY PORCELAIN—one-piece lampholder.
 - HEAVY-QUALITY PRESSED WELL GLASS—gives much higher threading accuracy, closer limits and a heavier, stronger glass.
 - DIE CAST MAZAC TOP MEMBER—engaging on rubberised asbestos washer.
 - HEAVY RUBBER GASKET—giving a definitely watertight joint.
- Can be supplied without Mazac Top for mounting direct to standard B.E.S.A. conduit box for positions where headroom is limited.
- No steel authorisation required.



R · E · A · L

'PLUTO'

PIPE LINES UNDER THE OCEAN



*This drum
is 10 ft. in
diameter*

J. & P. designed and manufactured the Double Combined Picking-up and Paying-out gear for handling and laying the "HAIS" Cable for every cable-laying vessel used for the

"PLUTO" operation. In addition, J. & P. equipped each storage site with cable handling gear. They also manufactured many, many miles of "HAIS" pipe.

RELIABILITY WHEN AND WHERE IT WAS VITAL

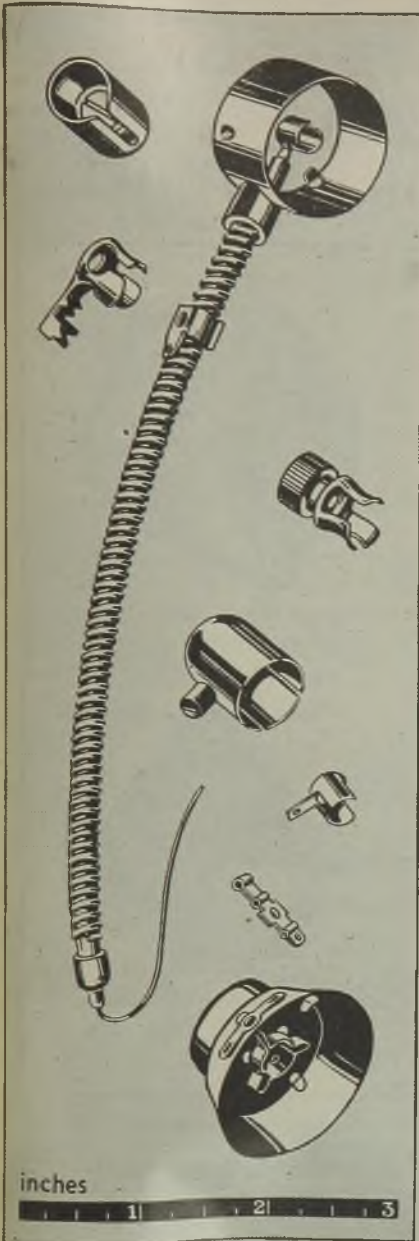
JOHNSON & PHILLIPS LTD.

CHARLTON, LONDON, S.E.7

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



The mark that means that "little more" in quality



BELLING & LEE LTD
CAMBRIDGE ARTERIAL ROAD, ENFIELD, MIDDX



The new type 50 B

'VARIAC' REGULATING TRANSFORMERS

*Roughly triple the
power rating of
the '100' Series*

The Type 50 B Variac, handling 7 kVA at 230 V in, represents a valuable addition to the Variac range, and will find many applications in industry.

50 B 7 kVA. Input 230 V (tap at 115 V),
Output 0-230 or 0-270 V.
Rated current 20 amps. Max. 31 amps.

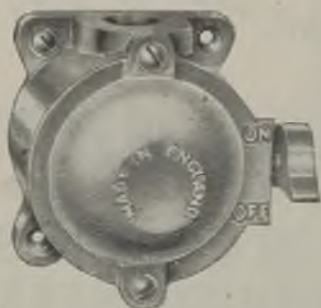
Excellent deliveries against I A Priorities. Other Variac types range from 170 watts to 7 kW. Write for Bulletin 424 B and circular 743 for complete data.



180 Tottenham Court Road, London, W.1
and 76 Oldhall Street, Liverpool 3, Lancs.

G.E.C.

WEATHERPROOF SWITCHES



S 516. 5 amp one way single pole switch with attached side handle.



S 518. One way single pole switch for operation with detachable key.



S 521
Detachable operating key for S 518 and S 605 switches



S 605. 5 amp one way single pole switch operated from front with detachable key.



S 615. 5 amp switch with thumb and finger grip rotating handle.

Examples from a wide range of weatherproof cast iron cased switches for use in exposed positions and in industrial buildings where adverse conditions of service are prevalent. These switches are all of the well known "Landor" quick make and break type. G.E.C. products of outstanding reliability.

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.

OFFICIAL NOTICES, TENDERS, ETC.

COUNTY BOROUGH OF BURNLEY

Electricity Department

TENDERS are invited for the supply and delivery of the following:—

Specification No. 1—Transformers.

Specification No. 2—E.H.T. Cables.

Copies of the specifications, conditions and forms of tender may be obtained on application to Mr. T. B. Nutter, A.M.I.E.E., Borough Electrical Engineer, 43, Grimshaw Street, Burnley.

Tenders, in plain sealed envelopes, endorsed respectively "Transformers" or "E.H.T. Cables," to be delivered to the undersigned not later than first post Wednesday, June 20th, 1945.

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

ARCHIBALD GLEN.

Town Clerk.

2109

Town Hall, Burnley.
31st May, 1945.

SITUATIONS VACANT

None of the vacancies for women advertised in these columns relates to a woman between 18 and 40 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 MANCHESTER EDUCATION COMMITTEE

Newton Heath Technical School

Appointment of Principal

APPPLICATIONS are invited for the post of Principal of the Newton Heath Technical School on the retirement of the present Principal (Mr. R. Saunbury, M.Sc., M.Ed.) in September next.

The School is organised in three sections, viz., the Junior (Secondary) Technical School with Courses preparing for entry to the Engineering and Rubber Industries, Ordinary National Certificate Courses in Mechanical and Electrical Engineering (Day and Evening) and Courses for the Licentiate and Associateship of the Institution of the Rubber Industry.

Candidates should be graduates of a British University, preferably in Science or Engineering, or possess equivalent qualifications. Suitable teaching experience is essential and industrial experience is desirable.

The Committee's salary scale for Principals of Technical Schools is under revision in accordance with the Burnham Reports, and any adjustment in the present scale (£600 × £25 × £300 plus £52 bonus) will operate as from 1st April, 1945. Previous experience may be taken into account in determining commencing salary.

Application forms and further particulars may be obtained (stamped addressed foolscap envelope) from the Director of Education, Education Offices, Deansgate, Manchester, 3, to whom they should be returned not later than 23rd June, 1945.

COUNTY BOROUGH OF WEST HAM

Education Committee

West Ham Municipal College, Romford Road,

Stratford, E.15

Principal: H. Baker, M.Sc., Ph.D., A.M.I.C.E., A.M.I.M.E.

APPPLICATIONS are invited for the full-time teaching post of **LECTURER IN ELECTRICAL ENGINEERING** with subsidiary **MECHANICAL ENGINEERING**.

A degree or other high qualification in the principal subject is desired.

Salary in accordance with the Burnham Technical Scale (London), with appropriate allowance for industrial experience.

The appointment is for the period of the war in the first instance, with every prospect of permanence for suitably qualified teachers.

Form of application and particulars may be obtained from the Principal upon receipt of a stamped addressed envelope, and should be returned so as to reach him not later than Saturday, June 16th, 1945.

IRVINE G. JARDINE,

Education Officer.

Education Offices,
95, The Grove, Stratford, E.15
15th May, 1945.

2061

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE COMPANY LTD.

24, Fennel Street, Manchester, 4

THE company have a number of vacancies for Engineer Surveyors and invite applications from those suitably qualified for either of the following classes:

- Lift and Crane Surveyors; training in lift or crane construction; both electrical and mechanical experience.
- Electrical Surveyors; apprenticeship and experience in the manufacture and repair of electrical machinery and in industrial use. Technical education up to Grad. I.E.E. standard.

Candidates, age 26-34, should apply in own handwriting, giving details of qualifications and experience. Freedom to take up duty immediately is not an essential condition. 2071

CENTRAL SUSSEX ELECTRICITY LIMITED AND ASSOCIATED COMPANIES

Senior Clerical Assistant

APPPLICATIONS for the above position are invited from candidates with sound knowledge and experience of the general clerical work of Electricity Undertakings. Ability to organise consumers' records and knowledge of up-to-date methods of stock control, etc., an advantage.

Salary, including present war bonus, £450 p.a.; Superannuation Scheme.

Applications should reach the undersigned by 15th June, 1945.

H. DIXON, M.I.E.E.,

Engineer and Manager.

Electra House,
Haywards Heath.

2078

ESTON URBAN DISTRICT COUNCIL

Electricity Undertaking

Appointment of Engineer and Manager

A PPLICATIONS are invited for the above-named appointment from persons experienced in the management and administration of an electricity undertaking. Supply is taken in bulk and the annual sales amount to approximately 34 million units.

The appointment, which will be terminable by one month's notice on either side, will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, stating salary required, age, qualifications and particulars of previous training and experience, together with copies of two recent testimonials, must reach the undersigned not later than Monday, 18th June, 1945.

STANLEY T. JOHNSON,
Deputy Clerk of the Council.

Council Offices,
Grantown-on-Tees.
1st June, 1945. 2072

COUNTY BOROUGH OF WEST BROMWICH

Education Committee

Kenrick Technical College

(Principal: R. C. Prescott, M.Sc.(Vict.), M.I.Mech.E.)

A PPLICATIONS are invited for a full-time post of Lecturer in ELECTRICAL ENGINEERING, commencing in September, 1945. Applicants should possess a good degree or its equivalent, together with sound industrial experience. Salary in accordance with the new Burnham Scale. Further particulars of the post and form of application will be sent on receipt of a stamped addressed foolscap envelope. Applications must be returned to the undersigned not later than Saturday, June 16th, 1945.

L. G. ROSE,
Director of Education.

Education Offices,
Highfields, West Bromwich.
16th May, 1945. 2022

THE ENGINEER SURVEYORS' ASSOCIATION

E NGINEERS (Mechanical, Electrical and Lift and Crane) seeking to enter the Engineering Insurance Industry should write to the General Secretary of the above Association, which is exclusively concerned with the industry, and is, in fact, the only Association so concerned.

Typical qualifications are: Thorough Power Plant experience, ashore or afloat; First Class or Extra First Class B.O.T.; National and Higher National Certificates; Drawing Office experience; Membership of a Senior Institution an advantage.

The Association's salary scale is in general operation throughout the industry.

JAMES C. FELL,
General Secretary.

19, Atlantic Chambers,
7, Brazennose Street,
Manchester. 2. 1988

A S.E. London factory has vacancies for experienced Engineers, preferably having pre-war experience of the design of radio and television receivers and the application of radio to vehicles. Excellent post-war prospects. Appointment when present restrictions of employment are withdrawn. Write in confidence to—Box 7188, A.K. Adv., 212a, Shaftesbury Avenue, London, W.C.2. 2035

B ELLING & Lee Ltd. require the services of Sales Engineers for London and the country; qualifications in electrical and/or radio engineering essential, but established sales connections are not required. Positions are permanent, and applications will be considered from Class "A" ex-service men only, who should indicate if possible when they expect to be released. Application forms will be sent in response to written replies only, to Cambridge Arterial Road, Enfield. 2089

D EVELOPMENT Engineer required, with good all round knowledge of engineering and plastics, to take charge of department and be able to apply this knowledge to the development of light electrical products with particular reference to moulded commutators. Reply, stating age, experience and salary required, to—Box 2110, c/o The Electrical Review.

E FFICIENT Lady Bookkeeper, with knowledge of typing.—Box 2104, c/o The Electrical Review.

C ITY of York. Deputy Electrical Engineer. Applicants should be Corporate Members of the I.E.E. or of equivalent standard. Must have had a sound electrical and mechanical engineering training and had experience in the construction and operation of an Electricity Supply Undertaking. Salary in accordance with N.J.B. Schedule, Grade 1, Class G, at present £771 p.a., rising to £808. The position is subject to provisions of Local Government Superannuation Act, 1937, and successful candidate will be required to pass a medical examination. Write, quoting D.1240XA, to the Ministry of Labour and National Service, Central (T. & S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for application form which must be returned completed, together with copies of not more than three recent testimonials, by 18th June, 1945. 2097

D RAUGHTSMEN required (after the present restrictions of employment are removed) by leading manufacturers in London area, for design department working on Radio and Television equipment. Previous experience essential. Good prospects. Write, stating age and full particulars to—Box 7247, A.K. Adv., 212a, Shaftesbury Avenue, W.C.2. 2081

E LECTRICAL contractors in London area, having large showrooms, require a Saleswoman as Assistant Manager. Excellent opportunity to person having personality and drive. Preference given to applicant having experience in electrical fittings and appliances, etc. sales. Apply, stating age, experience and salary required.—Box No. 2084, c/o The Electrical Review.

E LECTRICAL wholesalers require Trade Counter Assistants (must be under 18 or over 51). Must be conversant with all types of electrical material for installation purposes.—London Electrical Co., 92, Blackfriars Road, S.E.1. 24

E XPERIENCED Armature Winder wanted for India. £40 per month plus 10% of concern's annual profit. Four years' term. Passages paid. Leave on half pay. Desirable features: Sound mechanical sense; possess snaps of own heavy mill or textile jobs rewound; good health; unmarried; age 25-35; had own wiring business; understand quoting. (1944 concern's profits were £7,500.) Write —Box 7108, c/o The Electrical Review.

E XPORT Manager required by well-known fixed electric condenser makers. Managerial export experience of electrical component sales for equipment purposes and personal connection with merchant exporters essential. Age 30 to 35. Salary and possible interest commensurate with capabilities. First-class man wanted. State in full past experience.—Box 2007, c/o The Electrical Review.

H EAD Foreman required for electrical instrument assembly department. Capable trainer of female labour, experienced with modern production methods, not afraid of work. Good prospects to right man. Particulars of past experience, age and salary, and if disengaged.—Box 2085, c/o The Electrical Review.

T AMP Factory Manager. Required for the North, a Works Manager with technical experience and executive ability. The factory is small, with first quality production. Apply in confidence, with full particulars of qualifications, experience and salary required.—Box 2024, c/o The Electrical Review.

M ANUFACTURERS of electric irons, vacuum cleaners and other domestic electric appliances require keen and experienced man to build and develop sales organisation. Actual experience in this field essential for this excellent and progressive opportunity. Existing staff already advised. Write in confidence, full details experience and salary required, to—Box F.K.2, c/o 5, New Bridge Street, London, E.C.4.

O LD-established Export Firm require the services of an experienced and reliable Buyer well versed in the electrical trade and shipping.—Box 2103, c/o The Electrical Review.

P OWER Station Consultants (in London area) require Engineering Assistant with sound knowledge of electrical generation, switchgear and distribution equipment. Able to lay out schemes, prepare specifications and supervise installations. Must have good technical training and qualifications; also practical workshop or power station experience. Age about 40 preferred. Reply, giving full details of age, training and experience and state salary required, to—Box 509, L.P.E., 110, St. Martin's Lane, W.C.2. 2070

P RODUCTION Engineer required; shop apprentice trained, with practical experience of planning mass production processes of intricate small products. Academic qualification would be an advantage, but not essential. Applicants should have experience of handling small staffs and be capable of training juniors along orthodox lines. Appointment after relevant restrictions of employment are withdrawn. Write in confidence to—Box 7197, A.K. Adv., 212a, Shaftesbury Avenue, W.C.2. 2084

REQUIRED. Operation Foreman for shift duties in large water-tube boiler house. Must be accustomed to good disciplinary. The position is permanent and pensionable for suitable man. Wage 28.67d. per hour, rising to 29.67d. per hour when fully proficient. Applicants must state age and if married. The housing situation in the district is acute, and if the successful applicant is separated from his family he will be paid 24s. 6d. lodging allowance for a limited period whilst maintaining two homes. Applications should be addressed to—The City Electrical Engineer, Gloucester Corporation Electricity Dept., Commercial Road, Gloucester. 2017

SALES and Contracts Engineer. About 25/30 years of age, with experience in handling E.H.T. and L.T. switchgear work. Fullest details.—Box 2014, c/o The Electrical Review.

SALESWOMAN required for electrical showroom (London, W.C.). Full particulars wages, etc., to—Box 2076, c/o The Electrical Review.

SWITCHBOARDS, low tension. Departmental Manager required by important Midland manufacturers of low tension switchgear. Must have technical sales experience, be able to supervise estimates and deal with correspondence. Progressive and permanent opportunity for capable individual. State fully, in confidence, experience and salary required, etc.—Box 2073, c/o The Electrical Review.

TEST Gear and Maintenance Engineer required (after the present restrictions of employment are removed) by manufacturers in S.E. London. Experienced in diagnosis and repair of electronic test and measuring equipment. Capable of designing simple jigs and fixtures. Write, giving full details age and experience to—Box 7251, A.K. Advg., 112a, Shaftesbury Avenue, W.C.2. 2082

W.A.Y.L.E.A.V.E Officer required by electric power company. Applicant must have proved ability in negotiating with property owners and experience of crop valuation. Salary £312 to £416 a year according to age and qualifications. Apply, stating age, experience and qualifications, to—West Gloucestershire Power Company Limited, 126, London Road, Gloucester. 2090

WELL-established, progressive Electrical Wholesalers, London area, require efficient Departmental Manager, fully conversant with all electrical material. Permanent. Write, stating knowledge, experience and age—Box 37, c/o The Electrical Review.

WORKS Manager required for manufacturers of electrical accessories, West London area. Must be a very fully experienced man on production, sound knowledge of machines and press tools, time and motion study, rate fixing, production control and all branches of general works management: 300 employees. Preference given to man experienced in precision press parts and mass production methods for high grade products. Reply, stating age, experience and salary.—Box 2069, 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.

MERSEY Power Co. Ltd.—Assistant Switchboard Attendant.

SITUATIONS WANTED

ADVERTISER (50) desires change. Many years' administrative exp. sales office organisation. Methodical and efficient controller.—Box 7089, c/o The Electrical Review.

ALL-round Electrical and Radio Engineer, over 17 years' practical experience in all branches of trade, good technical education, well equipped, seeks service agencies in North-west England, full or part time.—Box 7151, c/o The Electrical Review.

CHIEF Clerk (38), 10 years present post, electricity supply, seeks appointment, release obtainable.—Box 7134, c/o The Electrical Review.

ELECTRICAL Engineer, Grad.I.E.E., 14 years' experience in manufacture and design of control switchgear having complicated circuits, lifts, ventilation and small generating plant, anxious to hear of permanent executive post in London. Excellent education, initiative, ideas, writing ability, languages.—Box 7114, c/o The Electrical Review.

ENGINEER B.Sc., A.M.I.E.E., age 38, holding senior administrative position in Indian sales organisation of British firm manufacturing motors, generators, transformers, switchgear, etc. desires change post-war to senior position in England, preferably one involving export management.—Box 7142, c/o The Electrical Review.

ELECTRICAL Maintenance Engineer, twenty years' experience radio transmitting equip., automatic machinery, all types of electrical equip.—Box 7153, c/o The Electrical Review.

FLUORESCENT Lamp Auxiliaries. Design and Production Engineer requires change, take full charge.—Box 7149, c/o The Electrical Review.

GRAD.I.E.E., Triple Finalist of City and Guilds, P.M.G. Cert. (33), experienced installation, maintenance, jern-turing, research, etc. Any offer (technical or commercial) given consideration.—Box 7139, c/o The Electrical Review.

HIGHLY-qualified Chartered Mechanical Engineer (42), seeks change. 25 years' elect. and mech. experience, ten years executive position on design, experiment and production of power-driven food-preparing and special purpose machines.—Box 7148, c/o The Electrical Review.

ILLUMINATING Engr. and Decorative Lighting Expert seeks change. Fully exp. draughtsman, conversant with latest developments.—Box 7132, c/o The Electrical Review.

P.L.U.M.B.E.R-Joiner, eighteen years' experience, desires post with cable contractors.—Smith, 99, Buck Lane, Kingsbury, London, N.W.9. 7150

POSITION as General Manager or Works Manager with production. Well versed in administration and organisation of labour. Capable of and experienced in re-organisation. Present salary £1,200. London district.—Box 7154, c/o The Electrical Review.

POST-war. Will your sales turnover increase during the next twelve months? The advertiser, due for early demobilisation, intends to recommence a very successful agency business. He has an outstanding sales record and is technically qualified. Will principals who require first-class representation please write—Box 7133, c/o The Electrical Review.

SALES Engineer (45) requires position, available in two months: 20 yrs.' experience, electrical and mechanical. Considerable pre-war turnover and connection, first-class testimonials.—Box 7138, c/o The Electrical Review.

STUD. I.E.T., seeks supervisory post. 22 yrs.' exp. etc. installations.—Box 7146, c/o The Electrical Review.

SUBMERSIBLE motor-driven high-pressure pumps. Chartered Electrical and Mechanical Engineer, skilled in design and manufacture, wishes contact pump manufacturers interested in developing sizes 500 to 120,000 g.p.h.—Box 7130, c/o The Electrical Review.

WELDING Foreman, position required, 16 years' experience sheet metal fabrication and light structural work, good disciplinarian, de-reserved, Home Counties or South preferred.—Box 7144, c/o The Electrical Review.

YOUNG Electrical Engineer, widely travelled, at present holding responsible position abroad, could be free for re-engagement, inducement offering, in the U.K. or on site early 1946. Good education and technical training, excellent references. Wide experience in executive situations home and abroad on installations, maintenance, repairs to electrical and mechanical equipment, steam and diesel engines, planning, layout. Any employer requiring really keen young engineer, preferably for service overseas, should write for further details to Box P.368, 19/21, Corporation Street, Birmingham, 2. 2040

YOUNG Electrical Engineer (23), apprenticeship, 6 years' experience F.H.P. electric motors, Ordinary National Cert., at present taking Higher Nat., desires interesting post, preferably research or design.—Box 7141, c/o The Electrical Review.

FOR SALE

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

WATER TUBE BOILERS IN STOCK

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.	"	180 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.

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

A.C./D.C. Gen. Set, input 200/1/50, output 3 volt. 100 amp. on bed, overhauled, from stock.—The Electroplant Co., Wembley, Middx. 2091

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

ASKIAI Cables, all sizes quoted for; good deliveries against Government contract numbers. Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7156

ALTERNATING Set, input D.C. 500 volt, output A.C. 400/3/50, 200 kVA, on bedplate. First class.—The Electroplant Co., Wembley, Middx. 2094

ALTERNATOR, 200 kVA, 250 r.p.m., 400/3/50, for coupling, perfect order.—The Electroplant Co., Wembley, Middx. 2093

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. 68

BEST English Cables, 1/.044 up to 127/103, deliveries against M.O.S. requirements. Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7156

CARBONS, large stocks assorted sizes, solid and cored.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7157

D.C./A.C. Convertors, as new, ball bearing, input 220 volt D.C., output 220/1/50, 44 & 74 kW., with transformers.—The Electroplant Co., Wembley, Middx. 2092

DIESEL Generating Set, comprising 35-h.p. Allen vertical engine direct coupled to 21-kW., 110/145-volts, compound interpole dynamo, 200 amps., direct running. Also 110-volt Battery, comprising 555 ampere-hour unit complete with stands. Seen running in Surrey. Sold separately if desired.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 2051

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

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; 24-kW, 220 v. D.C. Crude Oil Set.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 2105

HORNE & Co. are instructed to offer for sale valuable parcel of miscellaneous goods, including Steel-lined Rubber Discs, Lead and Rubber-covered Cables, Coils of Rope, Balata Belting, Shellac, 37 cases of Ampules, 3,000 Rubber Rings, with many other valuable and interesting lots. Forms of tender may be obtained from the Auctioneers' Offices, 18/19, Ironmonger Lane, Cheapside, E.C.2. Tele. Mon. 3845. 7131

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

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. 7158

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

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

MOTOR Generator Sets and Convertors, all sizes and voltages from 4 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

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

ONE B.T.H. indoor type oil-cooled Transformer, 6,600 volts, 3-phase, 50 cycles incoming, 2,200 volts, 3-phase, 50 cycles outgoing, 600-kVA capacity; voltage tappings plus and minus 5% on the incoming side. Two compound interpole 230-volts D.C. Generators, suitable for direct coupling, one by L.D.M., 80/85 kW, 1,000/1,500 r.p.m., size D10; one by B.T.H., 60 kW, 1,200 r.p.m., size BS1W. One Higgs Squirrel Cage, 400 volts, 3-phase, 50 cycles, four-speed, 3 h.p., continuous on each speed, motor with controller.—Oldfield Engineering Co. Ltd., 96, East Ordsall Lane, Salford, 5, Lancs. Bla. 3842. 1915

PORCELAIN Cleats, 2 and 3 groove, various sizes ex stock, price list.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7151

PORCELAIN Insulators, various sizes in stock, galv. I spindles.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7160

ONE 700-kW Revolving Field Alternator by The Brush Electrical Engineering Co. Ltd., 400/440 volts, 3-phase, 50 cycles neutral point brought out, 1,000 r.p.m., with 10-kW direct coupled exciter at 50 volts, arranged on cast iron bedplate, suitable for either belt drive or direct coupling.—George Cohen, Sons & Co. Ltd., Wood Lane, London, W.12. 2068

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

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

SEVERAL duplicate 20-h.p. and 25-h.p., 440-volt D.C., 3-bearing Motors by Mather & Platt, on baseplates, 650 r.p.m., with Brookhirst panels.—Newman Industries Limited, Yate, Bristol. 2047

SEVERAL Telescopic Tower Ladders ready for essential work. Extensions, Trestles and Steps to order.—Shaftesbury Ladders Ltd., 453, Katherine Road, E.7, Grangewood 3383. 15

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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

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1-kW Turbo-Generating Set, 110 volt D.C., £40.—Stewart Thomson & Sons, Fort Road, Seaforth, Liverpool, 21. 65

7 1/2-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

80-kW, 220-v., 350-revs., S.I., two ped. brgs., on bedplate.—Greenhalgh Bros., Burton's Field Mill, Atherton, nr. Manchester. 2044

100-h.p., 400/3/50, S.R., 730-revs., Louvre Vent., R.T.H. (ball bearings), with Ellison O.I. gear.—Greenhalgh Bros., Burton's Field Mill, Atherton, M/cr. 2045

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Particulars of the proposed amendment were set forth in the Official Journal (Patents) No. 2941 dated June 6th, 1945.

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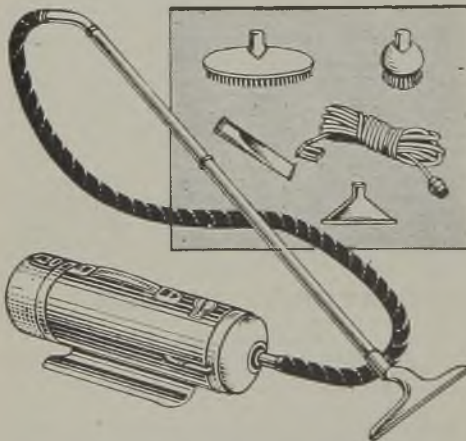
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Index to Advertisers

	PAGE		PAGE
Agro Electrical Co. Ltd.	65	Dowler, F., & Sons	59
Allen, W. H., Sons & Co. Ltd.	26	Drake & Gorham Wholesale Ltd.	8
Aluminium Development Association	58	Duratube & Wire Ltd.	84
Arrow Electric Switches Ltd.	36	Edison Swan Electric Co. Ltd.	38
Astor Boisselier & Lawrence Ltd.	60	Electrical Machinery Traders' Association	62
Austins of East Ham Ltd.	62	Electrical-Alloys Ltd.	56
Automatic Coil Winder & Elecl. Equipment Co. Ltd.	79	Empire Rubber Co.	46
Bakelite Ltd.	18	Enfield Cables Ltd.	23
Barbour, Wm., & Sons Ltd.	Cover iii	Engineering & Lighting Equipment Co. Ltd.	10
Barlow-Whitney Ltd.	60	English Electric Co. Ltd.	21
Belling & Lee Ltd.	69	English Numbering Machines Ltd.	80
B.E.N. Patents Ltd.	82	Ensign Lamps Ltd.	4
Berry's Electric Ltd.	40	Enthoven, H. J., & Sons Ltd.	66
Birch, H. A., & Co. Ltd.	Cover ii	Evershed & Vignoles Ltd.	37
Brentford Transformers Ltd.	24	Ferranti Ltd.	11
British Central Electrical Co. Ltd.	61	Fitter & Poulton Ltd.	60
British Electric Transformer Co. Ltd.	7	Fluxite Ltd.	50
British Insulated Cables Ltd.	9	Fox, P. X., Ltd.	81
British Precision Springs Ltd.	58	Geipel, William, Ltd.	80
British Ropes Ltd.	12	General Accessories Co. Ltd.	66
British Thomson-Houston Co. Ltd.	Cover iv & 5	General Electric Co. Ltd.	15 & 70
Bromley-Longton Electric Wire & Insulator Co. Ltd.	83	Graham Farish Ltd.	58
Brook Motors Ltd.	25	Harcourts Ltd.	54
Brush Electrical Engineering Co. Ltd.	22	Harland Engineering Co. Ltd.	49
Bryterlite Electrical Co. (Belfast) Ltd.	56	Heatrac Ltd.	1
Burn, George, Ltd.	61	Heayberd, F. C., & Co. Ltd.	43
Callender's Cable & Construction Co. Ltd.	17	Henley's, W. T., Telegraph Works Co. Ltd.	Cover i & 63
Carlisle Electrical Mfg. Co. Ltd.	50	Hick, Hargreaves & Co. Ltd.	56
Chloride Electrical Storage Co. Ltd.	55	Higgs Motors Ltd.	3
Clarke, Chapman & Co. Ltd.	63	Holophane Ltd.	20
Clarke, H., & Co. (Manchester) Ltd.	53	Hopkinsons Ltd.	81
Constructors Ltd.	79	Hyde, J. B., & Co. Ltd.	62
Crabtree, J. A., & Co. Ltd.	13	Igranic Electric Co. Ltd.	55
Crompton Parkinson Ltd.	19 & 51	Ismay, John, & Sons Ltd.	62
Croydon Engineering Co. Ltd.	52	Johnson & Phillips Ltd.	68
Cryselco Ltd.	30	Litholite Insulators & St Albans Mouldings Ltd.	79
Davis & Timmins Ltd.	84	Liverpool Electric Cable Co. Ltd.	14
Delco-Remy & Hyatt Ltd.	36	Londex Ltd.	84
Donovan Electrical Co. Ltd.	84	Lyons, Claude, Ltd.	69
Dorman & Smith Ltd.	39	Macfarlane Engineering Co. Ltd.	78

(Continued on page 82)

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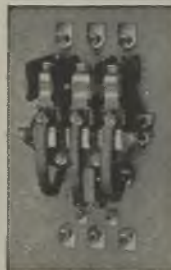
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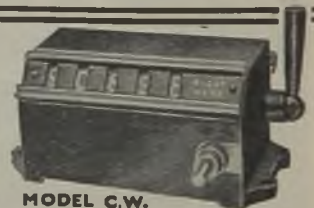
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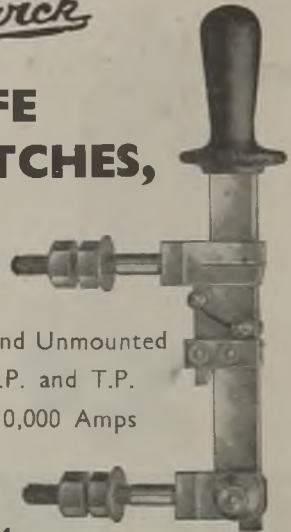
Index to Advertisers

(Continued from page 80)

	PAGE
Mallory Metallurgical Products Ltd.....	43
Manganese Bronze & Brass Co. Ltd.....	44
Martindale Electric Co. Ltd.....	41
Matterson Ltd.....	83
McGeoch, William, & Co. Ltd.....	82
McKechnie Bros. Ltd.....	57
M.C.L. & Repetition Ltd.....	1
Metropolitan-Vickers Electrical Co. Ltd.....	34
Metway Electrical Industries Ltd.....	36
Midland Dynamo Co. Ltd.....	65
Midland Electric Mfg. Co. Ltd.....	33
Mirrlees Watson Co. Ltd.....	54
National Fire Protection Co. Ltd.....	48
Newman Motors.....	64
Norman Engineering Co. Ltd.....	57
Oliver Pell Control Ltd.....	62
Outram, C. W., & Co. Ltd.....	54
Partridge Wilson, E., & Co. Ltd.....	29
Permutit Co. Ltd.....	32
Phosphor Bronze Co. Ltd.....	52
Pinchin, Johnson & Co. Ltd.....	Cover iii
Portable Furnace & Patents Co.....	28
Pyrene Co. Ltd.....	16
Pyrotex Ltd.....	8
Ransomes, Sims & Jefferies Ltd.....	52
Rejafix Ltd.....	28
Reyrolle, A., & Co. Ltd.....	31
Ross Courtney & Co. Ltd.....	1
Rowlands Electrical Accessories Ltd.....	67
Runbaken Electrical Products.....	84
Sangamo Weston Ltd.....	40
Siemens Electrical Lamps & Supplies Ltd.....	29
Siemens-Schuckert (Great Britain) Ltd.....	60
Simmonds Bros.....	60
Sperryn & Co.....	65
Standard Telephones & Cables Ltd.....	45
Static Condenser Co. Ltd.....	58
Stephens Belting Co. Ltd.....	78
Sternaw Co. Ltd.....	82
Strand Electric & Engineering Co. Ltd.....	66
Terry, Herbert, & Sons Ltd.....	6
Thorn Electrical Industries Ltd.....	47
Thorpe, F. W., Ltd.....	2
T. M. C.-Harwell (Sales) Ltd.....	65
Tok Switches Ltd.....	78
Tucker, J. H., & Co. Ltd.....	35
Universal Boilers & Engineering Co. Ltd.....	36
Vactic Ltd.....	78
Varley Magnet Co.....	79
Veritys Ltd.....	41
Victoria Instrument Co. Ltd.....	28
Ward & Goldstone Ltd.....	42
Ward, Thos. W., Ltd.....	83
Weir, G. & J., Ltd.....	28
Welding Industries Ltd.....	1
Westminster Engineering Co. Ltd.....	66
Westool Ltd.....	82
Wilcox, Edward, & Co. Ltd.....	50
Wireohms Ltd.....	66
Wolf, S., & Co. Ltd.....	27
Wright, Bindley & Gell Ltd.....	53
Yorkshire Electric Transformer Co. Ltd.....	59

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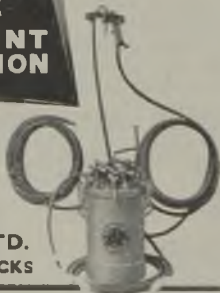
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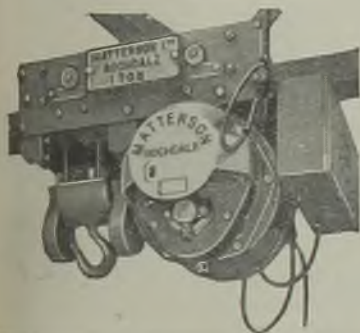
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