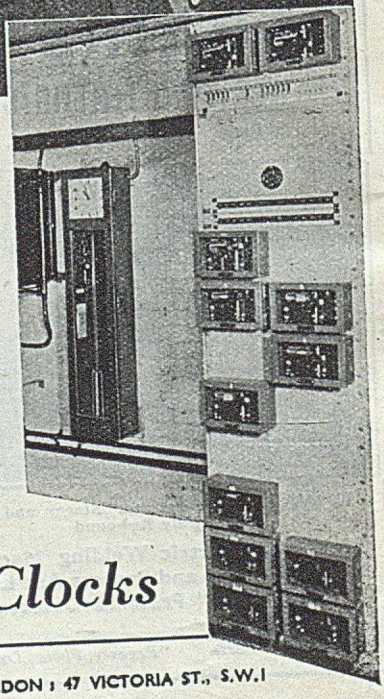
ELECTRICAL REVIEW

VOL. CXL JANUARY 3, 1947 NO. 3606

ESTABLISHED 1872 NINEPENCE WEEKLY

At the B.B.C.

Accurate time is distributed throughout Broadcasting House by the Gents' Electric Impulse Master Clock shown on the right. B.B.C. Engineers know that the Electric Impulse Clock System is ideally suited to large establishments where accurate, uniform time—independent of mains variations—is of prime importance. That is why they chose



GENTS'
OF LEICESTER

Electric Impulse Clocks

GENT & CO. LTD., FARADAY WORKS, LEICESTER • LONDON : 47 VICTORIA ST., S.W.1

You can't beat a Belling

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BELLING & COMPANY, LTD., BRIDGE WORKS, ENFIELD, MIDDX. Telephone: Howard 1212

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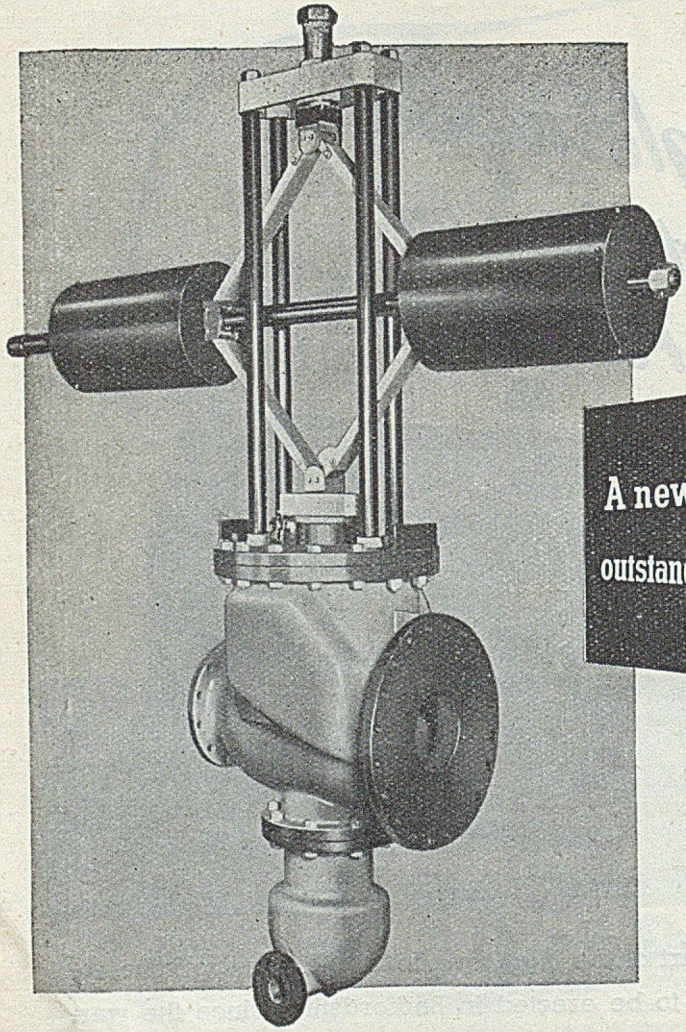


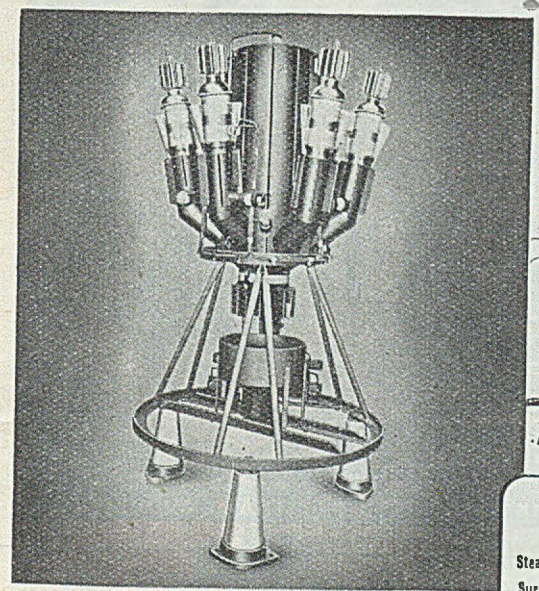
A new Relief valve of outstanding performance

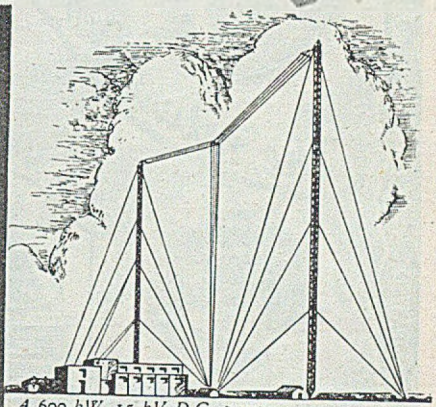
Amongst the many outstanding developments in the Blakeborough range of valves for steam duty is the Full Bore relief valve (Turner's patent No. 36854), This valve gives the unprecedented discharge of six times that of an ordinary relief valve under equal conditions, and three times that of a high lift pattern. It opens to the full area of the seat bore with only 3% accumulation pressure — less than one third of that otherwise required — and returns promptly without blow-down loss. Other features give freedom from wire drawing, and a setting pressure unaffected by spring hogging, differential expansion, or wear. The valve is available in versions suitable for pipe line, boiler, or superheater duty; in globe and junction patterns; and in cast iron, cast steel or bronze. Full details from J. Blakeborough and Sons Ltd., Brighouse, England.

BLAKEBOROUGH VALVES

"ENGLISH ELECTRIC"

Mercury Arc Rectifiers





A 600 kW, 15 kV D.C. pumpless steel bulb rectifier as used with radio transmitters.

THE English Electric Company's experience in mercury arc rectifiers embraces such applications of direct current as supplying ships in dock at 110 volts, traction service at 600, 1,500 and 3,000 volts, the largest rectifier installation in the British Isles for the electrolytic production of aluminium, and power for radio transmitters at 15,000 volts.

"English Electric" manufactures

- Steam Turbines
- Surface Condensers
- Feed-water Heaters
- Turbo-Alternators
- Water Turbines and Alternators
- Diesel Engines
- A.C. & D.C. Generators
- Electric Locomotives and Motor Coach Stock
- Diesel-Electric Units
- Tramcars and Trolley Buses
- Diesel-Electric and Turbo-Electric Equipments for Marine Purposes
- Aircraft
- Indoor and Outdoor Switching Stations
- Transformers of any size, type or voltage
- H.V. and L.V. Circuit Breakers
- E.H.V. and L.V. Switchgear
- Fusegear of all types
- Mercury Arc Rectifiers
- Synchronous Condensers
- Motor Convertors and Generators
- Electrical Equipment for Iron and Steel Works, Collieries, Mines and Industrial Undertakings
- Rolling Mill Motors
- Electric Winders
- Arc and Stud Welding Equipments
- A.C. and D.C. Motors and Control Gear
- Dynamometers
- House Service Meters
- Ignition Testers
- Electric Appliances for Domestic, Restaurant and Canteen use

THE ENGLISH ELECTRIC COMPANY LIMITED

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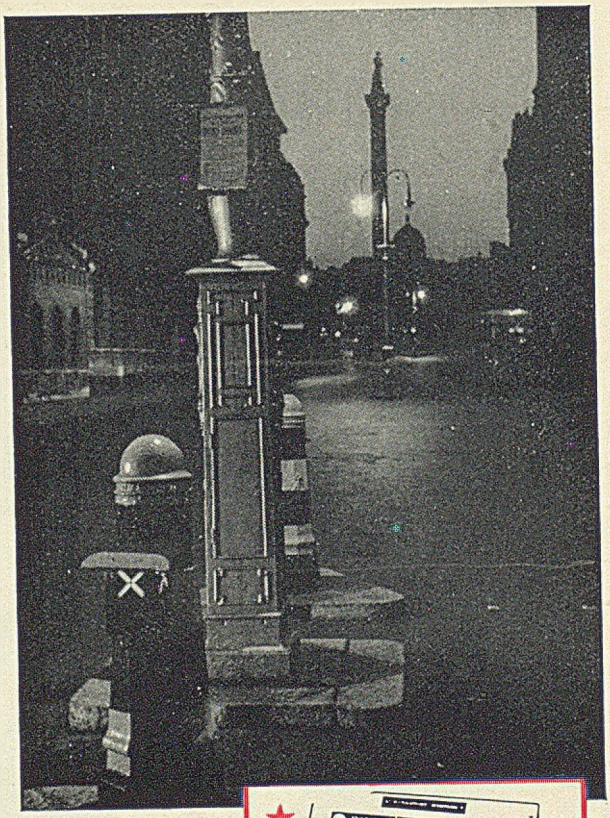
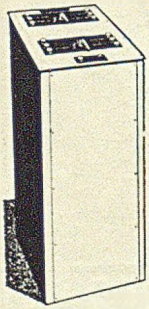
At

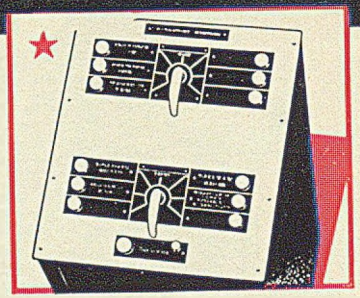
Controlling THE "LIGHTS OF LONDON"



In that section of the Central London Electricity Ltd. network covering the Mall, Whitehall, Strand, Trafalgar Square, Leicester Square and Charing Cross Road, the electric street lamps are now switched "on" and "off" by Rythmatic Equipment. This consists of Relays fitted to every lamp standard throughout the area and actuated by apparatus located in St. Martin's Lane sub-station comprising a Control Desk, Equipment for generating Audio Frequency Currents of from 300 to 1,000 cycles and Injection Apparatus for super-imposing these currents on to the network over the electricity supply mains already carrying power to the street lamps.

Situated in the heart of the great metropolis and responsible for the welfare and convenience of hundreds of thousands of people, street lighting in this area of London must attain perfection. In so far as its switching control is concerned, the installation of Rythmatic equipment will greatly help to achieve this result.





The Control Desk is fitted with two 7-position normal control switches, each having one "off" position and six signal positions and also a "Transmit" push button. Mounted in the Control Desk are indicating lamps which inform the operator of the switching position of the various Rythmatic relays on the network. These lamps are operated by standard Rythmatic relays fitted in the Control Desk and actuated by the actual impulses received on the low tension network, thus providing an exact indication that the signal has been correctly transmitted.

RYTHMATIC CONTROL EQUIPMENT

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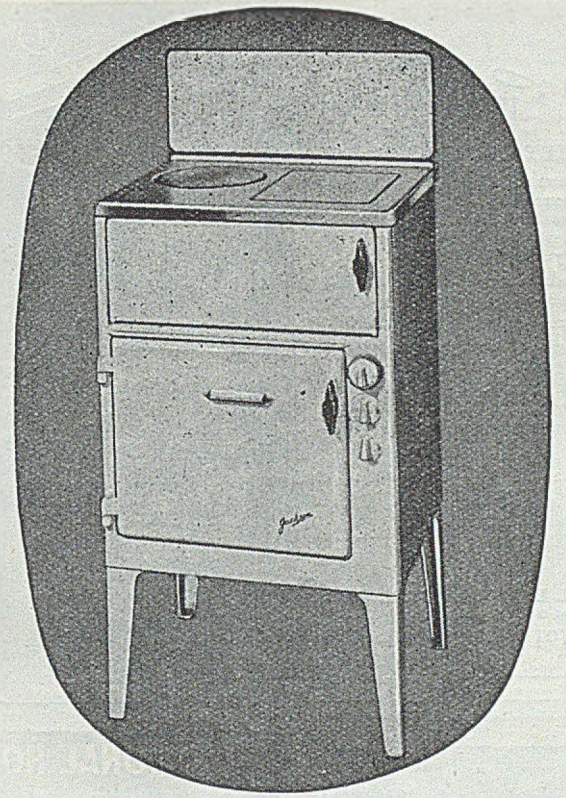

CHECK THESE FEATURES—Features that emphasise the value of *Jackson* ELECTRIC COOKERS

1. Pressed Steel Hob with Chromium Plated finish.
2. Thermostatic Oven Control.
3. Plug-in Elements throughout.
4. E.D.A. Earthing throughout.
5. E.D.A. Interchangeability (Grill Boiler and Boiling Plate).
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JACKSON 192 SERIES IV. All these features plus —the exceptional fine quality—well planned mechanical construction—completely dependable electrical performance—make the Jackson Cooker the logical choice of all who buy with an eye to the future.

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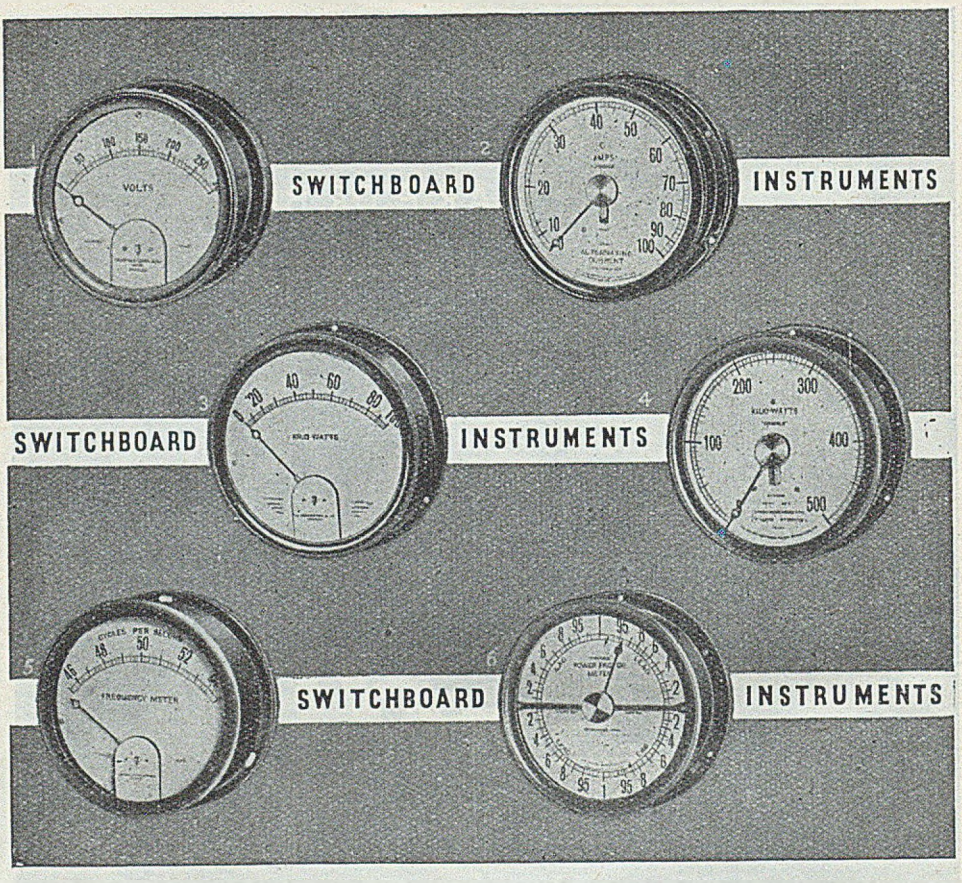

1. Standard Scale Ammeter and Voltmeter—Moving Iron and Moving Coil.
2. Cirscale Ammeter and Voltmeter—Moving Iron and Moving Coil.
3. Dynamometer Wattmeter.
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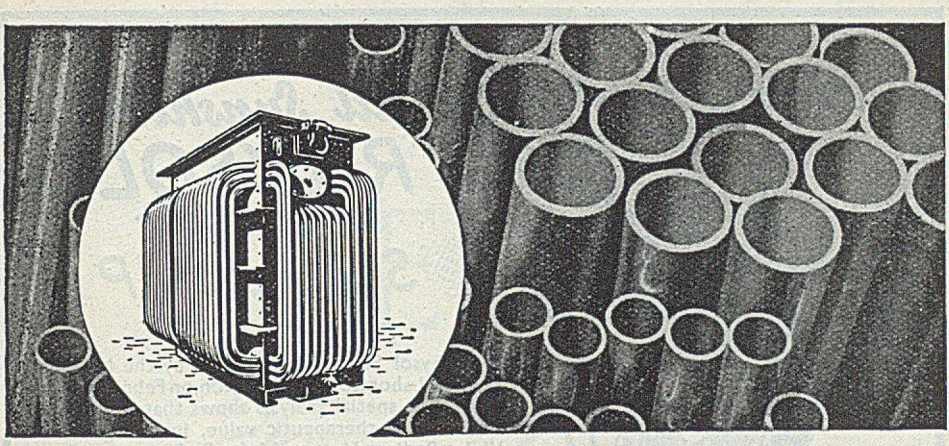
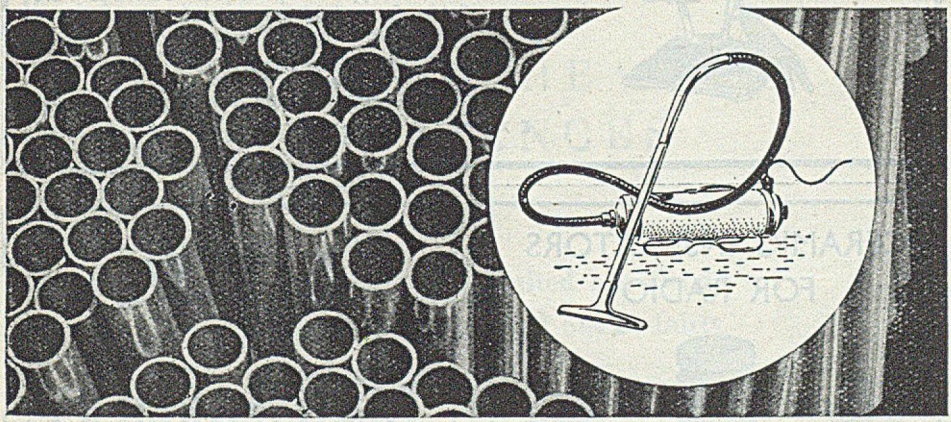


FROM POWER HOUSE TO POWER PLUG



Whether it be cooling tubes for transformer tanks or decorative tubes for domestic accessories, Tru-Wel electrically-welded steel tubes can usually help. They are today used in articles like cookers, fires, and fans; light fittings, vacuum cleaners and stand lamps. A special feature is their adaptability to new designs. Easy manipulation and assembly are ensured by their great accuracy and uniformity of concentricity, wall thickness and composition — the first and millionth lengths are identical in every respect. Tru-Wel electrically-welded steel tubes can be supplied in stock sizes or to your specification, and their clean surfaces take paints and enamels and all types of plating readily. Write to us for our illustrated booklet.

TRU-WEL

ELECTRICALLY WELDED STEEL TUBES

A Member of the Tube Investments Group

TUBE PRODUCTS LIMITED · OLDBURY · BIRMINGHAM

E.4

He's arrived . .

. . . and now that he is here may we express our wish that he brings a welcome promise of new and expanding business for all our customers, both old and new. We for our part can assure you that we shall be ready to co-operate in your undertakings by supplying all that is best and most up-to-date in the Electrical and Radio field

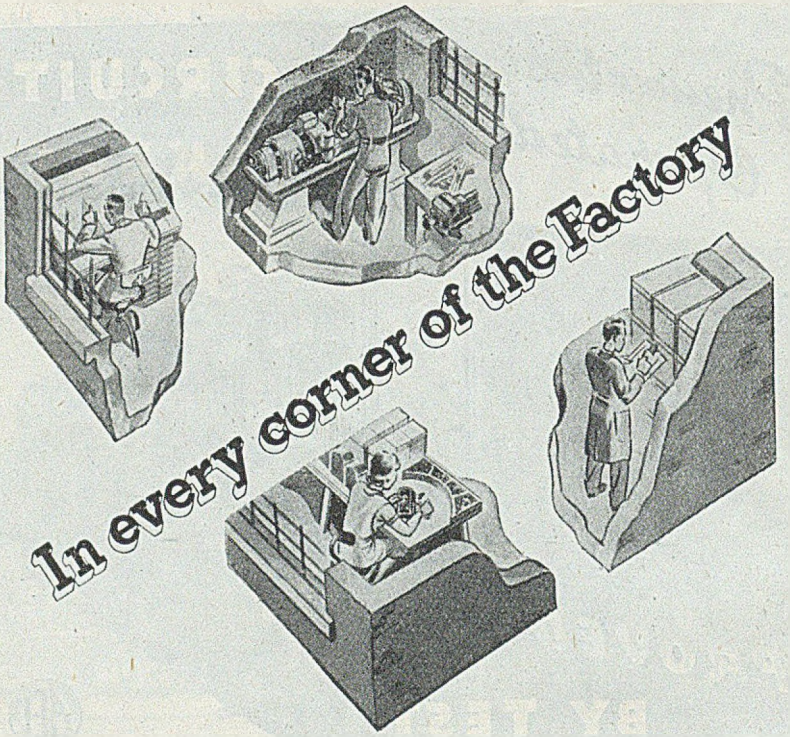
The SUN ELECTRICAL Co. Ltd.

118-120 Charing Cross Road, London, W.C.2

and at LEEDS, NEWCASTLE-on-TYNE and SLOUGH

FOR EVERYTHING ELECTRICAL INCLUDING VENTILATION

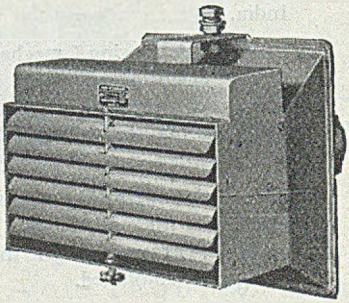
B



Every department, every office, warmed to a pleasant healthy temperature means comfortable workers, producing to the limit. The secret ?—thorough distribution of warmed air at just the right temperature ; in short an efficiently planned system of G.E.C. electric unit heaters.

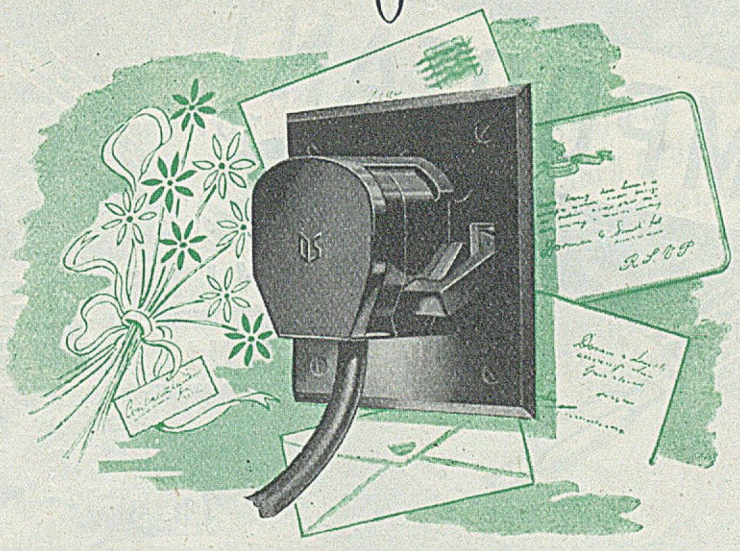
Inexpensive to instal and operating at low cost, these heaters need no floor space, no boiler house, and no labour. Each unit can be worked independently with or without thermostatic control.

Highly skilled G.E.C. specialist engineers are available to submit proposals on the planned installation of these Units or to advise on any heating problems.



G.E.C. Unit heaters of this type are available from 5 to 20kW. The fan ensures adequate heat distribution during the winter, and is a useful adjunct to the ordinary ventilating system during the summer.

G.E.C. ELECTRIC UNIT HEATERS



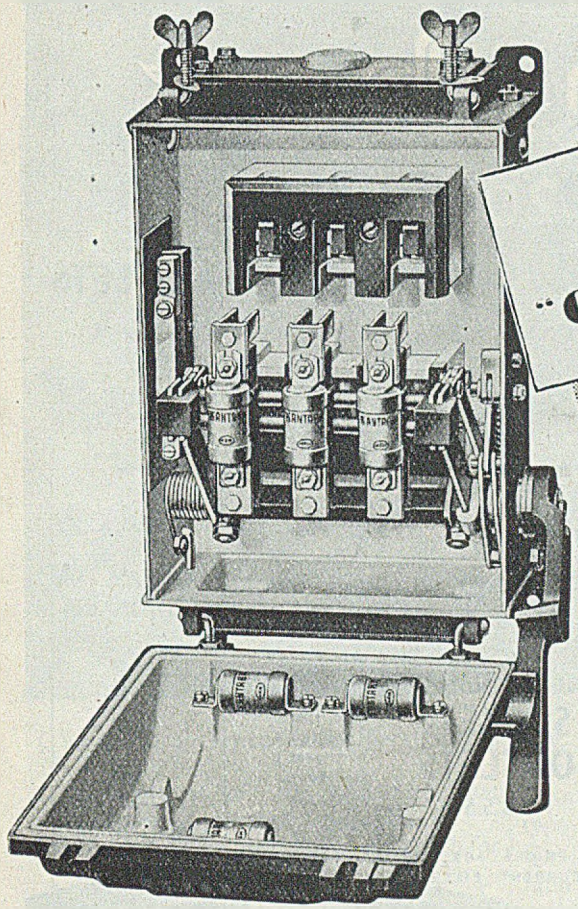
A Full Engagement Book

WE regret that at the moment the D S Fused Plug and Socket cannot keep all the engagements or meet all the people we would like.

Apart from production difficulties common to all, Government priorities are taking the bulk of the ever-rising output of the D S Fused Plug and Socket. But the day will come when this famous accessory will "come out" in real earnest, and add thousands more to her already huge host of admirers.

In the meantime, our compliments and apologies.

The **DS** *Fused Plug and Socket*



The NEW "Glasgow-Rex"

The Famous M.E.M Ironclad Switch Re-designed —with H.R.C. Fuses

M.E.M. designers have shown true leadership again. This new H.R.C. series is a triumph of compactness and adaptability. You can convert the standard switch to an H.R.C. fuse switch in a few moments. It is just as simple to convert a triple pole unit to triple pole and neutral. Here is a new kind of versatility in switchgear.

The "Glasgow-Rex" complies fully with Home Office regulations and the "Kantark" H.R.C. standard cartridge fuses are in accordance with B.S.S. 88/1939, A.C.4 and D.C.3. Appearance, workmanship and finish of these switches will win the admiration of engineers everywhere. Yet this high quality equipment is offered at reasonable prices. Only M.E.M. intensive specialisation could produce such value.

A descriptive list No. 278 is already available. It gives full details of the new "Glasgow-Rex" range, rated from 30-200 amps. Send for your copy now

M·E·M

Switch, fuse and motor control gear, electric fires and localised lighting equipment

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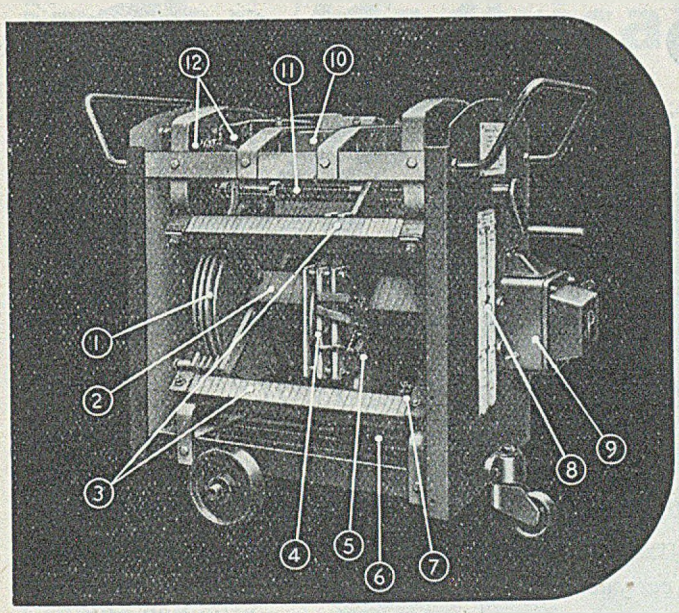
WELDING EFFICIENCY



Ask for Publication G.5

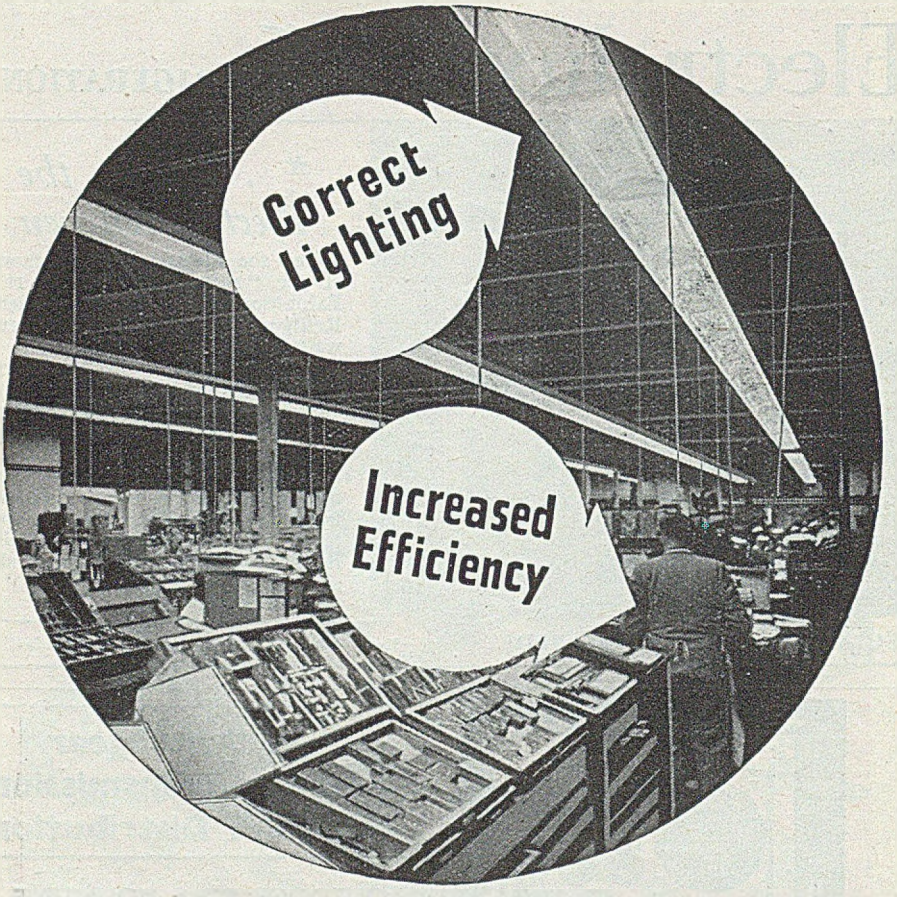
Single operator, portable, heavy duty, A.C. arc-welding set

(1) *Fixed secondary coil (with liberal cooling ducts).*
(2) *Centre limb of core—assembled from low-loss silicon steel laminations.*
(3) *Outside limbs providing return path for flux.*
(4) *Primary (moving) coil mounted in substantial insulated board.*
(5) *Tappings adjustable to suit supply.*
(6) *Self-cleaning spring-loaded contacts.*
(7) *Series parallel tappings for 190-220 or 380-440 volts.*
(8) *Welding current indicator.*
(9) *Double pole ironclad supply switch with brass packing glands for incoming cable.*
(10) *Auxiliary choke coil to give low current range.*
(11) *Square threaded operating shaft.*
(12) *Sockets for low and high welding current.*

The J. & P. single-operator, portable, arc-welding set is an air-cooled transformer of the moving coil regulating type. Constructed to B.S. Specification 638/1941, the set has a welding ratio of 22·5 kVA, while a diversity factor of 70 per cent. is used as the basis for the continuous B.S. rating of 15·75 kVA. It is thus fully rated for 250 amps. *continuous* hand welding current, with infinite variation over the two welding ranges of 30-60 amps. and 65-250 amps.

The heavy duty welding efficiency of a J. & P. arc-welding set could help *your* production. Publication G.5 gives full details—may we send you a copy ?

JOHNSON & PHILLIPS LTD.
CHARLTON LONDON S.E.7
The mark that means that "little more" in quality



UNTIL YOU'VE had experience of what correct lighting can do, you cannot fully appreciate how much a good lighting installation can save in hard cash.

Innumerable faults and errors which lead to waste of time and material can be traced to incorrect lighting. Many mishaps and accidents have their roots in the same cause, and it is now recognised that premature fatigue can be induced by poor light.

All this can be very easily corrected to the advantage of both the workers and the work, provided experienced advice is sought. BTH Lighting Engineers, with their detailed technical knowledge and long familiarity with lighting problems of all kinds, are equipped to provide sound counsel and practical suggestions to correct faulty lighting.

If you desire to avail yourself of their services, without obligation, you are invited to write to BTH Lighting Advisory Service, Bridle Path, Watford.

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MAZDA Lamps

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ELECTRICAL REVIEW

January 3, 1947

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXL. No. 3606 JANUARY 3, 1947 9d. WEEKLY

The Coming Year

Assured Future of Electrical Industry

ONE effect of the war was to give a considerable impetus to electrical development. Electricity proved to be indispensable to industry and the idea of indispensability was impressed upon those hundreds of thousands who by the fortunes of war found themselves in industry.

Unfortunately another thing brought about by the war was a serious shortage of generating plant and many types of fittings and appliances and the results of the interplay of these two opposing manifestations have been only too plain recently.

But for the shortage, 1946 would have been a wonderful year for the electrical industry. As it was, and in spite of the adverse conditions, the demand for electricity continued to grow and was satisfied to what was an amazing extent in the circumstances. The Central Electricity Board deserves much credit for the way in which it has dealt with the rising load without, as a rule, long-period disturbance.

Incomplete Harvest

What would the industry not have done if these irksome restrictions had not bound it? It has been very galling to have had to abandon, or at least only half reap, the harvest which has resulted from two decades of intensive and extensive cultivation.

For electrical manufacturers the past year has largely been one of "reconversion." Many of them, of course, were fortunate enough to be retained on more or less normal production and the change-over to peacetime conditions has not meant an upheaval. Others have had a more difficult time, but all reports seem to indicate that in so far as labour and material shortages have permitted they are emerging successfully from what has been a serious ordeal. A few concerns, however, are still in the throes of reconversion and find it a rather serious struggle.

Plenty of Business

There has been no lack of orders with home customers, on the one hand, ravenous for all classes of equipment and, on the other, with the Government urging manufacturers on to ever greater production for export. In some directions improved production has proved embarrassing, particularly in the domestic appliance field. It is odd to find this business flourishing in the present generating plant situation.

The export drive has been very successful. Recent Board of Trade returns suggest that the electrical industry is within sight of its rather ambitious target of £65 million per annum. In some respects this, too, has proved an embarrassment for, in the earlier part of the year at least, much plant was shipped overseas which was badly needed at home. We believe that this tendency has now been checked. It is a stern fact that without more labour and raw materials the industry cannot be all things to all men.

Prospects for the coming year are not discouraging. The fact that we have done so well in the difficult circumstances of 1946 should mean that there will be

even better results in 1947. Improvement may be gradual but we feel that matters are beginning to move in the forward direction and we have no doubts about the future of the industry.

Shorter Week

WITH the reduction of the working week in the engineering industry to five days (44 hours), as from the beginning of this year, the workers concerned tacitly agree that output shall not suffer. In present circumstances it is to be hoped that this will be the case and that the three hours thus lost will not have to be made up by increased overtime. The abolition of Saturday morning work will probably not make the difference that might superficially be expected, for to a very large extent this half-day has not been so productive as it should have been.

Electricity in Factories

ALTHOUGH the number of accidents due to the use of electricity in factories forms only a very small proportion (0·39 per cent) of the total from all causes, the percentage in the case of fatalities is appreciably higher. This lends force to the recommendation made made in the report of the Chief Inspector of Factories, reviewed in this issue, regarding the instruction of workers in methods of administering artificial respiration to those suffering from severe shock. Another lesson is the need for improved maintenance. Since electricity pervades the whole of industrial activities, the secondary effects of accidents in holding up production may also be serious.

Artificial Respiration

EVIDENCE at a recent inquest into the death of a man who was using a defectively wired electric hammer brought out an important point. It was stated that artificial respiration was applied to the man for eight or nine minutes before the arrival of an ambulance and it was not known whether it was continued at the hospital. Now eight or nine minutes is a totally inadequate period in such circumstances. Even if application was resumed at the hospital, a considerable time must have been wasted when promptitude and continuity were imperative. To interrupt artificial respiration to remove the patient to hospital would seem to be courting failure. It would be well for the Ministries of Labour and Health to issue clear instructions to first-aid people in factories and to hospital authorities that in cases of electric shock artificial respiration should be commenced immediately and continued without interruption for at least two or three hours.

Grinding Cattle Feed

SINCE the value of high load factor increases with distance from the source of electricity supply, any reduction in demand on lines serving farms is of greater proportionate value than it is in urban areas. Investigations made by Mr. C. A. Cameron Brown for the Electrical Research Association (Ref. W/T4) have shown that automatic hammer mills for grinding stock feed can be driven by much smaller motors for a greater number of hours, providing better service to farmers at a lower cost and taking less material for their construction than do the cumbrous mills in common use. A suitable follow-up is a new report, W/T10 (3s. 6d. net), dealing with the practical application of time-controlled mills to various farm requirements.

Rate Relief

MUNICIPALITIES owning electricity undertakings are worried about the possibility of losing the sums which they have regularly taken from the undertakings' profits to relieve the rates. On the face of things, it would seem that if any future State-created organization takes over and the authorities are relieved of the outstanding debts and the charges upon them, then there is no injustice. We are not inclined to sympathize with those who think that failure to take rate relief into consideration is unfair. It merely means that the general body of ratepayers takes over a burden hitherto carried only by the consumers.

Power Politics

ALTHOUGH it does not suggest that the Republican Party in the United States consists solely of champions of private enterprise in the electric power field, the *Electrical World* considers that that party's domination of Congress may lead to a slowing down of the move towards "public power" evident during the Democratic Party's régime. In this country, as we are becoming increasingly aware, the change in the political scene has had quite an opposite effect.

Testing Switchgear Operation

Checks on Closing and Tripping

By *V. Ananin*, B.Sc. (Eng.), and *B. J. Prigmore*, M.A.

THE proving of protective equipment on feeders and switchgear, usually by any of the various injection methods, is an important part of maintenance routine, but the proving of the actual operation of the switchgear is no less important.

After completing the overhaul of a circuit-breaker its correct operation should be checked, not only from the local control panel but also from all other panels from which the switch can be controlled. Should the switch be one of a pair, as for a two-speed induction motor with two windings, then the complete operation of the pair should be proved in addition to the operations of the individual switches.

It does not suffice merely to check the normal operational sequence. If this sequence is modified (should, for instance, only one of the switches be plugged in), the correct operation of the various frame auxiliary switches should also be checked. This may be done by simulating the several combinations of switch positions by the temporary wedging of frame switches, the wedges being so designed that they cannot inadvertently be left in place.

Further to these operational tests, however, it is generally wise to prove that a switch will close, or, more particularly, open under adverse conditions. It is well to check that a switch can be closed even if the control-circuit supply voltage is subnormal. Since switch closure has already been checked, it suffices to prove that the solenoid contactor can be closed if supplied at subnormal voltage. Normal closing is checked by bridging the contacts of the controller or push button. Closing at subnormal voltage may be checked by bridging these contacts with a resistance of such a value that, with the contactor-closing current flowing, the required reduction in voltage is obtained at the contactor-coil terminals.

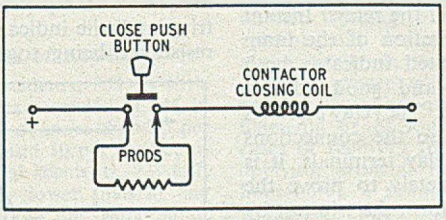


Fig. 1.—Switch-closing test

The test may be made as in Fig. 1, using test prods, connected to a portable resistance of the required value, with which to make contact with the controller or push-button closing terminals.

If a freely moving contactor fails to close when, say, 70 per cent of normal voltage is applied to its closing-coil terminals, correct operation may usually be obtained by reducing the air gap in its magnetic circuit, providing that in so doing the contact gap is not excessively reduced.

If the terminals on the push-button wires are not conveniently accessible at any place from which contactor operation may be observed, the substitution of a mechanical test, in the form of an extra force tending to prevent closure of the contactor, may be useful. A contactor is adjusted just to close at the required minimum voltage. Full voltage is then applied, the contactor being held open by a force which is gradually reduced until the contactor just closes. The force may conveniently be applied by a length of thread, hooked to the contactor moving portion as far from the hinge as possible, led over a smooth surface or small pulley and held in tension by a small weight. The maximum weight which fails to prevent the closure of this calibrated contactor is the standard for testing contactors. It is the weight against the force due to which any contactor should close when normal voltage is applied to its closing-coil terminals.

It is essential that a switch should trip correctly, even if the trip supply voltage is below normal. In some instances a trip test at 50 per cent of normal voltage is customary. The test is best performed, as is the first of the above mentioned closing-contactor tests, by the use of test prods and a portable resistance of the required value. The prods are preferably applied to the tripping terminals of the protective relay; this enables the whole of the relay-tripping circuit to be

proved. It is inadvisable to use the trip-relay contacts for routine testing, as, although ample in design for their duty, they are readily burnt by frequent use and will be worn by the frequent cleaning so necessitated.

In the circuit shown in Fig. 2, in which the series alarm relay is energized by the trip-coil current when the trip relay contacts are

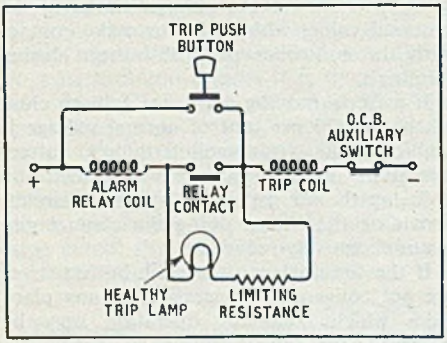


Fig. 2.—Trip and alarm relay test

closed, it may happen, if the trip coil will work at greatly reduced voltage, that it is the alarm relay which fails to operate on a low-voltage trip test. In this case the trip relay contacts should also be shunted with a lower test resistance, to ensure that the alarm will operate on, say, 70 to 80 per cent of normal voltage. If it will not, its adjustment is advisable.

The efficacy of trip-relay contacts is readily checked during injection tests. A flash-lamp bulb, in series with a dry battery, is connected across the trip terminals of the relay. Instant and full-brilliance illumination of the lamp when the relay is operated indicates both correct relay operation and good contact between the relay contacts. The relay contacts thus being proved, as also the connections between these and the relay terminals, it is sufficient in order completely to prove the protection circuits to perform the trip test by bridging these relay terminals either directly or with a resistance.

From the mechanical aspects of tripping, several points require attention. Many trip mechanisms are arranged so that impact of the trip plunger causes collapse of their toggle links. In performing tests on this type it is essential that the switch should be tripped at the first blow of the plunger, since action of the relay will not give any second impact to trip the switch.

In another type of mechanism, as in Fig. 3, the trip plunger merely lifts a form of catch or bridge, which, by releasing a portion of the mechanism, causes its collapse. Complete freedom of movement of the trip catch is necessary. When the switch is closed one of the pin joints of the mechanism is generally just off " dead centre." On the exact position of this joint when the switch is closed depends the pressure of contact at the point P.

If the switch mechanism has any stiffness, or if, owing to wear, this pin joint has approached too closely to dead centre, there will be insufficient force at P to result in movement of the mechanism when the catch is raised and the lever released. The excess of this force over that necessary to cause tripping may be measured by holding back the lever with a spring balance. The catch is then lifted and the tension in the spring balance reduced until the mechanism just collapses. The spring balance reading just before collapse gives the available force at P; this should be ample to give positive action when the catch is raised.

On the exact setting of the contact face P of the catch, depends the ease with which the plunger can lift the catch and cause tripping. To ensure that vibration (such as that caused by operation of an adjacent switch) will not cause the catch to release the lever, it is worth attempting to close the switch with the trip catch slightly lifted by inserting thin packing between the plunger and the catch. Should the switch fail to latch closed in this condition the cause of the failure should be investigated.

On many control circuits the " closed " indication lamp also indicates " healthy tripping," the indication lamp and a limiting resistance being together in series with the

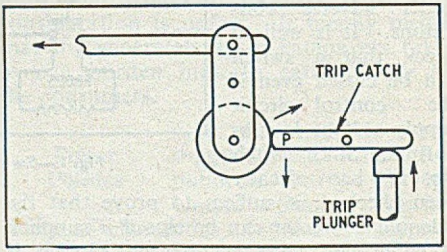


Fig. 3.—Mechanical tripping arrangement

trip coil, as in Fig. 2. Since the indication lamp is energized by the trip supply through the trip-coil circuit, it proves that circuit to be in order. Tripping is effected by short-circuiting the lamp and resistance. In the event of the lamp or the lampholder becoming short-circuited, the resistance will limit

the current and prevent trip-coil operation.

Should trip-coil operation be possible on a very low fraction of normal voltage, the limiting resistance may be so great as to cause the indicator lamp to be very dim. The temptation to decrease the resistance considerably should be resisted. Instead, the minimum operating voltage for the trip coils should be obtained by experiment, and the value of the resistance then decreased to an extent that is consistent with safety. In this way a maximum of convenience in indication combined with freedom from inadvertent operation will be obtained.

Tests of the above nature are of use in determining the limitations to the correct operation of complete switchgear and might well be performed on examples of all new equipment. When those parts which are liable to fail under adverse conditions have been discovered, they may then be listed as requiring routine testing, together with normal operational testing, at the conclusion of an overhaul of the equipment.

Factory Report

Suggestions for Ensuring Safety

PROBLEMS arising out of the change-over from war conditions to normal working in 1945 are summed up in the annual report of the Chief Inspector of Factories, Mr. H. E. Chasteney, who succeeded Sir Wilfrid Garrett on his retirement at the end of the year. There has been far less deterioration in safety standards than was noticeable after the previous war, but much leeway needs to be made up in respect of guarding machinery, maintenance and repairs.

New war factories show a substantial advance in lighting, which has yet to spread to peace-time industries. Attention is drawn to the importance of quality in lighting, on which increased emphasis is placed in the revised Code of Practice issued by the Illuminating Engineering Society. Appreciation is noted of the value of the 12,000 canteens serving hot meals which are likely to be permanent. The Information Branch of the Department, set up in 1943, continues to collect and distribute to those concerned up-to-date information on all aspects of safety.

Substantial Reduction of Accidents

The number of fatal accidents, 851, is little more than half the highest recorded (1,646 in 1941) and shows a decline of more than 15 per cent compared with 1944 and 10 per cent compared with 1938. Non-fatal accidents, 239,802, likewise were substantially lower than in any year between 1939 and 1944 but were about 61,000 more than in 1938.

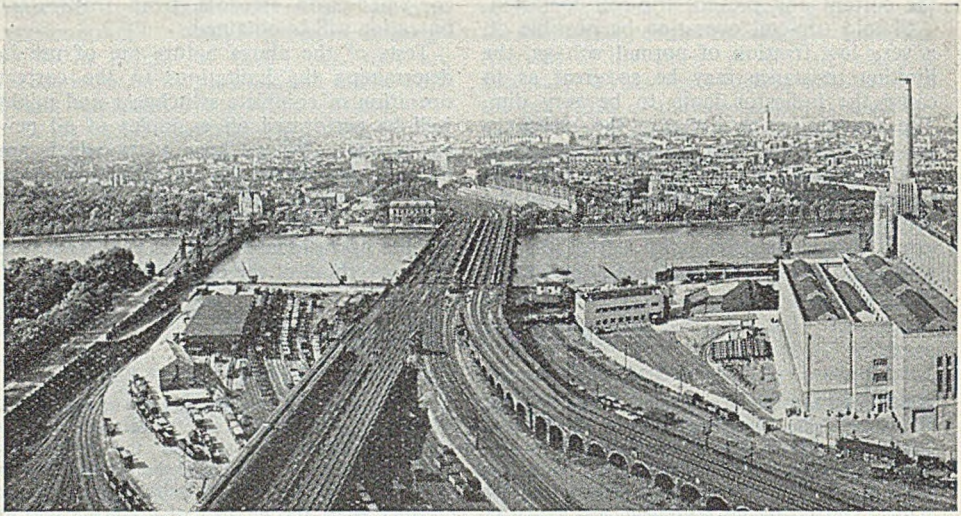
Owing to variations in volume and distribution of employment accident totals by themselves provide no true criterion unless related to man-hours, as is done in some works. The accident rate per 1,000 persons (excluding docks, and building and civil engineering sites) was 37 in 1945 as against the highest of 43 in 1942 and 29 in 1938. Power-machinery accidents have steadily fallen from 18·3 per cent in 1938 to 14·9 per cent in 1945.

Tables of accidents related to industry, age, sex and causes (in which the injured person is the unit) show that 8,749, including 16 fatal, occurred in electrical engineering works, 64 of which are attributed to "electricity." In electrical generating stations the total was 1,819, including 11 fatal, and the number due to electricity was 81. In all industries under the Factory Acts, the number of accidents due to electricity amounted to 937, of which 31 proved fatal. In a section on "Electrical Risks." Mr. H. W. Swann, Senior Electrical Inspector, refers to the significantly low proportion formed by the 31 fatal accidents in factories to a total of 178 in all places of which the Department had knowledge. No similar information regarding non-fatal accidents was available to the Department.

Importance of Proper Maintenance

This section includes the following notes. The majority of the 35 explosions of switchgear was due to inadequate maintenance. The importance of a low-impedance earth return for welding sets is emphasized, reference being made to the Fourth Edition of the Memorandum on Arc Welding (Form 329-1945). Failure of control and indicating gear should result automatically in safe stoppage of plant and design of electronic equipment should take into account the effect of the burning out of valve filaments or of faulty condensers. Thirteen cases of recovery from electric shock through applying artificial respiration up to half-an-hour—only a proportion of the accidents in which respiration should have been attempted with possible saving of life—show the importance of spreading a knowledge of the requisite procedure.

It is stated that mains supply for hand tools used in building should be transformed to about 100 V, the centre point of the secondary winding of the transformer being earthed. Other important recommendations of the Electrical Branch were given in the *Electrical Review* of September 15th last. Technical discussions with manufacturers on the safety of new equipment form an important part of an inspector's duties. In securing safety much depends upon effective maintenance.



London Load Building

I—Sources of Supply

This is the first article of a short series dealing with one of the most important and diversified supply areas in the country. It deals with three of the London Power Company's generating groups

WE have selected for treatment in our load-building series that part of Greater London which depends mainly for its supply on the London Power Co., Ltd., because in this area of about 80 sq miles, which extends roughly from Greenwich in the east to Maidenhead in the west, and from Chertsey in the south to Chesham in the north at the western part and tails off rather sharply and irregularly eastwards, there is probably by far the greatest variety of conditions, particularly with regard to load density, to be found in any area of comparable size in this country.

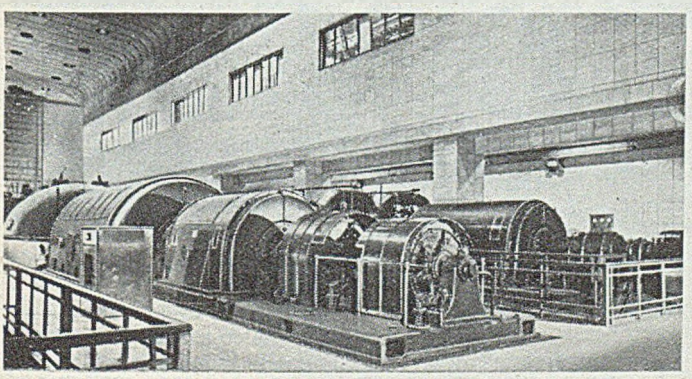
To follow the line we have taken in previous articles since the end of the war, we first present the "background," i.e., the generation, transmission and distribution activities, and this article, therefore, outlines the work of what may be termed the "production department"—generation. The Power Company has about a million kW of main plant in its five generating stations or station groups—Battersea, Deptford, Willesden, Grove Road and Bow—but as the chief function of the last two stations is to serve the grid they need not be included in our survey.

At Battersea there is now in commission a total plant capacity of 343,000 kW, including the 100,000-kW cross-compound turbo-alternator, and the two e.h.p. 440,000-lb per hour boilers associated with it, which were commissioned during the war and constitute the first instalment of Battersea "B" which was described in the *Electrical Review* of October 4th last. The earlier constructional work for the second generating set to be installed there is now going on, and this 60,000-kW set and its associated boilers will bring the total generating plant capacity of the whole station group up to 403,000 kW, and the total steaming capacity up to approximately 4,400,000 lb per hour.

The new turbo-alternator will be a single-shaft machine with a three-cylinder turbine and a hydrogen-cooled alternator. Extra-high-pressure main steam—1,350/1,420 lb per sq in. at 965 deg F—will again be adopted for the turbine, but in this case there will be no connection with the 600-lb per sq in. boilers. A 6,000-kW house set for the new plant will, however, take steam at the lower pressure. Pulverized-fuel firing will be employed for the three new 340,000/425,000-lb per hour boilers.

The new set (No. 5) will be disposed horizontally in line with, and to the south of, the 100,000-kW set, thus occupying, with the cross-compound set, about two-thirds of the turbine hall of Battersea "B" and leaving room on completion of the station for, say, another 100,000-kW turbo-alternator. The three new extra-high-pressure boilers will be aligned with Nos. 10 and 11 boilers, which were the first two to be installed in Battersea "B"—but will occupy positions to the south of them.

The combined Battersea stations constitute a main base-load group, operating on the three-shift principle, and the following are the operation results for 1945:—kWh generated, 1,424 million; kWh sent out, 1,343 million; maximum demand, 250,450 kW; load factor, 64·11 per cent; and thermal efficiency 26·74 per cent on a "sent-out" basis. During one week's run in March of last year, however, generated thermal efficiencies of 31·5 per cent and 28·9 per cent were recorded for Battersea "B" power station and the combined stations, respectively. The stations depend entirely, of course, on the Thames for their circulating water supply, and in normal times most of the fuel consumed is obtained from the Welsh coalfields.

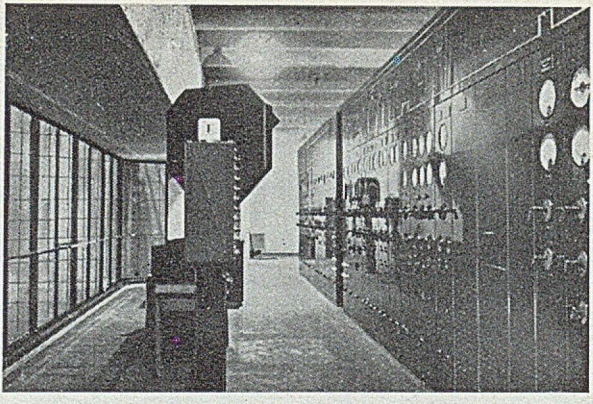


Battersea has a total plant capacity of 343,000 kW, including the new 100,000-kW e.h.p. cross-compound set (view from electrical end) in the "B" station

The group at Deptford—Deptford West and Deptford East—at the south-east corner of the area served, represents a total plant capacity of 353,750 kW, excluding house-service sets and frequency-changing plant. Some 215,000 kW of this main plant is installed in Deptford West power station and operates at 50 cycles, while the remainder consists of 25-cycle plant installed at Deptford East which is exclusively used to supply the Southern Railway. Both stations, which are operated on a three-shift basis, stand on a common site on the south bank

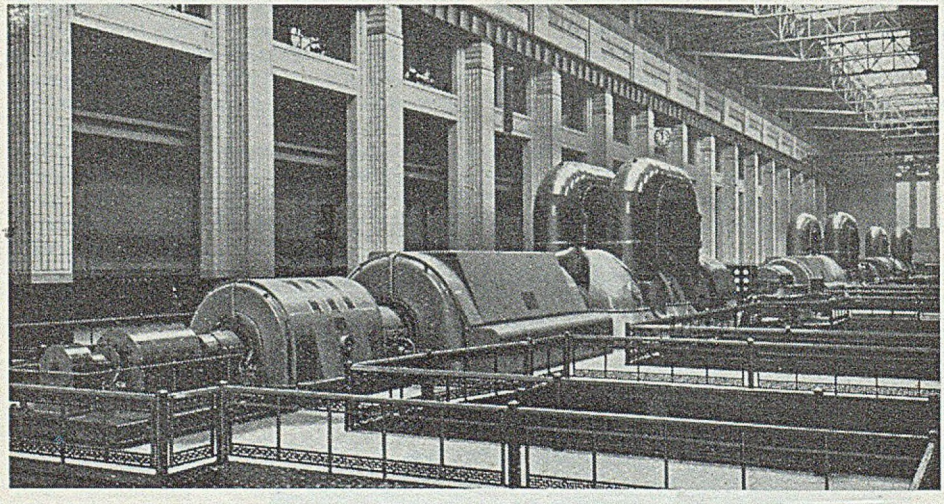
of the Thames and opposite the Isle of Dogs. They depend entirely on the river for their circulating water, and all the coal consumed is water-borne to the unloading jetty, the greater part of it being transported by means of the Power Company's fleet of colliers.

Each station is operated independently of its neighbour, except that a 30,000-kW frequency changer in Deptford West provides for an interchange of supply between the two stations and that a new substation on the site now provides a means of auxiliary interconnection in the interest of supply reliability. The following are the operation results for 1945:—Deptford West.—Load factor, 40·88 per cent; kWh generated, 669 million; kWh sent out, 634 million; maximum demand, 184,800 kW; thermal efficiency, 20·84 per cent. Deptford East.—Load factor, 30·81 per cent; kWh generated, 225 million; kWh sent out, 210 million; maximum demand, 81,000 kW; thermal efficiency, 16·47 per cent.



In emergency it has been possible to control both Battersea stations from the emergency control room overlooking the "B" turbine hall

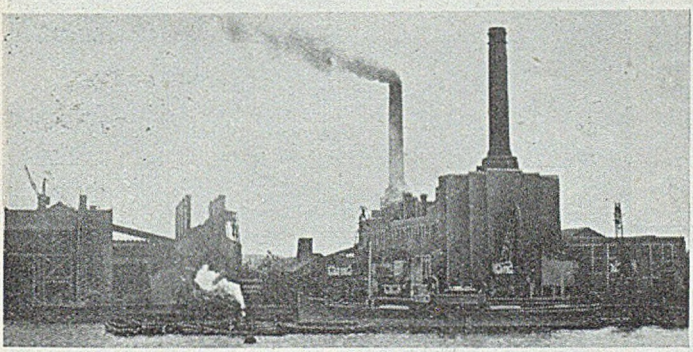
All the existing main generating plant in both stations was commissioned before the war, the largest unit being a 50,000-kW turbo-alternator in Deptford West. In this station there are also three 35,000-kW and two 30,000-kW sets. The seven main turbo-alternators in Deptford East vary in individual capacities up to 25,000 kW. The nineteen boilers in Deptford West afford a total steaming capacity of 2·37 million lb per hour, and the largest of these boilers is a 250,000-lb per hour La Mont forced-circulation boiler which was commissioned at the beginning of the war. The steaming conditions are 375 lb per sq in. and 780 deg F, with a feed-water inlet temperature of 250 deg F. The total steaming capacity in the Deptford East station is 1·485 million lb per hour, and the largest of the twenty-two boilers is a 160,000-lb per hour unit. The steam conditions in this case are 325 lb per sq in. and 700 deg F, with a feed-water inlet



Battersea "A" turbine hall accommodates a 105,000-kW and two 69,000-kW turbo-alternators

temperature of 180 deg F. Steam at 900 lb per sq in. and 900 deg F will be introduced on the completion of two new boilers which are now in the early stages of erection at Deptford East. This is of particular interest, partly because it indicates an ultimate change of steam conditions throughout the station group, and partly because of the scheme to interlink the two stations on the steam side as a means of facilitating to a great extent the later reconstruction schemes in both stations.

In the first place, by means of this interconnection scheme, the new boilers in Deptford East will augment the steam supply in Deptford West, and Hopkinson pressure-reducing and desuperheating equipment will be provided in the interconnecting pipe lines, so that the new steam supply will suit the Deptford West conditions. Secondly, the new steam supply from Deptford East will help to maintain the output from Deptford West while the existing boilers in this station are being replaced by more modern plant as and when this becomes necessary. Thirdly, it is visualized, the new boilers will become an organic part of a completely reconstructed Deptford East power station in which a number of 50,000-kW turbo-alternators will be installed.

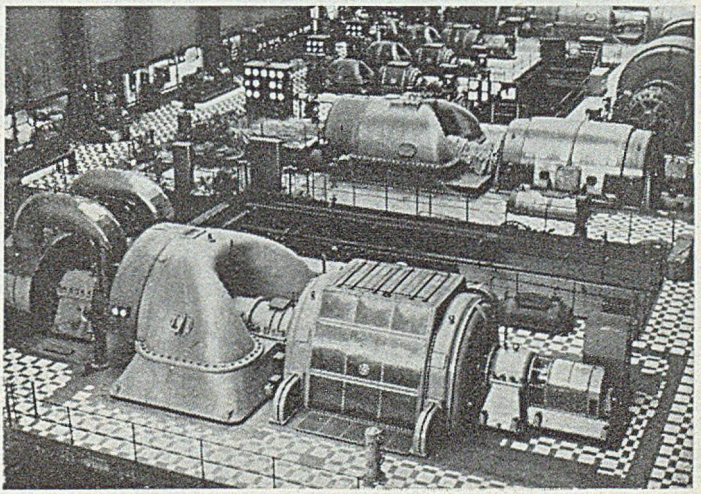


Deptford generating-station group (Deptford West right) has a plant capacity of 353,750 kW

The actual steam link between the two stations will be provided by a number of 700 ft long steam pipes. The interconnecting scheme, already well under way, provides for a 12-ft by 12-ft wall, directly through the coal store between and common to both stations, on which will be mounted an 8-ft diameter tunnel to accommodate the new steam mains as well as various water pipes, cables, etc.

In view of the rather novel aspect of this scheme it should be stressed that the new boilers really represent the first stage in the reconstruction of the old station, Deptford East. For their accommodation the existing boiler house is being so extended that a new portion will constitute about a half of the completed boiler house, which will be 140 ft high and will later on probably house eight boilers, each of the same capacity of each of the initial two, i.e., 220,000/250,000 lb of steam per hour. The stop-valve steam conditions will be 900 lb per sq in. and 900 deg F.

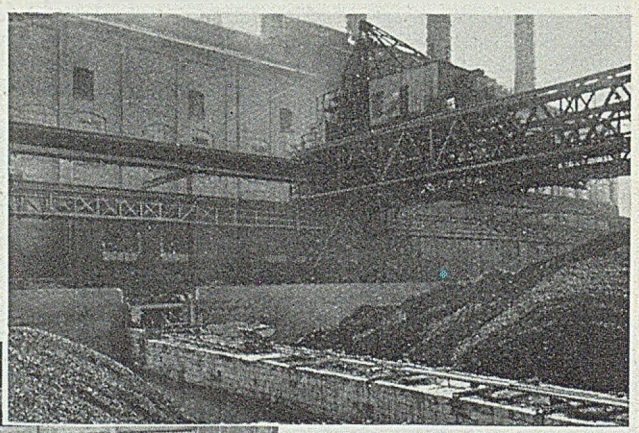
Each boiler is a Babcock & Wilcox high-head equipment, including a "Style 28" chain-grate stoker, a high-head steel-tube economizer, and a horizontal tubular air



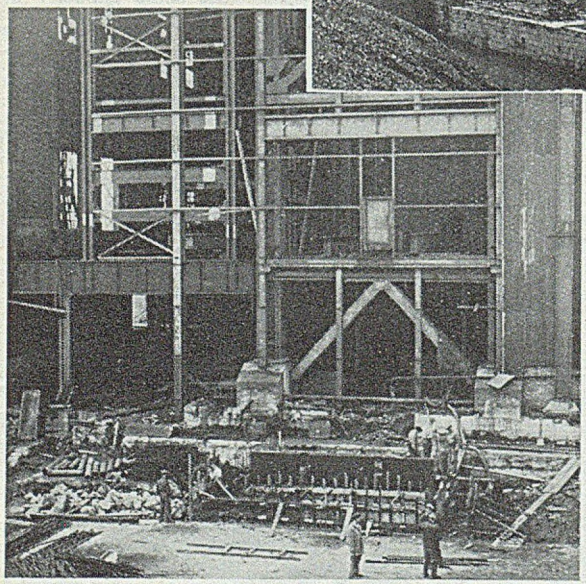
There is 215,000 kW of main turbo-alternator plant in Deptford West—one set "down" for overhaul

heater in which the outgoing gases flow around the tubes and the incoming air through the tubes—an unusual arrangement calculated to facilitate cleaning. The current extensions at Deptford East also include a new 300-ft chimney stack, new coal-conveying plant, and a twin system of John Thompson submerged ash conveyors. The twin ash conveyors in themselves provide for stand-by measures, and in this way the necessity for "external" stand-by plant is eliminated.

The Willesden station is situated on the south side of the L.M.S. line and near Harlesden on the Bakerloo Railway. It is operated normally as a two-shift station, with a daily shut-down period from about midnight to 6 a.m. The station is dependent entirely on towers for condenser-water cooling. The coal, practically all rail-borne, is handled by a tippler and conveyor system, and the 30,000-ton storage ground is served by an International Combustion grab-scraper for distribution and reclaiming.



Above: The steam interlinking scheme between Deptford E. & W. provides a 12-ft by 12-ft wall carrying an 8-ft diameter tunnel to accommodate the h.p. steam pipes



Deptford East boiler house is being so extended that the new portion will constitute about half of the completed new boiler house which may eventually accommodate eight 250,000-lb per hour boilers (early construction work)

Total main generating plant capacity is 158,750 kW; it includes a Richardsons Westgarth 30,000-kW, 3,000-r.p.m. turbo-alternator set which has now been commissioned for this winter's load. Four new Foster Wheeler boilers, each with a capacity of 110,000 lb per hour (m.c.r.), have also been installed. The following are the principal operating data for 1945:—kWh generated, 279 million; kWh sent out, 263 million; load factor for running hours, 32·42 per cent; maximum demand, 95,200 kW; and thermal efficiency, 17·25 per cent. The new plant is all being installed centrally in the station, the new turbo-alternator in the space left by the removal of two-phase plant many years ago, while the boilers are replacing four old 50,000-lb per hour units.

The boilers are two-drum units in vertical lay-out in order to obtain the required capacity from limited floor space. The top drum is at the 36 ft o.d. level, and the bottom one at 13 ft o.d. The steam conditions are 650 lb per sq in. and 875 deg F, with an inlet temperature of 320 deg F, as against 275 lb per sq in. for the older plant. The boiler heating area is 11,766 sq. ft. A Green "Diamond Gill" economizer with a heating area of 14,544 sq ft is located with the

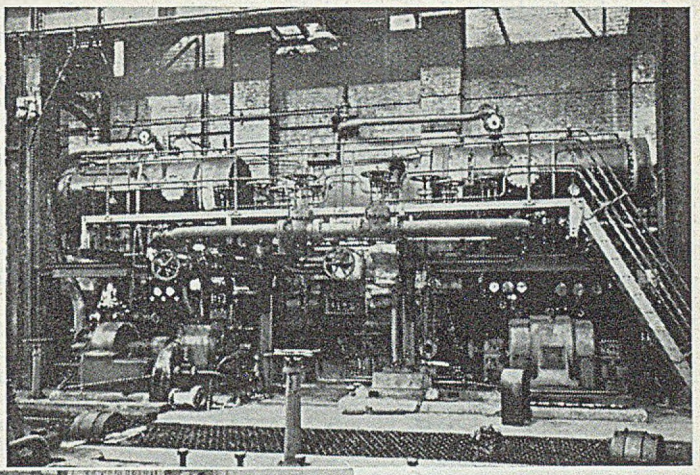
tubular air heater on the fan floor immediately above the boiler, and the Foster Wheeler air heater has a heating surface of 18,951 sq ft.

Each boiler has a radiant and a convection superheater, the steam passing through the combination in the sequence mentioned. By virtue of the fact that the steam temperature decreases with the increasing load characteristic of the radiant superheater and the reverse characteristic of the convection superheater the overall characteristic is rendered practically independent of the load.

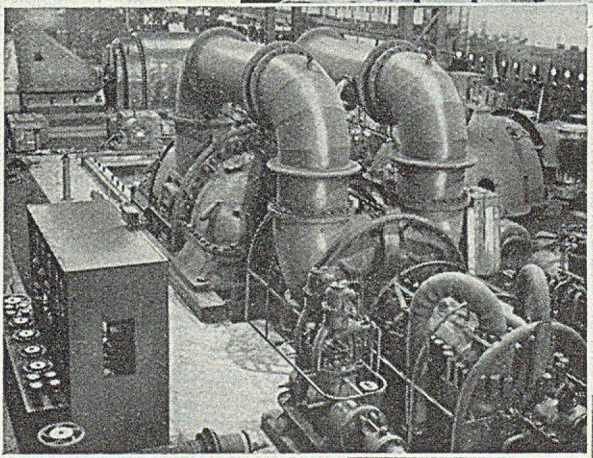
The radiant superheater, constructed of a special alloy steel, forms the roof and most of the front wall of the combustion chamber, whereas the convection superheater is shielded by two rows of boiler tubes. The side walls of the combustion chamber are water cooled, and adjacent to the stoker they are protected by means of "Blizzard" blocks.

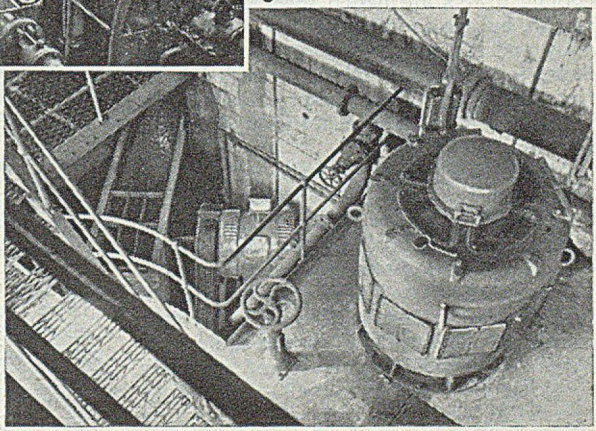
Boiler ashes are dealt with by a new removal sluice system including two Gwynne pumps which pass the water and ash to two large receivers from which the ash can be fed to road or rail vehicles. On its way from the pumps the ash is passed through a Fraser & Chalmers double-roll crusher.

Normally the new set will run independently of the older plant, but by means of reducing valves



Heat cycle of the new plant at Willesden embraces four feed heaters, of which two h.p. ones are shown (elevated) and at present one turbine and one motor-driven feed pump (motor-driven set incomplete)



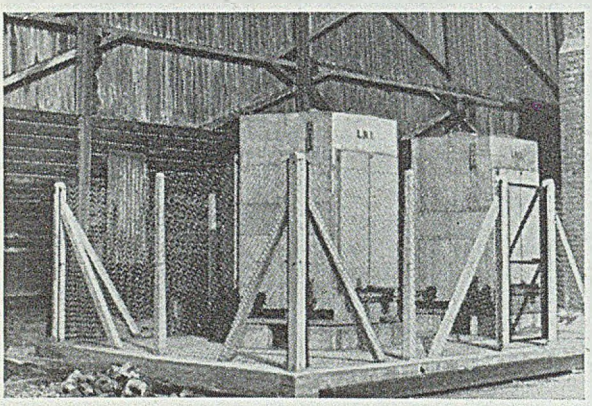


Above: New 30,000-kW turbo-alternator under construction at Willesden which will normally run independently of the older plant

Right: New sluice ash-removal system at Willesden; on its way from the pump the ash is passed through a double-roll crusher (left, lower level)

and desuperheaters the new boilers will be able to supply a limited amount of steam to the l.p. section of the station. The turbine has three cylinders, with a double-flow l.p. cylinder which exhausts into twin condensers. Steam is bled at four main stages to two l.p. and two h.p. feed-water heaters, and there is a gland heater in the heat cycle between the two l.p. heaters. The twin condensers have an overall cooling area of 28,000 sq ft, and they will produce a vacuum of 28·5 Hg, with circulating water at 72 deg F. Two Mather & Platt vertical c.w. pumps have a capacity of 1·230 million gallons per hour each. There are at present two Mather & Platt feed-water pumps, one motor and one turbine driven, each with a capacity of 330,000 lb per hour. A second motor-driven pump will be installed later. There are ten cooling towers, including a hyperbolic concrete one with a capacity of 1·5 million gallons per hour. The wooden cooling towers are nested together near the station, but the concrete one is some distance away and in order to get water out to it a boost is necessary; this is provided by a motor-driven axial-flow pump, which will deal with 1·5 million gallons per hour against a 17-ft head.

All the old plant generates at 6·6 kV, stepped up to 22 kV before switching, while the new set generates direct at 22 kV, and two transmission systems—one 66 kV and one 22 kV—are served by interconnecting transformers. New B.T.H. air-break switchgear has been installed for the new plant auxiliaries. This centrally-housed equipment, which is solenoid operated and remotely controlled from the plant, is 400-V truck-type apparatus with carrying and rupturing capacities of 800 A and 25,000 kVA. Where two-speed motors are served there is a separate circuit breaker for each winding.



New liquid neutral earthing resistance at Willesden, believed to be the first of its type in this country

A new B.T.H. liquid neutral earthing resistance for the 22-kV system is believed to be the first of its type to be installed in this country. It has an opposite characteristic from the ordinary grid resistor, in that the resistance is reduced as the time increases, and in this way it assists in the clearing of faults. Further, the thermal capacity of the new equipment is greater than that of the ordinary type of grid resistor. The resistor is a solution of water and bi-carbonate of soda, proportioned to offer a resistance of 8 ohms, and the special arrangement of the electrodes is designed to induce circulation of the liquid and to minimize local heating or boiling. Thermostatically controlled heaters prevent freezing in the winter, and distance thermometers afford remote readings in the control room.

We are indebted to Sir Leonard Pearce, C.B.E., D.Sc., engineer-in-chief and chief executive officer of the London Power Co., Ltd., for the co-operation of his staff in the preparation of this article and for permission to publish it.

Nickel in 1946

IN a letter to shareholders, Mr. R. C. Stanley, chairman and president of the International Nickel Company of Canada, Ltd., says that operations in Canada are now running at 75 per cent of the enlarged productive capacity, which closely approximates the rate prevailing in 1937, when a record tonnage of nickel was sold. Although the costs of mining, smelting and refining have increased substantially, apart from bringing the United States prices of nickel into line with the prices in the world market, no price increase has been made, or is contemplated. Over 35 per cent of the nickel used in the world is absorbed in stainless steels, which are likely to find increasing markets. Plating accounted for more nickel in 1946 than in any previous year, showing an increase of over 50 per cent on pre-war consumption, and in the United States there was a similar spectacular increase in the production of nickel silver.

There are many new, revived, or extended applications for nickel steels, nickel plate, cupro-nickel, and the company's alloys, "Monel" and "Inconel," which have been joined by the "Nimonic" series of alloys originated and developed by the Mond Nickel Co., Ltd.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AS a result of the acquisition by the Government of the shares of Cable & Wireless, Ltd., the following directors and officials have vacated their offices:—

Chairman and managing director: Sir Edward Wilshaw, K.C.M.G. Joint managing directors: Hon. Jocelyn Denison-Pender, C.B.E., and Mr. R. E. Luff, C.B.E. Directors: Mr. E. G. Brooke, Lord Courtauld-Thomson, K.B.E., C.B., Lt. Col. Ivor Fraser, Mr. A. H. Ginman, Admiral H. W. Grant, C.B., Lord Inverforth, P.C., Brigadier H. J. Lenton, Hon. George Peel, D.L., Sir Harry Twyford, K.B.E., and Sir John Wardlaw-Milne, K.B.E. Officials of the company who are members of the board of management: Messrs. J. U. Burke (assistant secretary), W. G. Edmonds, O.B.E. (staff manager), H. W. Grove, O.B.E. (traffic manager), W. G. R. Jacob, O.B.E. (engineer-in-chief), E. K. Jenkins (secretary) and F. H. Maitland (assistant secretary to board of management). Other officials: Messrs. D. L. Flexman (contracts manager), A. Sabater (joint deputy traffic manager) and J. H. Hannigan (deputy staff manager).

Mr. L. Satchwell, who founded the Rheostatic Co., Ltd., twenty-five years ago, has resigned his office as managing director, but will continue actively as chairman and advisory technical director of the company. **Mr. T. N. Flight** and **Mr. M. J. Gartside** have been appointed joint managing directors of the company. **Mr. A. J. H. Stevens** recently joined the board as works director.

Mr. H. Watson-Jones, M.Eng., A.M.I.E.E., A.M.I.Mech.E., Assoc.I.Min.E., of the Metropolitan-Vickers Electrical Co., Ltd., has been appointed Divisional Chief Electrical and Mechanical Engineer to the North-Western Divisional Coal Board with effect from January 1st, 1947. He was born in 1899 and received his practical training first with the Mersey Docks and Harbour Board and later at the Metropolitan-Vickers Trafford Park Works, taking an engineering degree course at Liverpool University. Subsequently he was employed by Metropolitan-Vickers as installation engineer (chiefly on industrial and power supply equipment), as liaison engineer in the United States, and as senior engineer in the general engineering department, where he was responsible for complete power supply and distribution schemes at home and overseas. In 1937 he was appointed general manager of the Birtley Co., Ltd., Co. Durham, returning to Metropolitan-Vickers in 1939 as head of the Mining Department. In this position, which he now holds, he has dealt with many comprehensive electrification schemes for collieries and mines. Mr. Watson Jones has written a number of articles published in engineering journals and has read papers, chiefly on colliery electrification, before various engineering institutions.

Mr. H. Watson-Jones

Mr. A. J. Gill, deputy engineer-in-chief of the General Post Office, whose promotion has been announced to the position of engineer-in-chief of the General Post Office on the retirement of Col. Sir Stanley Angwin, K.B.E., D.S.O., M.C., T.D., was born in 1889 at Stoke - sub - Hamdon, Somerset. He had early engineering experience in the Yarrow shipbuilding yards and was also employed at the British Thomson-Houston works, Rugby. In 1913 he entered the Post Office Engineering Department as assistant engineer, and was attached to the Radio Section. Mr. Gill was appointed executive engineer in charge of the Radio Experimental Section at Dollis Hill in 1925, and became an assistant staff engineer in 1929. Three years later he was appointed staff engineer of the Radio Branch, and in 1944 he became deputy engineer-in-chief. Following on the Moscow Telecommunications Conference at which Sir Stanley Angwin headed the United Kingdom delegation, Mr. Gill will continue to handle the work of co-ordinating the inter-departmental preparation for the forthcoming international conference dealing with the regulation of radio.

Mr. A. J. Gill

Mr. Bernard Fisher, A.M.I.E.E., of Boythorpe, Chesterfield, latterly technical assistant to the chief electrical engineer of the Tube Investments (Group Services), Ltd., has been appointed power installation engineer to Sheffield Electricity Department. Mr. Fisher was for some years with the Staveley Coal & Iron Co., Ltd. He was for a time assistant electrical engineer to the Chesterfield Tube Co., Ltd.

Mr. F. A. Fox, M.Sc., F.I.M., has relinquished his position as chief metallurgist of Magnesium Elektron, Ltd., and has joined the staff of the British Welding Research Association as assistant director of research. Mr. Fox has been engaged in metallurgical research since

1934, in both the ferrous and non-ferrous fields, and has been responsible for many publications, mainly in the light alloy field.

Mr. R. G. Devey, M.I.E.E., chief electrical engineer to Lever Bros., Port Sunlight, has retired after thirty-three years' service with the company. He was responsible for the electrification of many of the premises belonging to associated companies in this country, on the Continent, in the Far East and in South America. He is succeeded as chief engineer by **Mr. E. J. Evans**, M.Sc.(Eng.), A.M.Inst.C.E., M.I.Mech.E., M.I.E.E., who has been deputy manager of the power department of Imperial Chemical Industries, Ltd., for the past twelve years.

Mr. J. H. Greenwood, M.I.E.E., who as we recently reported has been appointed deputy engineer and manager at Walsall, received his technical education at Halifax Technical College and has since had extensive experience in the electricity supply industry. For six years he was with the Yorkshire Electric Power Co., when he was in charge of many districts. He also served with the Stalybridge, Hyde, Mossley and Dukinfield Joint Electricity and Transport Board for over three years, completing the whole of the d.c. to a.c. change-over in the four boroughs and preparing a comprehensive protection scheme for the e.h.v. system. Mr. Greenwood has for the past twelve years been with the Willesden electricity undertaking as mains and distribution engineer.

Mr. J. H. Greenwood

Dr. R. J. Sarjant, head of the research department of Hadfields, Ltd., has been appointed to the Chair of Fuel Technology at Sheffield University.

Sir Arthur Fleming has been appointed to the board of British Industrial Plastics, Ltd.

After nearly 45 years' service with the London Electric Wire Co. & Smiths, Ltd., **Mr. H. B. Hocken**, manager of the Birmingham branch, has retired. He is succeeded by **Mr. E. W. Darville** as from January 1st.

Mr. R. Weaving, M.I.E.E., retired on January 1st from the position of general manager of the British Electric Transformer Co., Ltd. (in association with Crompton Parkinson, Ltd.). He retains his seat on the board. Mr. Weaving joined Crompton Parkinson, Ltd., at Chelmsford in 1928 as transformer engineer, and went to the British Electric Transformer Co. as chief engineer early in 1933, later being appointed general manager. He became a director in 1939.

Mr. Weaving is succeeded as general manager by **Mr. E. T. R. Ball**, who joined Crompton Parkinson, Ltd., as a designer in 1928 and was transferred to Hayes in 1933 when the merger with Crompton Parkinson, Ltd., took place. He became production manager in 1939.

Mr. F. C. Winfield has been taken into partnership by Merz & McLellan. He has been with the firm for many years and he will normally be at the Newcastle office.

Mr. F. H. Beasant, B.Sc., A.M.I.E.E., has been appointed manager of the Traction Division of Crompton Parkinson, Ltd., in succession to **Mr. H. G. McClean**, who is taking up an appointment in the United States.

Messrs. P. C. Sharp, J. H. R. Nixon, B. L. Metcalf, D. S. A. E. Jessop and **Col. H. T. Thornley** have been appointed local directors of the Brush Electrical Engineering Co., Ltd.

Mr. B. G. Harrison has resigned from the board of Crabtree Electrical Industries, Ltd.

Mr. T. H. Thorneycroft has retired from the boards of the Clyde Valley Electrical Power Co. and its subsidiaries.

Mr. H. H. Partington, general manager of a number of electricity supply companies in the Scottish Power Co. group is retiring this month under the age limit. **Mr. J. J. Cargill** succeeds him as general manager of the Grampian Electricity Supply Co. and **Mr. A. W. Andrews** as general manager of the Scottish Central Electric Power Co. and Scottish Midlands Electricity Supply, Ltd.

Mr. J. F. Thomas, manager of the Cardiff branch of Falk, Stadelmann & Co., Ltd., retired on December 31st. Mr. Thomas entered the service of the company in 1903. From 1906 to 1927 he was outdoor representative in South Wales and has been manager of the Cardiff branch from its opening in 1927. He is to continue to act in an advisory capacity and is succeeded as manager by **Mr. A. W. Gibbs**, assistant manager at Cardiff for many years.

Mr. J. F. Thomas

Mr. A. N. Bott, county electrical engineer of the Stewartry of Kirkcudbright, has been appointed city electrical engineer of Winchester. Mr. Bott was born at Nottingham in 1907 and was educated at the University College there. After training in the Post Office Engineering Department and the Nottingham electricity undertaking, he joined, in 1930, the contracts department of W. T. Henley's Telegraph Works Co., Ltd., as assistant engineer and surveyor. Later he became a resident engineer in Yorkshire for the J. L. Eve Construction Co., Ltd., and then chief assistant to the resident engineer S.W. England area of Johnson & Phillips, Ltd. After serving as assistant engineer with the Westmorland Electricity Supply Co. and with

Buchan & Partners, Edinburgh, he joined the Kirkcudbright county undertaking in 1935 as mains engineer. He was successively consumers' engineer and deputy county electrical engineer and succeeded Mr. G. E. Vaughan as "interim" county electrical engineer in 1940, being confirmed in the position in March last. The County Council is advertising for a new county electrical engineer in succession to Mr. Bott. The appointment will carry a salary of £900, rising by annual increments of £50 to £1,000, plus appropriate war increase.

Mr. W. N. C. Clinch has been elected chairman of the Electricity Supply Joint Committee for the ensuing year and **Mr. F. Newey** vice-chairman.

Mr. F. L. Ogden, former chief electrical engineer and manager of the Oldham Corporation undertaking, has been elected an associated member of the Incorporated Municipal Electrical Association.

Mr. J. L. Williams, chief accountant of the Isle of Wight Electric Light & Power Co., Ltd., has been appointed assistant accountant to the Shropshire, Worcestershire & Staffordshire Electric Power Co., following the retirement of **Mr. E. G. Williams.**

Mr. T. H. V. Walker, resident engineer at North Wilford power station, was recommended for appointment as deputy borough electrical engineer at Nottingham by the Corporation Electricity Committee on December 18th. Mr. Walker went to Nottingham in January, 1932, as assistant superintendent of the North Wilford power station. He became station superintendent in 1933, and resident engineer early in 1945.

Mr. H. Harrison, mains engineer with Tynemouth Corporation, has been appointed deputy borough electrical engineer. Following the retirement of Mr. J. B. Glen, borough electrical engineer, Mr. Harrison will have charge of the electricity department until a successor to Mr. Glen is appointed.

Mr. Llewelyn Lewis, electrical engineer to Holyhead U.D.C., has been appointed electrical engineer to the Portland U.D.C.

In referring to the forthcoming retirement of **Mr. J. Barnett Feltham**, engineer and manager of the Long Eaton Urban District Council electricity undertaking, in our issue of December 13th we stated that he was retiring in February next. Mr. Feltham now informs us that he does not retire until March 31st. He was appointed to his present position in 1933 and not 1923 as stated.

Mr. A. E. Thomas, A.M.I.E.E., of Walsall, has been appointed consumers' engineer and meter superintendent to the Chesterfield Electricity Department in succession to **Mr. W. J. Jefferson**, who has taken up an appointment at Leyton.

The G.E.C. Head Office Dramatic Society presented "Cinderella," its first pantomime since 1938, at Magnet House, Kingsway, W.C.2, for seven performances from December 16th to 21st. The show was entirely original, having been written by John Hurst, a member of the Head Office staff, who also composed all its amusingly topical songs. The pantomime was full of pointed "gags" about the present state of the electrical industry and there was much good-natured leg pulling of well-known G.E.C. personalities. Some of the artistic effects reached a very high level. "Cinderella" was produced by Marian Naylor and it would be invidious to pick out any of the large cast of thirty-four for particular praise where all did so well. The singing of the chorus was excellent. The proceeds, after meeting expenses, will be devoted to Dr. Barnardo's Homes.

Obituary

Mr. J. Christie.—We regret to learn of the death at Folkestone recently of Mr. John Christie, a former engineer and manager of the Brighton Corporation Electricity Department and a past-president of the I.M.E.A. Born at Glasgow in 1868, Mr. Christie began his career as a marine engineer with the British India Steam Navigation Co. For a short time he served as assistant to Professor A. Jamieson at the Glasgow and West of Scotland Technical College which he had earlier attended as a student, and subsequently he held positions with Crompton & Co. at Chelmsford and in the testing department of Siemens Bros. & Co., at Woolwich. As second engineer at St. Pancras he assisted in the installation of plant at the generating station. At Glasgow he was concerned with the equipment of the old Waterloo Road station and when, after four years as city electrical engineer of Londonderry, he returned to Glasgow as power-house superintendent, he was responsible under Mr. W. A. Chamen for the erection and running of the first section of the Port Dundas and Pollokshaws Road stations. He joined the Brighton Corporation in 1900 and succeeded Mr. Arthur Wright as engineer and manager. While he was at Brighton the Southwick station was built and to meet the rapid growth of the undertaking large extensions were carried out there and at North Road. Mr. Christie retired in 1930. He leaves a widow, two sons and a daughter.

Mr. H. C. Godsmark.—We regret to report that Mr. H. C. Godsmark, general manager of the Newcastle-on-Tyne Corporation transport and electricity undertaking since 1941, died recently in Newcastle General Hospital. He was fifty years old and succeeded Mr. T. P. Easton as manager of the undertaking. Mr. Godsmark had previously been general manager of the Huddersfield Corporation transport undertaking, and had been operating manager of the Joint Omnibus Committee of the L.M.S. and Huddersfield transport. He was also at one time deputy general manager of the Nottingham transport undertaking and had served with

Manchester Corporation and the former London County Council tramways. He was trained at the Loughborough Technical College and with the Brush Electrical Engineering Co., Ltd.

Mr. W. Barnes.—The death occurred recently of Mr. Walter Barnes, who was secretary of the Reading Electric Supply Co., Ltd., from 1907 until 1934, when the undertaking was purchased by Reading Corporation. He had also been secretary of the Thames Valley Electric Supply Co. and other companies. He was eighty-four years of age.

Mr. W. H. Gatley.—The death occurred on December 22nd of Mr. William Henry Gatley, of Gatley & Co., electrical engineers and registered contractors of Todmorden.

Mr. H. M. Hubbard, former chairman of the Barcelona Traction Light & Power Co., Ltd., and a vice-president of the Brazilian Traction Light & Power Co., Ltd., died suddenly on December 22nd at Egham, Surrey, at the age of eighty.

Mr. Andrew Gordon, principal of the firm of A. Gordon & Co., electrical engineers, Motherwell, died suddenly at his home on December 23rd.

Will.—**Mr. R. Hodge,** M.I.E.E., for many years manager of the Bristol office of the Metropolitan-Vickers Electrical Co., Ltd., who died on May 27th last, left £17,266 (net personalty £16,751).

Canadian News

AN interim report by the Hydro-Electric Power Commission of Ontario presented for consideration and discussion to the Ontario Municipal Electrical Association puts the cost of changing the 25-cycle system in the Niagara district to 60 cycles at $200,000,000 which, it is suggested, could be spread over twenty years. Plans considered by the Commission would permit the programme to be executed and financed so as not to increase the wholesale power rates to municipalities under normal conditions by more than 5 per cent on the average over 1945 rates.

POWER RATIONING PROSPECT.—That the possibility of rationing might have to be faced within the next two years if the increase in power loads continued at the present rate was stated recently by Dr. T. H. Hogg, chairman of the Hydro-Electric Power Commission of Ontario. He said that the Commission had been unable to construct any new power supply facilities during the last five years and at the present time was operating without any reserve or surplus capacity. At present two new power stations were under construction, one of 70,000 H.P. at DeCew Falls, which would be completed next summer, and the other of 80,000 H.P. at Stewartsville, on the Madawaska River, which should be finished in the summer of 1948.

I.M.E.A. Notes

THE Incorporated Municipal Electrical Association, which has been occupying temporary premises in Earl's Court Road since the expiration of its Wellington House tenancy, has now secured a permanent headquarters at Kingsway House, Kingsway, London, W.C.2, and is moving into the new premises shortly.

Fluorescent Lamp Supplies

At a recent meeting of the I.M.E.A.-E.L.M.A. Joint Committee, the E.L.M.A. representatives explained the shortage of fluorescent tubes as being due to the tremendous public demand with which the manufacturers had been unable to cope. There had been a lack of machinery, but electric lamp manufacturers now proposed to make the machinery themselves. It was denied that fluorescent lamps had any harmful effects.

E.C.A. and the Register

Following upon consideration of the matter by a sub-committee, the Council of the I.M.E.A. has asked the Electrical Contractors' Association to meet representatives of the I.M.E.A. to discuss the position which has arisen from the withdrawal of E.C.A. support from the National Register of Electrical Installation Contractors.

Pointers or Cyclometers?

The I.M.E.A. Council recently recommended to the British Standards Institution that in considering the revision of B.S.S.37—Electricity Meters—the Institution should provide for cyclometer dials as well as pointer dials. At a meeting of the Electrical Industry Committee of the B.S.I. it was stated for the Electricity Commissioners that when the Meters Act came into force they were more or less compelled to approve cyclometer types where they satisfied the Commissioners' requirements or compel the authorities to go to great expense in replacing them. They could not withdraw their approval until existing meters were scrapped.

The Electrical Industry Committee came to the unanimous decision not to proceed with the preparation of a specification including cyclometer type meters.

Welding Loads

Discussions have taken place between representatives of the I.M.E.A. and the members of B.E.A.M.A. concerned regarding welding equipment on the mains. The plant manufacturers suggested that recommendations on types of welding plant load characteristics, method of framing tariffs, etc., might be produced jointly by the I.M.E.A. and B.E.A.M.A. It was agreed that any recommendations would have to deal separately with arc and resistance welding. It has been decided that manufacturers of welding equipment shall prepare two memoranda of the types of plant, load characteristics, power factor, etc., for discussion with the electricity supply associations.

Views on the News

Reflections on Current Topics

I WAS glad to see Miss Caroline Haslett's letter in last Sunday's *Observer* taking that journal to task for suggesting that the present deficiency in generating plant should have deterred " planners " from providing so much electrical equipment in modern houses. Miss Haslett rightly says that as these houses are designed to last for some fifty years it would be unwise to deprive tenants of the benefits of electricity for this period because of a temporary shortage. She goes on to suggest that one remedy for the present difficulties is the " staggering " of load in industry and the home, and concludes by emphasizing the fact that the modern housewife insists on electrical labour-saving equipment.

* * *

The popular fallacy that restrictions in electricity supply can be equalized as between different factories is scotched in a circular of the Minister of Fuel and Power regarding a new Order that relates to fuel saving in industry. This idea, which usually fails to distinguish between short-time shedding of kW, necessitated by overloading of generating plant, and longer periods of curtailment to save kWh takes no account of the importance of a factory to the national production drive or of the possible effects on, say, the linings of a steel furnace of cutting off electricity at even 24 hours' notice. Again it would start a truly vicious circle if a colliery were, in its turn, deprived of electricity and so could not produce coal for the power stations serving it. The savings required will be from industry *as a whole;* the italics are Mr. Shinwell's.

* * *

During the past twelve months questions have been asked in the House of Commons almost daily about the supply of poles for overhead lines. The latest reply (from the President of the Board of Trade) indicated that of 30,000 poles to be " released " 20,000 were to go to the Post Office and only 10,000 to electricity supply authorities. Mr. G. J. Moody, regional manager in South Essex for the County of London E.S. Co., points out that before the war the County of London group alone was using between 5,000 and 7,000 poles a year and he truly says that 10,000 will not go far among all the present claimants. I suppose it is essential that the G.P.O. should have " priority " in this matter although of the two essential services I should have thought electricity came first.

* * *

Many householders, I find, have little idea about the working of a " Willans line " in connection with their water-heating installations. So long as the apparatus is in operation they hold the erroneous opinion that the quantity of hot water drawn off makes no appreciable difference. Actually the average amount of coal required for every bath has been calculated at 4 lb. Suppose, then, that the occupants of, say, 250,000 houses of four persons apiece who take a warm bath daily decide to revert for the next twelve months to the weekly habit of their fathers and grandfathers, the amount of coal saved would be about 550,000 tons. This would be equivalent to a week's margin at all electric power stations.

* * *

I have already mentioned that the Ministry of Fuel and Power has refused to permit battery-operated shop-window lighting. The reason given that fuel is required for charging the batteries has some justification. But, if the *Daily Graphic* is to be believed, the Ministry has also declined to countenance windmill-generated electricity for shop-window lighting. This would look like a rigid working to a rule without regard to exceptions which may make nonsense of it.

* * *

A service of trolley-buses has recently been introduced at Palma, capital of the Spanish island of Majorca, states the journal *Metalurgia y Electricidad.* One detail which attracted my attention was the fact that the single-deck vehicles are designed to carry seventy passengers—twenty-five seated and *forty-five* standing. It must be difficult for the conductor to decide when the bus is full.

* * *

Several press references have come to my notice lately regarding the awkward times at which the Central Electricity Board decides to cut off electricity supply. It seems that this happens just as people want to switch on fires, water heaters, cookers and other things. How much more convenient it would be if the cut was made at, say, 2 a.m. !

—REFLECTOR.

CORRESPONDENCE

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

A.C. Motor Starters

IN his article published in your issue of December 13th, "Rotor" in Diagram 4 shows three over-current and one earth-leakage trips, whereas with leakage gear two over-current releases only are necessary. Furthermore, he shows time-lag fuses connected across the over-current releases, but I do not think any starter maker of repute would embody time-limit fuses in motor starters, as if the starting current on any particular drive were maintained for any length of time, the fuses would have to be wired to pass this current and subsequently would not give the requisite over-current protection.

The standard practice of starter makers is to fit over-current releases of the direct series type with oil-dashpot time lags and, for leakage, three current transformers and a leakage trip. Presumably "Rotor" has shown time lag fuses because the current transformers operate both the over-current releases and leakage trip.

Should any particular starter be of a size which rules out the possibility of using direct series over-current releases, then with oil-dashpot time lags, five current transformers would be necessary.

Manchester. W. BRIGGS.

Rotor replies:—"I agree that two over-current releases only are essential when leakage trips are used. At the same time the third current transformer is necessary with the arrangement shown in Fig. 4, and the simple provision of the third overload trip provides a safeguard against the leakage trip failing to function for any reason.

"Within the space available the article was intended to deal in a general way with the principles of protective gear and to include older types of apparatus still in commission as well as modern gear. Time-lag fuses shunted across the overload trip coils have been used in control panels of large motors of the slip-ring type, with a suitable size of fuse which allows the passage of the starting current and yet causes tripping of the breaker on prolonged or dangerous excess currents. With this arrangement the overload trips are not fitted with oil dashpots and alteration of the current setting is carried out by fitting a different size of fuse.

"The modern overload trip with oil dashpot has the advantage that both the tripping current and the time lag can be independently adjusted, and it is not necessary to replace a fuse when the trip operates."

Cost of Living in India

RECENT "Situations Vacant" notices suggest that United Kingdom firms still appear to be unaware of conditions in India at the present day and are mentally still in the days when the "Sahib" was one of the ruling race. The cost of living is now two or three times pre-war but the salaries offered are only about 20 per cent up, which means that the newcomer will have to count every penny to avoid debt. That is impossible in a country where the custom is to have one set of prices for the native population and another (higher) set for the foreigner, and where almost all price controls have been lifted.

For a proper comparison of salaries, pounds sterling in England should be multiplied by forty to get the equivalent scale in rupees in India. I have been in Bombay for a year and can state definitely that no Englishman will get a flat nowadays unless he is prepared to pay from Rs.10,000 to Rs.15,000 (illegally) to the landlord as *pagri* or "key money," due to the housing shortage and "Quit India" slogan. Unless an applicant is prepared to live as a bachelor, the contract should stipulate that the firm will provide accommodation.

Those wishing to make a career in India are strongly advised to ask a newly-returned civilian about conditions. To rely on those who were in India in pre-war days or who have only seen it while in the Army is to risk a spell of extreme discomfort.

Bombay. B. JUBB.

I.E.E. Annual Dinner

THE annual dinner and reunion of the Institution of Electrical Engineers is being resumed and will be held in the Grand Hall of the Connaught Rooms, Great Queen Street, W.C.2, on February 27th. Full details and application forms for tickets will be circulated to members about the middle of January, and application should not be made until this form is received.

News from France

From Our Paris Correspondent

WORKING upon the assumption that the demand for electricity will increase from the present level of 4·3 million kW to 8·2 million kW by 1951, the French Modernization and Equipment Commission has drawn up a plan for the provision of the necessary plant.

It is emphasized that some priority in the allocation of materials will have to be accorded, and the quality of steel products will be as important as quantity. The supply of labour is likely to prove very difficult, particularly for the hydro-electric workshops. It will be necessary to increase rapidly from 22,000 workers (including 7,000 prisoners of war) to 50,000. In particular, skilled workers are lacking and a sub-commission has studied the question including the provision of dwellings for workers.

Specialized machinery and technical collaboration may be sought from America and Switzerland. For the construction of mechanical and electrical equipment, the Commission has approached French constructors who have declared themselves capable of the necessary work in spite of the volume required. The two branches likely to receive most orders are for boiler and hydraulic turbine construction.

Up to the present, certain complete sets of equipment have been ordered abroad, as likely to be delivered without undue delay. Orders to the United States have included boilers for the Gennevilliers group (100,000 kW), and the Harnes groups (100,000 kW). From England transformers are being obtained and from Switzerland hydraulic equipment and miscellaneous electrical apparatus. The constructors themselves agree that for certain items, where French industry is ill-equipped to supply them, orders should be placed abroad. For example, it will be indispensable to import workshop material, as well as rotor shafts. Certain other equipment, such as large bulldozers, etc., which are regarded as American specialities, will be imported, and altogether 15,000 tons out of the 25,000 tons of special material required will be obtained from abroad. For the other material, demands will be dependent on the recovery of the steel and cement industries, as well as the labour available. Altogether, it has been estimated that 230 milliard francs will be required for the electrical industry to which about 20 milliards will have to be added for the construction of mining plants.

Electric Lamp Production

Provided sufficient raw materials are forthcoming there is every prospect that the French electric lamp industry will attain pre-war production levels very shortly. Estimates have, however, been optimistic, forecasting 125 per cent by the end of 1946 and 150 per cent in 1947, but so far only 30 million lamps are being produced quarterly instead of 40 million. The difference was to have been made up by imports from Czechoslovakia, America and Austria, while awaiting sufficient coal for the French industry to produce to its limit, but imports have been negligible. The varying quality of materials provided results in a good deal of wastage in production, and shortage of proper packaging causes a 10 per cent loss in transit. However, production is considered satisfactory, and the main cause for its insufficiency is the greatly increased demand.

The average life of the lamps has been reduced about 20 per cent owing to the quality of raw materials used, and instability of supply voltages. Certain sectors regarded as indispensable to the economy of the country are given priority in obtaining lamps, absorbing about 40 per cent of production. It is admitted that only immediate increases of raw materials and electric power can enable demands to be satisfied, and the immediate authorization of imports is demanded.

French Overseas Trade

FROM the official statistics of French foreign trade for the first eight months of 1946 it appears that France on balance is an importer of electric power plant. Exports of such apparatus were only half the value of imports. On the other hand, exports of telegraph, telephone and radio material were twice the value of imports. The principal items imported during the eight months are shown below:—

IMPORTS, JANUARY-AUGUST, 1946

	Imports Fr. (000)
Dynamo-electric machines and transformers	282,540
From Germany	35,000
,, Great Britain	74,800
,, Switzerland	79,700
,, United States	65,600
Switch and control apparatus	60,100
From Switzerland	35,500
,, Great Britain	7,500
,, United States	7,700
Electric welding apparatus	57,600
Telegraph and telephone apparatus not elsewhere specified	6,700
Automatic telegraph apparatus	10,100
Radio apparatus, except valves imported separately	49,900
Measuring apparatus except meters	8,500
Electro-medical apparatus	22,800
Electric heating material	29,300
Domestic refrigerators (electric)	3,400
Unspecified electrical apparatus	34,000

The leading French electrical exports during the first eight months of 1946 were (valued in thousands of francs):—Dynamo-electric machines and transformers, 144,100 (two-thirds to French Colonies); switch and control apparatus, 61,200 (53,000 to French Colonies); telegraph and telephone apparatus, 29,000 (mainly to French Colonies); radio apparatus, 180,000 (130,600 to French Colonies); heating apparatus, 47,200 (40,500 to French Colonies).

Power-Cable Specifications

Brief Review of the Present Position

By C. C. Barnes, Graduate I.E.E.

THE broad classification of electric cables is based on the type of dielectric. In general impregnated-paper-insulated cables are used for transmission and distribution, varnished-cambric-insulated cables for interconnectors in power and substations and for motor, transformer and switchgear connections, while compound-insulated and vulcanized-bitumen-insulated cables are confined to mining work for which service, however, increasing use is being made of paper-insulated cables because of the higher current ratings that can safely be assigned to them.

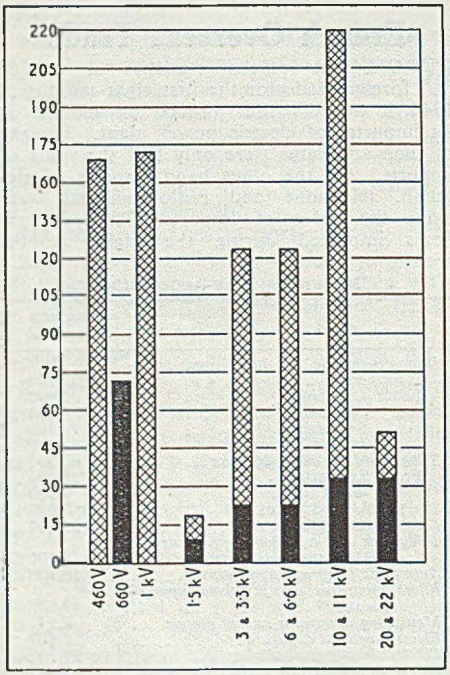


Fig. 1.—Comparison between numbers of lead-covered cables in B.S. 480—1942 (black section only) and in B.S. 480—1933 (total height)

Before 1933 the British Standard detailing thicknesses of dielectric, lead sheath, steel tape and wire armouring for paper, jute, vulcanized-bitumen and vulcanized-rubber-insulated cables was B.S. No. 7—1926 for a maximum operating voltage of 11 kV. A revised specification for paper-insulated cables only was issued as B.S. 480–1933 and this specification was again reissued in modified form in 1942 to cover the range of paper-insulated cables from 660 up to and including 22 kV. Belted cables are included for the whole range, while alternative design data are given for 11-kV three-core screened cables and for 22-kV three-core screened and three-core S.L. (separate-lead) types.

B.S. 480—1942 does not allow for any primary change in the radial thickness of dielectric or lead sheaths, as compared with the 1933 edition, but it greatly reduces the number (from 887 to 192) of lead-covered cables (Fig. 1) by excluding cables for non-earthed systems, adopting shaped conductors for the whole range of multi-conductor cables, except the smallest sizes, and modifying the voltage range.

Fig. 2 shows the gradual reduction in dielectric and lead thicknesses (the radial thickness of lead being a function of the cable diameter) since the original B.E.S.C. report on cables (in 1904). B.S. 480—1933 introduced for the first time the practice of specifying a *minimum* thickness of dielectric, whereas earlier standards were based on *average* thicknesses.

The voltage range has been modified as follows: In the 1933 specification two types of medium-voltage cables were standardized, i.e., 460 and 1,000, having minimum radial thicknesseses in the former case of 35 mils of paper on each core and no belt insulation (apart from a binder over the laid-up cores) and 35 mils for both core and belt insulation in the latter.

Experience has shown that two standards for medium-voltage cables are not justified and in 1942 one voltage, i.e., 660 V, for cables having minimum core and belt thicknesses of 35 and 20 mils radial respectively was specified.

The earlier nomenclature, which specified delivered (declared) high voltages of 3, 6, 10 and 20 kV with a permissible increase of approximately 10 per cent was brought into line with the standard system voltages specified in B.S.77—1939, viz. 3·3, 6·6, 11 and 22 kV.

For 660 V there are now seventeen conductor sizes built up from nine wire diameters, the copper sections ranging from 0·007 to 1·5 sq in. Comparable sections in the latest (German) specification of Verband Deutscher Electrotechniker 0225/1937, range from 25 sq mm (0·0388 sq in.) to 1,000 sq mm (1·55 sq in.), twenty-five copper sections which can be stranded from *one* wire diameter.

The following copper sections have been omitted from the medium-voltage range of B.S.480—1942: 0·01, 0·03, 0·075, 0·12 and 0·85 sq in. For high voltages two sizes only have been omitted, i.e., 0·03 and 0·075 sq in.

In the past a four-core cable usually had a neutral conductor one-half to one-third of the conductor section of the phase cores, but the same copper area for all cores is now recommended (see footnote to Table 3 of B.S.480—1942). The introduction in 1942 of shaped conductors only for multicore cables of 0·0225 sq in. and larger sections has resulted in a reduction in both the weight of material and cost of the cable. For 11 kV, circular conductors are specified only for 0·0225 sq in. section; the smallest (shaped) conductor specified for the 22-kV range is 0·04 sq in.

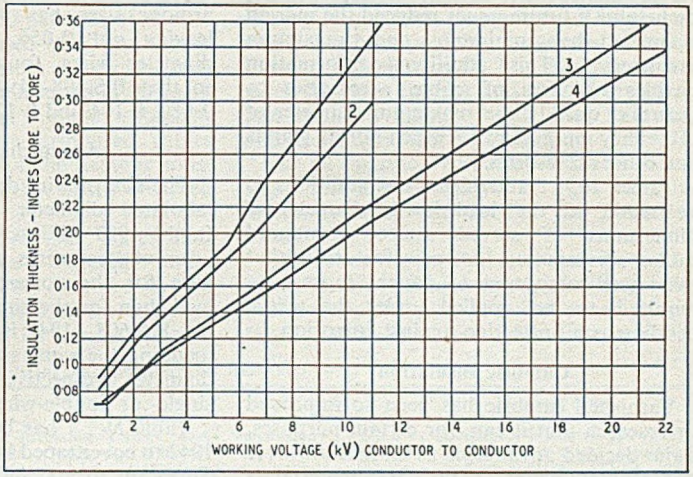


Fig. 2.—Dielectric thicknesses (core to core) for paper-insulated cables in British Standards. (1) B.E.S.C. Report No. 7—1910 (average); (2) B.E.S.A. No. 7—1919 and 1926 (average); (3) B.S. 480—1933 (minimum); (4) B.S.480—1942 (minimum)

The standard method of core identification used to be by means of coloured paper tapes lapped on the outside of the core insulation. Appendix 11 of B.S.480—1933 recommended a colour scheme for new installations, but most supply authorities were loth to depart from their own particular colour combinations with the result that cable makers were often compelled to provide widely different colour arrangements. This presented difficulties when building up stocks of power cables and also complicated production schedules, so in B.S.480—1942 the cores are identified by *numbers* printed on the outer layers of core papers at frequent intervals, the identification scheme being as follows:—Twin cables, 0, 1; three-core 0, 1, 2, 3 for 660 V and 1, 2, 3 for higher voltages; four-core 0, 1, 2, 3; five-core 0, 1, 2, 3, 4. The number 0 indicates the neutral conductor.

With a solidly earthed system the voltage to earth is limited to the "star" voltage (phase-to-phase ÷ $\sqrt{3}$), and neutral earthing is often necessary because only then can many of the most important relay protective devices be operated to full advantage. The grid system has greatly reduced the number of systems which do not comply with Clause 19 of B.S.480—1942. This clause states that:—A system may be considered as an earthed system when one of the following conditions applies:—

(*a*) The neutral point is permanently connected to earth through a suitably low impedance.

(*b*) A device is installed which automatically and instantly cuts out any part of the system which becomes accidentally earthed.

(*c*) The neutral point is earthed through a Petersen coil with arrangements for isolation within an hour of the occurrence of a fault.

This specification provides design data for earthed-type cables but a supplementary table, No. 13, gives data for 3·3- to 11-kV unearthed cables for undertakings at present operating unearthed systems. To reduce the demand for non-standard cables it is recommended that where an unearthed cable is required an earthed-type cable for the next higher voltage should be used.

Concentric cables are not included in 480—1942, but as some undertakings are committed to their use for unearthed systems, design data is given in Supplementary Tables where they are termed " non-standard " and not recommended for new installations.

B.S.480—1942 departed from earlier specifications by giving minimum and maximum dimensions over the lead sheath for the full range of cables included. It would, however, be helpful if future issues reduced the margin between the minimum and maximum diameters. This additional information enables suppliers of cable accessories to ascertain quickly the maximum diameter of cable they must allow for when boring glands and other accessories.

Tables 10, 11 and 12 set out additions to be made to the lead-sheath diameter if dimensions of served and/or armoured cables are required. A new feature is that two well-compounded paper tapes are required to be applied under the textile bedding as a protection against corrosion.

Cambric Insulation

Varnished cambric has been so improved by research that it can, for certain purposes, claim decided advantages as an insulant over impregnated paper. The basic material is cotton sheeting impregnated with a varnish composed of pure boiled linseed oil and either a high-grade gum resin or asphaltum, depending on whether the yellow or black type of varnished cambric is required. Experience has shown that black v.c. gives better results as a cable insulant, practically no deterioration being observed after prolonged service.

Cambric-insulated cables are widely used for internal wiring where terminating boxes are not employed but out of doors adequate protection such as a terminal box is required. Varnished-cambric insulated cables are often used where vertical installations of considerable length are necessary, since drainage of compound cannot occur.

B.S.608—1935 provided design data for 460-V and 1,000-V varnished cambric cables and was revised in 1942 in order to bring it into line with the modifications introduced by B.S.480—1942, in regard to the dimensions, method of core identification, voltage range and elimination of unearthed-type cables. B.S.608—1935 included an Appendix C, which specified a test for tinned copper conductors. This tinning test has now been omitted, since the considerable improvement in the standard of varnished cambric has made the use of tinned conductors unnecessary. When compared with the paper-cable specification, the following copper sections have been omitted from the 660-V range:—0·01, 0·0145, 0·03, 0·04, 0·075, 0·12, 0·15, 0·25, 0·6 and 0·85 sq in. In the high-voltage range the following conductor sections are omitted:—0·03, 0·04, 0·075, 0·15, 0·25, and 0·60 sq in. The range of wire-armour sizes has been also restricted by leaving out 0·056, 0·072, and 0·160 in. diameter wires, found in the 1935 edition so that B.S.608—1942 includes only 0·064, 0·080, 0·104 and 0·128 in. armouring wires.

Armouring-Wire Sizes

The size of wire depends on the minimum tabulated diameter over the lead sheath. In the 1933 edition, cables having a double layer of steel wires used a smaller diameter wire for the corresponding diameter over lead than for the single-wire-armoured type, but B.S.608—1942 is more logical in recommending the same size wire for a given lead diameter irrespective of whether the cable is single- or double-wire-armoured.

Table No. 7 has been added to B.S.608—1942 to cover taped braided and compounded cables up to and including 11 kV. Twelve sizes are provided for medium voltage and eight for high voltages.

B.S.760—1943 superseded B.S.760—1938 for paper-insulated cables for use in mines, the changes generally following those of B.S.480—1942, but with the few exceptions the thickness of the lead sheath has been reduced for all sizes and types of cable in this specification. The highest voltage in the 1943 edition is 6·6 kV instead of 11 kV in the earlier specification. In B.S.480—1942 unearthed cables are regarded as non-standard, whereas for mining work data are included for both earthed and unearthed cables for 3·3 and 6·6 kV.

The dielectric for mining cables is heavier than for the corresponding voltages in B.S.480—1942, in view of the more arduous operating conditions. Paper-insulated vulcanized-bitumen-sheathed cables are sometimes used for mining work in place of the lead-sheathed type in order to minimize the weight to be handled. The present position of these cables is not clear since no design data have been published in British Standards corresponding to that included in B.S. No. 7, 1926. This omission is possibly due to the limited demand for this type of cable.

Regulation 129 of the Coal Mines Act calls for a metallic covering on all cables operated above low voltages, where the roadway conveying the cables is also used for mechanical haulage or where there is a risk of igniting gas, coal dust, or other inflammable material.

Regulation 125 requires an earthing system, including any cable armouring connected, to have a conductivity at all parts and at all joints equal at least to 50 per cent of that of the largest conductor used solely to supply the apparatus; furthermore no switch, fuse or circuit-breaker may be inserted in the earth conductor. An exception is made in Regulation 129 for single-core armoured cables where the conductance of the armour must be at least 25 per cent of that of the enclosed conductor.

Clause 14 of B.S.760—1943 states that where the conductance required under Regulation 129 cannot be obtained by the use of galvanized-steel wire of the specified size, it may be obtained by the insertion in the armour of h.d. tinned-copper wires not smaller than the galvanized-steel wire.

Paper-insulated cables installed vertically in a shaft or on a steep gradient should be of the drained or non-bleeding type in which the dielectric is devoid of free compound. In wet conditions or where moisture is liable to drip from the shaft sides or roofs, the water frequently contains acid or concentrations of inorganic salts and protective servings should be adequate to prevent corrosion of the steel armouring. Colliery cables are invariably single- or double-wire-armoured.

Standards for jute-insulated cables (which are referredto in I.E.E. Wiring Regulation No. 1306) were discontinued when B.S. No. 7 was revised, but B.S.1216—1945 has recently been issued at the request of the Wiring Regulations Committee. This specification has been prepared on generally similar lines to B.S.480—1942, but dimensions are given for both circular and shaped multicore jute-insulated cables, and the following additional comment is given under Clause II: "For all unarmoured cable the metal sheath shall normally be alloy 'E' (i.e., lead-tin-antimony alloy as detailed in B.S.801—1938)."

The following method is specified for core identification:—Single core, plain jute; twin, one core plain jute and the other fabric-taped; three-core, one plain jute and the others fabric-taped and paper-taped; four-core, plain jute, fabric-taped, paper-taped and jute- or cotton-braided, respectively.

SUMMARY OF SPECIFICATIONS REFERRED TO IN THIS ARTICLE

B.S. No.	Year	Title	Dielectric	Voltage range
7	1946	Rubber-Insulated Cables and Flexible Cords for Electric Power and Lighting (including Supplement on the uses of polyvinyl-chloride compounds as an alternative to v.r.) PD540 Amendment No. 1 Sept., 1946, Transitory Relaxations(relating to Rubber-Insulated Cables and Flexible Cords).	Vulcanized-rubber or polyvinyl-chloride compounds.	For rubber-insulated 250 V to 11 kV. For p.v.c. insulated and/or sheathed, 250-V and 660-V cables with conductors up to 0·06 sq in. and flexible cords.
480	1942	Paper-Insulated Cables for Electricity Supply.	Oil-impregnated paper tapes.	660 V to 22 kV earthed only. (Additional tables included for 3·3 to 11-kV unearthed type cables.)
608	1942	Varnished-Cambric-Insulated Cables for Electricity Supply.	Varnished-cambric tapes.	660-V to 11-kV (earthed type only).
760	1943	Paper-Insulated Cables for Use in Mines.	Oil-impregnated-paper tapes.	660 V to 6·6 kV (earthed and unearthed types).
883	1940	Cables and Flexible Cords for Electrical Equipment of Ships. Amendment No. 3, Aug., 1943, Ref. PD149, added supplement relating to polyvinyl-chloride compounds.	Impregnated paper, varnished cambric, rubber and polyvinyl-chloride compounds.	Paper, 1 to 6·6 kV; varnished cambric, 1 to 6·6 kV. Rubber and p.v.c. 250 and 660-V.
1216	1945	Jute-Insulated Cables for Electricity Supply.	Impregnated jute.	660-V only.

REFERENCES.

1. H. J. Allcock, *I.E.E. Journal*, Vol. 88, Part 1, January, 1941.

2. J. A. B. Horsley, "Rationalization of Colliery Electrical Equipment," *I.E.E. Journal*, Vol. 89, Part 2, April, 1942.

Lamp Tests

Light Output, Consumption and Life

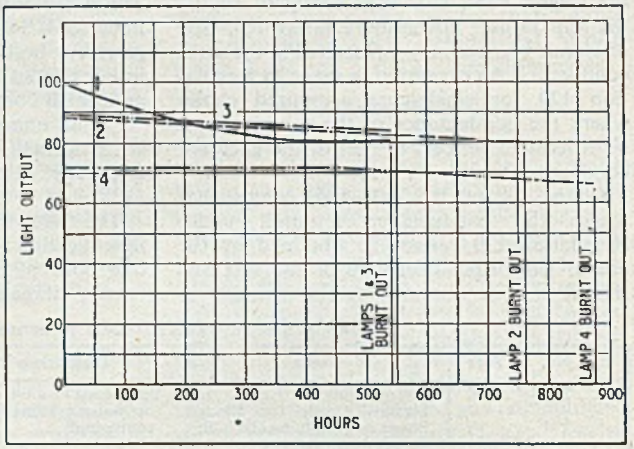
By T. A. Ledward, A.M.I.E.E.

DISCUSSION upon the relative merits of different lamps is not, as a rule, based on comparative tests in which light output, watts consumption, life and cost are all taken into account. In the tests here described, four 40-W gas-filled lamps were purchased from retailers in the ordinary way. Nos. 1, 2 and 3 were of different makes, but No. 4 was purchased as the same in all respects as No. 3.

A fifth lamp was used as a standard and was switched on only when readings were being taken for the lamps under test. This enabled a check to be kept on possible variations of readings owing to external temperature change or other cause affecting the instruments.

The lamps under test were left continually in circuit on the a.c. supply mains, thus being subject to normal voltage variations, but were switched over, for the purpose of taking readings, to an adjustable supply, so that all readings were taken at exactly 230 V. All lamps were subject to three switching operations per day. In every case, failure occurred during a switching operation.

The graph shows curves of relative light output from the start of the tests until the failure of each lamp. It will be seen that lamp No. 1 did not maintain its initial advantage in light output. The figures for light output in the table are merely relative and are given in terms of percentage of the light from lamp No. 1.



Relative light output of four lamps under test

Lamp No.	Initial Light Output	Watts consumption	Average light output per W.	Life per cent	Cost per cent	Figure of Merit
1	100·0	42·7	95	54·1	100	51·4
2	89·0	41·6	100	75·9	82·5	92
3	89·5	42·4	98	54·1	45·7	116
4	72·0	38·2	89	87·6	45·7	171

The usual standard for the life of a lamp is 1,000 hours, but the actual life probably depends mainly upon the number of switching operations. Voltage can, of course, have a considerable effect if the average is high. In these tests, the average supply was not more than 233 and the highest reading noted was 236. Vibration as a factor in the reduction of life may be ruled out in the test conditions.

The figures for lamp life are given as percentages of 1,000 hours. The table shows the relative average light output per watt (taking lamp No. 2 as 100 per cent), the life of each lamp as a percentage of 1,000 hours and the cost of each lamp as a percentage of the cost of lamp No. 1. The average light is the average during the life of the lamp. From these figures a figure of merit, $M = \frac{L \times T}{C}$ has been deduced, where L = average percentage light output, T = life as percentage of 1,000 hours, and C = percentage cost of lamp, relative to No. 1. Figures of merit form a true criterion where the watts consumption is exactly the same for each lamp. Where it is abnormally low, the light output may be so low that the lamp would be considered unsatisfactory. Uniformity of manufacture is of importance, and tests of a large number would be necessary to assess the merits of different makes.

Overseas Electrical Trade

Further Progress in November

IN November last a new record for monthly electrical exports was reached, the total (as will be seen from Table I) approaching £6 million. As in the previous month this represented over three times the monthly average for 1938. Once again radio apparatus was the leading item; the value was more than six times the 1938 average figure. Details given by the Board of Trade returns show that among Empire countries India (£117,250) and South Africa (£100,079) took the largest quantities. Norway (£53,346) was the principal foreign buyer.

In an allied field—telegraph and telephone apparatus—exports were also high and at £541,581, reached twice the pre-war level in value. In this case Australia was the largest buyer, with a total of £92,219, followed by Soviet Russia (£59,326), South Africa (£59,314), New Zealand (£34,512) and India (£23,120).

The cable class as a whole (including submarine types) advanced from a 1938 monthly average of £359,881 to £999,876 in November. The principal markets were:—Non-submarine telegraph and telephone, South Africa (£55,349) and Argentina (£16,236); rubber insulated, South Africa (£46,789), India (£35,669) and New Zealand (£44,898); insulation other than rubber, India (£60,795), South Africa (£43,043). Australia (£29,477) and Argentina (£13,387).

With the sole exception of stationary accumulators, all the other items showed substantial advances, notably electric cooking and heating apparatus, instruments, X-ray apparatus, lamps and lighting equipment, and vacuum cleaners.

TABLE I.—ELECTRICAL EXPORTS AND IMPORTS

Class	Exports			Imports		
	Nov., 1946	Nov., 1945	Monthly Av., 1938	Nov., 1946	Nov., 1945	Monthly Av., 1938
	£	£	£	£	£	£
Telegraph and telephone wires and cables, submarine	133,277	14,134	17,289			
Ditto, not submarine	203,118	78,804	71,803			
Wires and cables, other than telephone and telegraph, rubber insulated	312,019	61,001	117,533	3,209	* 51	31,246
Ditto, insulation, other than rubber	351,462	110,698	153,256			
Radio apparatus	970,805	75,997	149,593	154,006	31,399	75,160
Telegraph and telephone apparatus, other than radio	541,581	191,097	242,716	2,152	5,366	9,243
Electric carbons, furnace	*	*	*	12,812	2,722	4,054
Other electric carbons	*	*	*	2,915	16,372	2,301
Electric lamps	100,296	60,218	49,440	490	32	10,265
Other lighting apparatus	221,635	68,259	48,565	1,976	274	38,662
Primary batteries	63,468	22,059	13,572	1,983	1,426	3,549
Accumulators, portable	127,552	32,487	28,874	*	*	*
Ditto, stationary	13,953	1,722	19,773	*	*	*
Ditto, parts and accessories	54,087	16,291	—	*	*	*
Electric cooking and heating apparatus	156,578	15,978	30,664	*	*	*
Commercial electrical instruments, including ammeters, voltmeters, etc., and parts	111,270	13,896	15,878			
House service meters	63,897	8,651	15,791	11,876	1,771	32,057
Other electrical instruments	67,342	10,028	9,612			
X-ray apparatus, vacuum tubes and parts	83,521	14,044	4,881	11,298	7,760	9,734
Insulating materials, not elsewhere specified	132,652	19,715	19,343	*	*	*
Unclassified electrical goods and apparatus	383,175	75,417	110,615	11,783	35,038	42,630
Generators, complete, up to 200 kW	122,768	38,384	38 071	*	*	*
Ditto, over 200 kW	340,580	67,481	119,079	*	*	*
Ditto, parts	66,589	*	*	*	*	*
Motors	278,380	72,089	145,045	3,069	3,893	26,033
Convertors and transformers	177,007	66,154	101,304	*	*	*
Rectifiers for power-house use	14,974	1,673	3,463	*	*	*
Motor starting and controlling gear	178,856	24,078	50,866	*	*	*
Switchgear and switchboards, other than telegraph or telephone	405,559	80,727	184,533	*	*	*
Other electrical machinery	13,573	5,575	15,497	4,025	349	14,455
Electric vacuum cleaners	164,716	13,942	26,662	50	44	7,519
Other electrically-operated portable appliances	63,257	12,094	10,394	1,308	1,027	17,108
Total	5,917,947	1,272,693	1,814,114	222,952	107,524	324,016

Taking electrical goods and apparatus as a whole, South Africa proved to be the principal customer (£534,752) with the following taking the next places:—India (£450,498), Australia (£206,941), New Zealand £187,814). France was the leading foreign market, followed by Norway and Russia.

So far as electrical machinery was concerned the rise above 1938 values was not so great—from £657,858 to £1,598,286. Of the total, as a matter of special interest in these days of plant shortage, only £122,768 represented generators of over 200-kW capacity. Motors (another item of importance to home industry) rose in value to only £278,380. A noteworthy feature of this trade was the shipment of generating plant valued at £254,293 to Russia, apart from unenumerated plant valued at £311,270, making Russia by far the best customer for electrical machinery. India's purchases amounted to £235,960 and South Africa took third place with a share valued at £187,753.

TABLE II.—DISTRIBUTION OF EXPORTS OF ELECTRICAL GOODS AND APPARATUS

Destination	Nov., 1946	Nov., 1945	Monthly Av., 1938
	£	£	£
Eire	108,195	56,506	37,562
Channel Islands	43,281	21,612	11,965
Palestine	92,278	3,783	8,371
British West Africa	56,600	5,942	12,864
Union of South Africa	534,752	137,287	157,602
Southern Rhodesia	36,490	3,886	9,574
British East Africa	17,882	6,293	7,830
British India	450,498	190,561	122,928
British Malaya	153,422	—	32,280
Ceylon	42,484	21,598	14,931
Hong Kong	50,265	—	12,874
Australia	206,941	115,366	196,823
New Zealand	187,814	51,610	95,851
Canada	54,487	15,821	12,482
British West Indies	39,733	22,212	12,887
Other British Countries	152,456	21,969	26,336
Soviet Union	169,212	295	36,780
Finland	20,206	—	5,824
Sweden	114,888	699	13,735
Norway	177,185	7,379	12,582
Denmark	138,437	1,601	18,282
Poland	43,636	370	9,626
Netherlands	70,923	11,345	20,190
Belgium	131,120	13,366	10,874
France	180,455	22,767	15,674
French West and Equatorial Africa	1,297	293	400
Switzerland	37,487	7,297	3,572
Portugal	34,253	4,462	6,498
Portuguese East Africa	6,698	843	6,924
Spain	86,768	26,119	3,808
Italy	1,335	456	5,659
Czechoslovakia	12,339	—	7,205
Yugoslavia	5,831	3	1,471
Greece	19,163	—	4,888
Roumania	—	—	13,350
Turkey	13,798	23,009	7,633
Egypt	89,328	70,048	12,872
Iraq	26,557	758	5,456
Iran	72,636	303	16,330
China	86,482	—	4,042
United States of America	5,528	2,853	5,546
Chile	8,392	—	6,635
Brazil	67,053	—	11,123
Argentine Republic	43,707	389	45,387
Other Foreign Countries	199,346	21,395	33,672
Total	4,091,688	890,496	1,119,200

Electrical imports consisted largely of radio apparatus from Canada (£133,127). The only other large supplier was the United States (£44,458).

It will be noticed that although the total value of imports of electrical goods and apparatus was still below the 1938 average it was double the figure for November, 1945. Electrical machinery imports were well below the 1938 level—less than a fifth.

Power Shortage in Italy

From Our Milan Correspondent

OWING to the shortage of electricity various Italian industries are being compelled to cut down their output by 40-50 per cent during the winter season. In order that the manufacture of railway rolling stock shall not be held up the Ministry of Transport has made arrangements to supply these engineering firms with power produced for electric traction, the railways making good the deficiency by using oil-burning steam locomotives.

Prof. Bottani, who has been appointed High Commissioner for Electric Power, in the course of a press interview, has pointed out that in 1942 the output of electricity reached 20,000 million kWh, whereas at present it has dropped to 15,000 million kWh, while the demand has increased. Construction of new power plants has been limited by the shortage of labour, reduction of the deliveries of cement, poor transport facilities, and the shortage of capital.

During the past few weeks the High Council for Public Works organized a meeting of the leading Italian electrical industrialists to examine the building of new plants. Present plans provide for the completion of new plants with annual outputs as follows: In 1947, 869 million kWh; in 1948, 1,635 million kWh; in 1949, 2,659 million kWh; and in 1950, 3,432 million kWh.

With regard to nationalization, it would appear that a settlement of the problem has been found through the proposal of the Italian Government to participate in the capital of the Compagnia Nazionale Imprese Elettriche (CONIEL). Indications are that the danger that the situation of the hydro-electric industry in Italy would be affected by the Peace Treaty has been overcome as the result of a direct Italo-French agreement.

It is interesting to note that a special domestic electrical apparatus show is to be held at Milan in the course of the next International Samples Fair during April, 1947.

COMMERCE and INDUSTRY

Cable Makers' Five-Day Week. Proposed Manchester Coal Tunnel.

AT a recent meeting of the Joint Industrial Council for the Electrical Cable Making Industry, agreement was reached to establish a five-day week of 44 hours throughout the cable making industry, to become operative on the third pay day in January, in respect of the period for which payment is made on that pay day. A Memorandum of Agreement (Doc. J.I. No. 1,862) sets out the methods by which consequential adjustments are to be made to the existing wage rates applicable to all adult time-workers, pieceworkers and shift workers. No alteration is necessary to the current rates paid to juveniles, but as the rates of wages per hour to juveniles must be raised the increase will be added to the cost-of-living bonus, and not to the basic rate. Tables illustrating changes in the hourly rates of wages of juveniles will be available in due course.

Electricity Supply Holidays

The National Joint Industrial Council for the Electricity Supply Industry has decided that the term "public holidays" shall mean Good Friday, Easter Monday, Whit-Monday, August Bank Holiday, Christmas Day and Boxing Day, or, when either Christmas Day or Boxing Day falls on a Sunday, the normal working day next following Christmas Day or Boxing Day. Provided that in any district in which the District Council so agrees the words "public holidays" shall mean such substituted holidays as may be agreed, not exceeding in the aggregate in any year the normal working hours of the six holidays set out in this definition.

Token Imports

Illuminating glassware other than lamp globes and lamp glasses is included in a fourth supplementary list of goods which can be imported into the United Kingdom under the token import scheme arranged by the Board of Trade at the request of the overseas governments concerned. The countries now participating in the scheme are Canada, the United States, Belgium, Switzerland, France, Denmark, Sweden, Holland and, since January 1st, Luxemburg.

Simultaneous Shot-Firing

Improvements in electric detonators are a major factor in enabling official permission to be given to the simultaneous firing of two or more shots in coal mines. The Minister of Fuel and Power has made a new S.R. & O. (No. 2060, 1946), amending Cl. 6 (9) of the Explosives in Coal Mines Order, 1934, under which simultaneous shot-firing may be carried out under conditions to be imposed by the Chief Inspector of Mines. The conditions usually include the following:—Maximum number of shots per round; use of only low-voltage electric detonators check-tested by the manufacturers; test for continuity of firing circuit immediately before firing; weekly testing of exploder at surface.

New Scottish Factories

Burndept, Ltd., are opening an additional factory at Dundee's industrial estate. At first it will house research departments and the dry cell and battery manufacturing section. Provision has been made for large extensions to allow for the manufacture of radio sets and domestic appliances.

Scottish Electric, Ltd., Dundee, has taken a factory as an extension of its present premises. It will be used for the manufacture of electrical apparatus for industry, cinemas, &c., and for the repair and rewinding of small electric motors.

L. Sterne & Co., Ltd., refrigeration engineers, propose to inaugurate a new factory block this year. This will raise the aggregate floor space at their Hillington works to 150,000 sq ft.

Chinese Import Licensing

Details are given in the *Board of Trade Journal* of December 21st of the import licensing regulations introduced by the Chinest Government in November. The schedules appended to the regulations show that a number of electrical classes are affected, including power generating and transmission plant; prime movers (including generators); steam-raising equipment; railway and tramway supplies; materials, fixtures and fittings for wiring, etc.; electric cookers, fans and other domestic appliances; accumulators, batteries and condensers; and telegraph and telephone instruments.

B.E.A.M.A. Contract Formulæ

The latest figures for the B.E.A.M.A. contract price adjustment formulæ are as follows:—Rate of pay for adult male labour at December 14th, 103s. (no change). Costs of material: The index figure for intermediate products published by the Board of Trade on December 14th is 201·8 and is the figure for the month of November, as compared with 199·9 for October.

Suggested Coal Tunnel

A scheme for conveying coal by underground tunnel from Bradford colliery to the bunkers at Manchester Corporation electricity works was considered by the Electricity Committee recently. Provisional agreement was reached regarding the Corporation's section of the work, which is estimated to cost £50,000; the cost to the colliery company would be considerably

greater. The chairman of the Committee (Sir William Walker) stated that when the scheme was completed coal of a very suitable character for electricity generation would be delivered at the power station at a cost substantially less than by any other form of conveyance. By 1950 it is expected that the undertaking will be receiving coal at the rate of 200,000 tons per annum direct from the pit.

Unions and Nationalization

The *Electrical Power Engineer* reports a meeting held in November between the Minister of Fuel and Power and representatives of trade unions operating in the electricity supply industry. The object was to impress upon the Minister the need for safeguarding the position of employees in any scheme for the nationalization of the industry. Matters dealt with included machinery for negotiating wages and conditions; superannuation rights; employees' representation; training schemes; and compensation for loss of employment or worsening of conditions. The unions' spokesman was Mr. E. W. Bussey (Electrical Trades Union) and the Electrical Power Engineers' Association was represented by Mr. J. C. Welburn (president) and Messrs. Oswald, Wallace, Palmer and Essex.

Scottish Electricians' Wages

By agreement between the Electrical Contractors' Association of Scotland and the Electrical Trades Union the hourly rate of wages for journeymen electricians employed in the electrical contracting industry in Scotland will be increased from 2s. 4½d. to 2s. 6d. with effect from January 1st. It has also been agreed that holidays (the first three working days of the year and the local spring and autumn holidays) will be paid for at ordinary plain time rates as from and including the New Year holidays, January 1st to 3rd.

Scottish Building Centre

Colonel G. Gardner-McLean, presiding at the ninth annual general meeting of the Scottish Building Centre held in Glasgow on December 24th, expressed satisfaction with the progress made during the year. He said that not only had there been an encouraging increase in the number of exhibitors and of exhibits, but there was also a gratifying improvement in the number of visitors, especially during the last three months, while technical inquiries were considerably higher than at any time in the Centre's history. The present year had opened with promising signs, and there was every reason to anticipate that satisfactory progress would be maintained.

Whaling Factory Ship

Power for the electrical equipment in the whale refinery *Southern Harvester* built by the Furness Shipbuilding Co., Ltd., for Chr. Salvesen, which is now at the Antarctic whaling grounds, is provided by six Diesel-engine driven generators and one small steam-driven set. The Diesel sets develop 1,680 kW (three are of 400 kW, two of 200 kW and one of 80 kW). The Mirrlees vertical single acting, trunk piston, four-stroke, airless injection, cold starting type engines are direct coupled to Brush generators of the single pedestal pattern, open, canopy protected, drip-proof, compound wound design at 220 V d.c., suitable for parallel operation or independent running as required. The three 400-kW sets are driven by Mirrlees "HF6" six-cylinder Diesel engines, the two 200-kW dynamos by Mirrlees "TL6" six-cylinder engines and the smaller 80-kW set by a "TL" type three-cylinder engine. A Clarkson waste heat gilled tube economizer is installed in the exhaust pipe line of each of the six-cylinder "HF" and "TL" engines. The piping is so arranged that when necessary these economizers can supply feed water to the main boilers.

Russian "Electric Road"

According to the Soviet news agency Tass, construction of the first high-frequency motor road has begun in Moscow following successful experiments by Prof. Georgi Babat. A cable charged with high-frequency current laid beneath the road will produce an electromagnetic field which will be picked up by vehicles equipped with special receivers and condensers. The weight of this motor together with the condenser and other devices is said to be 40 per cent of that of an ordinary four-cylinder internal-combustion engine. It is estimated that cars using the road will be able to travel at over 124 miles an hour.

Quality Control

A Bibliography of Statistical Quality Control has been compiled by Dr. G. I. Butterworth for the College of Economics and Business (University of Washington Press, Seattle, Washington; 114 pages, $1.50). It lists 712 books and articles on the subject that have been published in English-speaking countries, including nine which have appeared in the *Electrical Review*.

Electric Drive in Industry

On December 11th and 12th a series of lectures, in conjunction with a small exhibition of equipment, was organized by the Bradford Corporation Electricity Department in co-operation with the British Thomson-Houston Co., Ltd., on the subjects of "Electric Drive in Industry" and "Electronics in Industry." Lectures were given each afternoon and evening by Mr. G. W. Edgley, Leeds district manager, and other members of the B.T.H. Co.'s staff, to large audiences composed of industrial executives and industrial engineers. The company's sound film, "Electronics in Industry," was exhibited after each lecture. At a luncheon preceding

the lectures those present included the Lord Mayor of Bradford (Alderman T. I. Clough), the Deputy Lord Mayor (Councillor Alton Ward), the chairman of the Electricity Committee (Alderman R. Barber), the deputy chairman (Councillor J. Foster), the electrical engineer and manager (Mr. T. H. Carr), the commercial manager and deputy chief official (Mr. A. Haselhurst), and the chief assistant engineer (Mr. A. N. Aikman).

Mr. Edgley, speaking for his company, emphasized that its immediate purpose was not the booking of orders for motors or other electrical gear, but it hoped that contacts made as a result of the lectures between the supply authority, the users and potential users of industrial electricity supplies, and the B.T.H. Co. as representatives of the electrical equipment manufacturers in general would result in full co-operation between all concerned when schemes of electrification were considered. This co-operation was highly desirable having regard to the wide range of equipment now adopted as standard, and particularly so when it was acknowledged that manufacturers were often able to make special provisions to meet particular needs if given the opportunity to do so. He also stressed the fact that supply authorities constituted a vital link between industry and the equipment manufacturers.

Mill Lighting Installation

A new fluorescent lighting scheme at Smith & Philips' blanket mills at Witney is thoroughly approved by the operatives. In the weaving shop there are seventy looms over each of which is a "Trufolite" reflector made by the Revo Electric Co., Ltd., with an 80-W tubular fluorescent "Osram" lamp. Each fitting is mounted 4 ft 6 in. above the working plane, and the degree of illumination provided averages 30 l.p.f. The previous tungsten illumination varied in intensity from 5 to 15 l.p.f. To help provide maximum reflection and distribution of light the walls of the shop are coloured cream and the ceilings white. The installation was planned and carried out by Hill, Upton & Co., Ltd., Oxford.

Transport Bill Summary

A four-page summary of the Transport Bill giving a very clear picture of this far-reaching scheme has been produced by *Motor Transport*, Dorset House, Stamford Street, London, S.E.1. Copies are available at 4d., post free, or 12s. 6d. a hundred.

Fatality

A case of fatal electric shock from a wireless aerial was heard by the Forest of Dean coroner recently, the victim being Mrs. Evelyn Nancy Ward (30), of Berry Hill, near Coleford, Gloucester. The evidence showed that there was contact between the aerial and a clothes line on which Mrs. Ward was hanging clothes with wet hands. Mr. S. G. R. Hart, electrician, of Coleford, said there was a breakdown in the insulation of part of the wireless set in Mrs. Ward's house.

London Electricity Workers' Wages

The question of a wage increase for electricity workers in the London area was considered at a meeting of No. 10 Council for the Electricity Supply Industry (Greater London Area) on Monday last. A committee was appointed to discuss details of the proposed increase, which will affect all grades.

St. Dunstan's

The 31st annual report of St. Dunstan's for the year ended March 31st last states that there are 1,673 blinded survivors of the first world war living to-day. The total for the second war, including the aftermath which will manifest itself during the next twenty or thirty years, but primarily during the next five or ten years, is estimated at 1,160. The present assets of St. Dunstan's are a little under two-thirds of what would be necessary to capitalize its future needs. In order to secure its future St. Dunstan's plans to raise by voluntary contribution the sum of £306,000 in each of the next ten financial years starting from April 1st, 1946. The report expresses thanks to those who have rendered personal service or who have made donations.

Welding Research

With reference to the notes on welding research which appeared in our issue of December 13th, the British Welding Research Association points out that the experimental tests will be conducted at Abington Hall, near Cambridge, and not Abingdon, Berks., as stated.

Dissolution of Partnership

Messrs. S. Aldwinckle and W. F. Grainger, carrying on business as electrical engineers under the style of Aldomic Electrics at 22 and 24, King Richard's Road, Leicester, and at 25, High Street, Skegness, have dissolved partnership. Mr. Aldwinckle will attend to debts and carry on the business under the same name.

Rashleigh, Phipps Fire

We are informed by Rashleigh, Phipps & Co., Ltd., that their Hanover Square premises were broken into on the night of December 27th and maliciously set on fire. Only one section of the stores and three or four offices were affected. While a certain amount of disorganization will result, owing to the loss of records and lack of essential services, the business will continue as usual.

Dunlop War Secrets Film

Many wartime devices are shown in action in a new type of documentary film, "Far Horizons," produced by Cossar Turfery for Verity Films, which tells the story of the Dunlop war effort. The film combines the qualities of

a feature story with a background of industry during the war years and will be seen early in the New Year at 73 centres in England, Scotland, Northern Ireland and Wales.

Shipbuilding in 1946

During 1946 the Burntisland Shipbuilding Co., Ltd., completed twenty-one vessels for various companies. These included the *Oliver Bury*, a 2,904-ton collier, for the London Power Co., Ltd.

Trade Publications

Telephone Manufacturing Co., Ltd., Martell Road, West Dulwich, London, S.E.21.—Illustrated brochures describing the " Syncycle " static ringing convertor for telephone exchanges; cam-type " TMC " multiple switching keys; and Carpenter polarized relays for repeating signal pulses of varying time duration.

Vacuum Cleaner & Electrical Supplies, Ltd., 543, Moseley Road, Birmingham, 12.—Price list of spare parts, hose, belts, sweeper brushes, carbon brushes, bearings, commutators, motor rewinds and switch movements.

J. E. Wildbore, 26, Marlborough Street, Oldham, Lancs.—Illustrated and priced leaflet on " Protectafil " anti-vibration shock absorber for pendant lamp fittings, spring suspended to permit swinging.

Calendars, Diaries, etc.

The neat diary received from the Cressall Manufacturing Co., Ltd., is bound in navy-blue box calf leather and contains a list of products in which the company specializes.

The extremities of a girl clad in bracelets and sandals—and a bowl of flowers!—compete for attention with an electric fire on the calendar of Clifton Aircraft, Ltd.

Reproductions of photographs of Swedish scenery, life and industry illustrate the weekly date slips of the 1947 calendar of Swedish Lloyd, Gothenburg.

Monthly sheets with bold figuring form the useful calendar received from Victor H. Iddon, Ltd.

A handy engagement calendar has been received from the Middlesex Electron Co., Ltd.

An appealing damsel using a telephone, from a painting by David Wright, entitled " Lines of Communication," illustrates an attractive calendar sent us by William Steward & Co., Ltd.

Fernand Espir, Ltd., have sent us a useful desk calendar mounted on a neat wooden base with two days to each slip.

" Seeing's Believing," from a picture by F. M. Bennett, in which an angler is producing a fish from a basket to substantiate his story, makes a pleasing calendar received from Fitter & Poulton, Ltd.

A handy desk diary has been received from the United Steel Companies, Ltd., which has one week to each page.

Some excellent pictures of Chester as it was a century ago are reproduced on the calendar of Brookhirst Switchgear, Ltd., which has monthly sheets showing also the preceding and following months.

This year's artistic calendar from Mr. Christopher Wade is entitled " The English Garden."

Trade Announcements

The British Thomson-Houston Co., Ltd., is moving its Birmingham stores to Unett Street, Hockley, Birmingham, 19 (Tel. Northern 2261) on January 4th.

Canterbury Factors, radio and electrical wholesalers, have opened a central showroom and trade counter at 41, High Street, Canterbury, and ask for manufacturers' catalogues and advertising material.

The new address of Felicity Sound Reproduction, Ltd., which produces a range of amplifiers, gramophone record reproducers and public address equipment, is 87a, Upper Richmond Road, Putney, London, S.W.15. Telephone: Putney 1665 and 0873.

Trade Marks

THE following applications have been made for the registration of trade marks. Objections may be entered within a month from December 18th.

LONDEX. No. 636,607, Class 7. Electric welding machines, elevators, ignition apparatus being parts of internal combustion engines, and electric ignition timers for i.c. engines, generators, motors (not for land vehicles), washing machines, machines (not included in other classes) for household and technical purposes, incubators; and parts (not included in other classes) of all such goods.—Londex, Ltd., Brettenham House, Strand, London, W.C.2.

THERMEGA. No. 642,296, Class 9. Electrical apparatus and instruments included in Class 9, and electrically-heated clothing for airmen and for use by operatives or workpeople against accident or injury.—Thermega, Ltd., 51-53, Victoria Street, London, S.W.1.

PERLITE. No. 643,151, Class 9. Electric insulated wire.—Aerialite, Ltd., Castle Works, Back Grosvenor Street, Stalybridge, Ches.

TRIBORD. No. 644,055, Class 9. Electric flat irons and kettles. Also No. 644,056, Class 11. Breakfast cookers, boiling rings, waffle-irons, toasters, wash boilers, water heaters, fires and radiators, all being electrical devices.—Hogan & Wardrop, Ltd., City House, 158, City Road, London, E.C.1.

ISOTROL. No. 644,188, Class 9. Mercury-arc rectifiers, control apparatus, thermionic valves and thyratron valves.—Lancashire Dynamo & Crypto, Ltd., Trafford Road, Trafford Park, Manchester, 17.

DUROGLASS. No. 643,852, Class 11. Lighting fittings of glass.—Duroglass, Ltd., Blackhorse Lane, Walthamstow, London, E.17.

Electrical Materials

Large Increases in Metal Prices During 1946

This review, prepared by the Metal Information Bureau, shows that during 1946 *there were very substantial increases in the prices of all metals, but rubber was cheaper. There were adequate supplies of most materials but lead is scarce and is likely to remain so, while the present shortage of aluminium should be eased when the Government's aluminium housing programme is completed.*

IN some respects events during 1946, so far as copper was concerned, may be said to have run in the opposite direction to anticipations. Immediately following the close of the war a scramble by war-torn nations to cover their immediate requirements took place, and by early 1946 major producing countries were concerned with how they were going to dispose of their outputs, despite the fact that these were below wartime peak figures. Subsequent events, however, ran counter to the belief that a world surplus of copper would accrue.

One major factor leading to the present tight copper supply position was a series of major strikes, chief of which were the prolonged labour disputes at mines and refineries in the United States during the opening months of the year and serious interruptions to production in Chile. In fact the big Braden property is still strike-bound. Of primary importance to United Kingdom consumers were the wages disputes in the Northern Rhodesian copper mining belt which for a time reduced output from that source by no less a figure than 15,000 tons a month. Generally speaking, however, consumers of raw metal in Britain have been able to meet their requirements adequately, although, with consumption gradually on the increase, stocks have been reduced from 123,100 tons at the end of 1945 to 94,000 tons at the end of September, 1946.

The question of erecting an electrolytic refinery in Britain was brought to the fore at various times throughout the year, but official intentions in the matter are unknown at the moment. The desirability of the existence of such a plant in the United Kingdom is obvious, one instance of its utility being the shipment of about 148,000 tons of brass scrap to Canada and America for refining and return of the resulting copper, quite apart from the substantial tonnages sent to the Continent from time to time for refining on a toll basis.

Indicative of the strong world demand for copper throughout the year has been the appreciable rise in the official maximum quotation in this country, the raising of which from time to time has been brought about by the Ministry of Supply being forced to pay progressively higher prices on the world market for its supplies. The year opened with electrolytic copper quoted at £62 a ton, delivered; a rise of £10 in April took the quotation to £72, a further rise on July 1st lifted it to £84, whilst yet another advance about the middle of November brought the cost to the consumer up to £98 a ton, at which figure it now stands—with no guarantee that it will not go higher.

Tin

With the end of the war in the Far East the question of tin supplies became of immediate importance and a Colonial Office adviser was despatched to Malaya to report upon the situation. Some fair quantities of tin were located there, but the state of dredges, machinery and equipment (though better than was originally hoped for) was such as to preclude the attainment of full-scale production for three or perhaps four years. During the first few months of 1946 it was necessary to hold down tin consumption in most countries although it is true to say that the important requirements of consumers in the United Kingdom and United States were substantially covered.

To assist the position, both the United States and Britain drew on their reserves of metal. Gradual improvements in the monthly rate of production were recorded but the incentive to higher figures was somewhat damped by the delay by the British and American authorities in raising their purchasing prices. The Ministry of Supply maintained its quotation at £300 a ton long after Nigerian producers had made a strong case for a higher price in view of the fact that they had worked their richest ore reserves for the Allies during the war. Similarly, the Americans and Bolivians haggled over the figure to be paid for the latter's output. Factors such as costs of production, world requirements and the removal of controls in

America all finally resulted in a higher tin price. On September 26th the United Kingdom quotation was advanced to £380 10s. a ton, at which figure it now stands. For the present available supplies of tin continue to be allocated throughout the world by the Combined Tin Committee in Washington.

Lead

World requirements of lead in connection with rehabilitation and reconstruction schemes resulted in potential demand rising throughout the year although, as is still the case, a decided stringency in supplies has characterized this market for the whole of 1946. In both Britain and the United States a system of rationing was imposed so that consumers of raw metal found themselves unable to obtain more than a portion of the supplies they required for the production of manufactured items. Undoubtedly the hardest hit in the United Kingdom were the sheet, pipe, cable and battery makers and as a result of the shortage of virgin metal several bottlenecks were reported. In the House of Commons the question of the low level to which this country's stocks had been allowed to fall was frequently referred to the Minister of Supply; from his replies it is apparent that, despite continual attempts to obtain supplies, there is little if any prospect of an appreciable improvement in the position for some time to come.

United Kingdom consumption of refined lead has been progressively curtailed until it now stands at about 17,000 tons monthly but, despite the rationing scheme mentioned above, stocks have been reduced from over 65,000 tons at the beginning of the year to a mere 19,800 tons at the end of September. Following the steady increase in the world value of lead the official maximum quotation in Britain has risen from the £30 a ton, delivered, at which the year opened, to the present record figure of £55 a ton. Little surprise would be occasioned by yet another advance in the near future as world prices are well above the United Kingdom level.

Zinc

Of the four base non-ferrous metals, zinc has undoubtedly remained in the best supply position throughout the past year. Consumers here generally have been able to obtain sufficient supplies of raw metal to cover their requirements, although as consumption in the United Kingdom has gradually increased there has been a steady reduction in stocks until, at the end of September, they stood at little more than 54,300 tons. This compares with metal stocks amounting to 137,300 tons as at January 1st. There are, admittedly, appreciable quantities of concentrates held in addition but with home zinc production running at no more than 6,000 tons monthly it has remained necessary for the bulk of raw zinc supplies to be obtained from abroad.

On the whole imports have only been on a small scale and it is to be hoped that the Government is taking steps to ensure that increased tonnages arrive in 1947 as any further attrition of the country's reserves may well result in a difficult situation. The dearth of supplies experienced by some countries can be directly attributed not so much to a shortage of ore as to the limited smelter output due, particularly on the Continent, to the acute coal supply situation and shortage of labour. In the United States the removal of price control during the closing months of the year had the effect of lifting the zinc price there to 10·50 cents per lb, a move which was quickly followed in Britain. United Kingdom official price changes during 1946 were from £31 5s., at which figure the year opened, to £39 5s. on April 8th, to £50 on July 1st, to £55 on November 13th, the last remaining the current zinc quotation.

Aluminium

With the termination of hostilities and the resultant falling off in demand for aluminium, major producing countries such as America and Canada found themselves with surplus aluminium producing capacity, the existence of which forced the closing down of many Government-owned reduction plants. Subsequently, however, demand broadened and it looked as if full capacity could be utilized in the supplying of peacetime needs. In the United Kingdom substantial quantities of secondary material were available and for a time it appeared that the market would be a weak one.

The initiation of the Government's aluminium house programme, however, has been responsible for absorbing a large proportion of this surplus material so that at the moment the outlook for aluminium is a good deal brighter than was originally anticipated. Ample tonnages of virgin metal are obtainable from Canada and a big contract was placed by the Ministry of Supply covering 1946 and 1947, but the much increased rolling and extrusion capacity is proving inadequate and delivery delays are

lengthy. On completion of the programme mentioned above the situation may be eased.

The year opened with the home price of aluminium ingot standing at £85 a ton, delivered, although this was subsequently reduced to £67 on April 10th, following the contract between the Ministry of Supply and Canadian producers under which the latter were to supply metal to the United Kingdom up to the end of 1947. With the revaluation of the Canadian dollar, which brought it into line with the American, the United Kingdom price was once again raised to £72 15s., at which figure it now stands.

Rubber

The year 1946 was a very eventful one in the rubber industry as it saw the end of Government bulk buying and the resumption of large-scale production of natural rubber in Malaya and the Dutch East Indies. This natural rubber output rose more rapidly than most people had anticipated and as a result, with the resumption of operations on the London Rubber Exchange from the beginning of 1947, prices showed some falling off from the level at which the Government here had been supplying industry.

America seems certain to maintain a substantial output of synthetic rubber for strategic reasons: Consequently there should not be any scarcity of raw rubber to meet the large requirements of the rest of the world. Indeed, when full-scale plantation production is reached some difficulty may be found in disposing of all the rubber available at remunerative prices.

New Lighthouse Apparatus

ST. Catherine's Lighthouse, Fowey is to have a new 25,000-c.p. light which on most nights will be visible over twenty miles away. The old optical apparatus, supplied by Chance Bros. towards the end of last century, is being retained, but the coal-gas light is being replaced by an electric lamp "flashed" by a motor-driven character mechanism, all operating off the mains supply to the district. The apparatus is automatically switched on at dusk and off at daybreak by means of a clock with solar compensation. If a lamp burns out during the night an automatic lamp changer brings a stand-by electric lamp into focus, and if mains supply failure occurs during the night the lamp is automatically maintained by a stand-by battery capable of operating the light for two winter's nights without recharging. All the switchgear character mechanisms, etc., are housed within a unit fitted in the existing lantern. A separate battery house contains the stand-by battery and a charger.

Australian Notes

From a Correspondent

THE Western Australian Minister for Electricity, Mr. A. Hawke, states that the Electricity Commission is making good progress in implementing the Government policy for the South-West Power Scheme. The Commission has invited tenders for three 2,500-kW turbo-generators and one additional boiler for the Collie power station, and has lent three generating units to the Bunbury Council. At a power house being constructed at Katanning (W.A.) for Katanning Flour Mills, Ltd., two vertical 330-B.H.P. Diesel engines, coupled to two G.E.C. 220-kW d.c. generators will be installed, the latter having been ordered from Britain.

The recent strike of railway locomotive engineers, which resulted in all electricity supplies being cut off in the metropolitan area of Perth for over a fortnight, led to a suggestion that oil-burning plant should be installed at East Perth, and the local Market Gardeners' Association is pressing for a hydro-electric scheme. In reply to the suggestion of oil-burning equipment, the Premier, Mr. Wise, states that it would not be an economic proposition. The estimated cost to equip five boilers is £39,150 and no date could be given for delivery and installation.

The State Electricity Commission of Victoria has purchased earth-moving and constructional equipment to the value of £250,000 in the past year, and during the next few months additional purchases will bring the total expenditure on this type of plant since the end of the war to £550,000. Most of the equipment is required for work on the hydro-electric project at Kiewa, where the second power station will be 450 ft underground.

The Eastern Goldfields Transport Board Bill, which is now in its second-reading stage in the W.A. Legislative Assembly, contains proposals to enable the Kalgoorlie and Boulder municipalities and the Kalgoorlie Road Board to take over tramways now under the control of Kalgoorlie Electric Tramways, Ltd. The company has operated the existing services for over forty years, and the Bill is the result of an amicable agreement between the parties.

The Fremantle Municipal Tramways and Electric Lighting Board reports a net profit of £20,581 for the year ended August 31st last; the profit for the previous twelve months was £41,854. Revenue from traffic sources was £80,831, and from lighting, £134,074. During the year 7,783,276 passengers were carried by the trams, and 1,684,015 by the buses.

A new subsidiary of Electronic Industries, Ltd.—Electronic Imports Pty., Ltd.—has been formed to handle the large number of overseas agencies acquired by this company.

It is understood that a thermostatically controlled washing machine which boils, washes, rinses and dries clothing is being manufactured in Sydney and will be on the market shortly.

Pulverized Fuel Boilers

Discussion on Mr. Sparks's Paper

THERE was a large attendance at the recent joint meeting of the Institutions of Electrical and Mechanical Engineers when MR. C. H. SPARKS (Babcock & Wilcox, Ltd.) presented his paper on boilers designed to burn coal in the pulverized or crushed states (*Electrical Review*, December 27th), illustrated with two short cinema films in colour showing the interior of a "cyclone" furnace while molten slag was being tapped for quenching in water.

The discussion was opened by MR. F. SHAKESHAFT (C.E.B.) who said that the spreader stoker was being tried out on a fairly large scale in this country. The economic size of generating sets would be 50 to 60 MW running at 3,000 r.p.m. and on account of the difficult fuel situation, which might persist for years, some of them were to be constructed in two or three sections each comprising four boilers in two sets with ratings chosen so that any three boilers would enable full load to be generated by two sets. A further number of medium size stations would be constructed on the unit principle, the size of the sets being 30 MW, the aim being to generate the maximum amount of power in the shortest possible time.

Influence of Boiler Size

It was the considered opinion of both station owners and manufacturers that pulverized fuel firing should be adopted as the boiler sizes were rather too large for stoker type plant, having due regard to the fuel situation. In certain places where fuel was more stabilized, the unit principle of construction would enable a saving of $33\frac{1}{3}$ per cent to be made in the capital cost of the boiler plant. Notwithstanding the fall in calorific value of the coal supplied between 1939 and 1945, there had been a material increase in the supply of unwashed slacks and small coal. In 1944 about 50 per cent of the total coal consumed in selected stations was supplied in that form. Four million tons was consumed in pulverized form and the remainder in stoker-fired plant. While the availability of this plant had materially suffered, the pulverized fuel plant had been able to maintain both output capacity and reasonable availability.

About 75 per cent of the total generating stations in the country were within a few miles of coalfields and strong recommendations had been made to the authorities for a rational zoning of coal supplies to ensure the delivery of fuel of more uniform characteristics. The volatile content of the coal from certain of the major coalfields varied by only two or three per cent, but the widely varying mineral matter and moisture content might still require different designs of burners and special designs of milling equipment. To ensure the economic disposal of pulverized fuel fly ash, special care must be taken in siting new generating stations and in making extensions to existing generating plant. A number of new stations, therefore, were being located in proximity to low lying land which might be effectively reclaimed by the disposal of the fly-ash, for future building or agricultural purposes. Others had been situated on estuaries to permit the disposal of the ash at sea.

Dust Removal

MR. J. MAYER (International Combustion, Ltd.) thought that dust was the salvation of pulverized fuel firing and the removal of the dust before it reached the atmosphere was fully justified. Pulverized fuel had come through many severe tests during the past few years and there were many power stations which had used this fuel over long periods containing 18 per cent moisture and 23 per cent ash with a calorific value down to 8,000 B.th.u. There was a good deal of scope for pulverized fuel to cope with any severe worsening of the average fuel values in this country. The main difficulty with the slag tapping furnace in this country was that it was unsuited to two-shift working.

DR. A. PARKER (director Fuel, Research Station) said that a survey of the technical and economic possibilities of various fuels was needed but it would be some time before that could be done. What was wanted at the moment was a guarantee of approximately the same quality with every delivery, even if it could not be the best quality. One of the biggest disadvantages of pulverized fuel was the large amount of fly-ash that must be disposed of. To re-fire it into the combustion chamber would cause certain troubles

due to its high sulphur content. The spreader stoker might mitigate trouble due to bonded deposits, but at present they were without experience of that aspect.

MR. E. MCCABE (South Wales Electric Power Co.) remarked that the statement in the paper that stoker fired boilers arranged for grit re-firing local to the ash discharge end of the stoker had remained free of deposit, should not be taken as a sweeping statement of fact. He had been associated with two designs of modern chain grate stoker-fired boilers in which economizer deposits had been experienced in a most malignant form. He thought there was a tendency to exaggerate the importance of reducing the excess air to the minimum. Could not ash from pulverized-fuel-fired plant be returned to the pits to fill the spaces where the coal had been won?

MR. J. P. O'REILLY (John Thompson Water Tube Boilers, Ltd.) said the author's statement as to the failure of attempts to burn pulverized coal in a confined space provoked controversy, in view of the many pulverized-fuel-fired Lancashire boilers operating successfully to-day, and burning very inferior coals. Pulverized fuel firing was not without fault, all the problems had not been completely solved, nor would pulverized fuel supersede the burning of solid fuels by other means, but where consideration was given to the considerable amount of knowledge now available on this subject, pulverized fuel would still continue to play an important part in the reduction of coal consumption and operating costs.

Limitations Suggested

MR. J. F. FIELD (Edinburgh) said he was interested in the author's divine discontent with pulverized fuel firing, but very much doubted whether the alternatives put forward would, as was implied, knock out pulverized fuel in the future. He did not believe that the spreader stoker would be able to deal with any wider range of fuel than the ordinary stoker and whether the cyclone furnace would be any more flexible in the matter of ash content remained to be seen, although there was some possibility that it might. It might be possible to burn coal with an extraordinary amount of ash in it, but that raised the question whether the administration of the coal industry could produce coal with more than a certain amount of ash in it without increasing the cost of production. With the present known methods he did not think there was much chance of improving the raising of steam. It was necessary to break new ground entirely and he thought that problem was beyond individual firms in this country. Over 30 million tons of coal was burned annually for power generation and it was necessary to have a research establishment worthy of this country.

MR. A. E. POWELL (Merz & McLellan) thought it was reasonable to argue that the consumption of coal for the generation of electricity would increase by as much as 20 million tons per annum and the extent to which that would be off-set by reduced demands from other directions was problematical. He thought the cyclone furnace would be a more serious competitor to pulverized fuel firing than the spreader stoker.

Methods of Conserving Coal

MR. W. N. C. CLINCH (Northmet Power Co.) said that the author had endeavoured to show what might in future be the best means of burning coal, but he had not made any specific representations. Mr. Sparks was interested in the conservation of coal, but it was possible to conserve coal by utilizing the best heat cycle possible.

MR. R. DAVIS did not agree that pulverized-fuel-fired boilers suffered as regarded availability. Semi-anthracite and semi-bituminous coals had been burned successfully in normal size furnaces for many years. Also it was possible to work with a very small proportion of excess air without undue slagging. He also pointed out certain disadvantages of the cyclone furnace for shift working and partial load due to the freezing up of the molten slag. It was also unlikely to be immune from corrosion troubles.

MR. H. E. BARRETT (Bristol Electricity Department) said that a suitable coal size was an ideal which was not likely to materialize for a long time. Therefore, it was better to design boilers to meet existing conditions. Power stations might be put on the coalfields where there was bound to be a surplus of fines for which there was no market, but it did not follow that they would be suitable for power production. He knew one power station which had had thirty-five varieties in the last month, but they could not be burned well in pulverized-fuel-fired installations while the size was too small for either the cyclone furnace or the spreader stoker.

MR. W. C. CARTER (John Thompson Water Tube Boilers, Ltd.) said that more attention should have been given to the

possibilities of fine pulverization by means of steam and air pressurization. The cyclone furnace was a very complicated pressure part, but might be simplified if some form of forced circulation were used. If the main boiler was to be of a natural circulation type, the furnaces could use Le Mont water walls as an adjunct thereto.

DR. R. LESSING said the paper boiled down to the question of the quality of coal and the subject of fly ash loomed very large. In 1924 he had pointed out the difficulties that would arise when inferior coal with high ash content was used in pulverized-fuel furnaces. The dust in the coal when mined, as distinct from the fines, was the material which contributed very largely to clinkering in stoker-fired boilers and at the same time, created most of the fly ash trouble. He considered that the dust should be taken out at the collieries. That dust was ideal, in his view, for pulverized firing and there was a potential production in this country of some 10 million tons per annum. If used in that way, the remaining 95 per cent of the coal would be of very much better consistency for stoker-fired installations.

MR. F. TURNER thought an attempt should be made to burn something other than raw coal for power production purposes in order that the by-products, which were so valuable, especially in the plastics industry, should not be thrown away. He suggested that electricity producers and the gas industry should work more closely together.

THE AUTHOR, in reply, explained that several points had not been dealt with in detail in the paper purposely because he wanted the views of others. If spreader-stoker critics would have a look at a certain small installation in Scotland with which he was associated, he could convince them that there was a great deal more in it than they believed. The coal used in the cyclone described was only 4-mesh, which was very fine indeed, if considered as coal particles and not as dust. It was too fine to be put in the station yard, as it would fly about. The real difficulty about the cyclone furnace was that unless the ash had suitable characteristics, it would not slag. If it were not possible to tap the ash slag out in the way he had shown on the film, it would not be as satisfactory as was desired. It was also wrong to say that the cyclone was unsuitable for shift working; it could be lighted up in two or three minutes.

Steel-Strip Annealing

Details of Electric Furnaces

ANNEALING furnaces for steel strip in coils at the rolling mills of the Whitehead Iron & Steel Co., Ltd., Newport, Mon., are the subject of a paper written by DR. B. JONES and MR. I. JENKINS for the Iron and Steel Institute.

The newer plant was designed for an output of 1,000 tons a week and is worked in conjunction with an older similar installation for up to 550 tons a week, although during the war it exceeded 600 tons a week on occasions. All the electric annealing plant was installed by the General Electric Co., Ltd.

Rearrangement of the earlier sections was completed in 1940 and now includes thirteen furnaces for heating annealing pots varying from 20 to 44 in. in diameter. During 1944-45 further extension of the rolling mills, with automatic regulation of the tension of the strip by "Metadyne" control, involved the provision of sixteen more annealing furnaces. Six of them are rated at 120 kW each with containers of 36 in. diameter by 74 in. deep; the other ten are rated at 130 kW each with containers of 44 in. diameter and the same depth. A 10-ton overhead crane is used for loading the pots and an electromagnet for transporting the coils of strip.

The furnaces are energised in two groups of eight, each with maximum loadings of 1,040 and 980 kW respectively. The r.m.s. value of the load is such that all furnaces may be maintained in production in the event of a transformer failure. Each group is served by three 400-kVA transformers in parallel, stepping down from 6 kV to 400 V, three-phase, 50 c/s. The paper includes details of the manner in which the furnace heating elements are wound and disposed; of their pyrometric temperature control panels, heat recuperation, the controlled gas atmosphere and the annealing cycle.

Although the capital cost of the electric annealing plant is high, it is offset by very small maintenance cost, uniform working conditions and good quality of the annealed strip. There has not been any apparent deterioration of the pots, in some cases after more than twelve years' service, compared with the two-year life of the pots used with the former gas-fired plant.

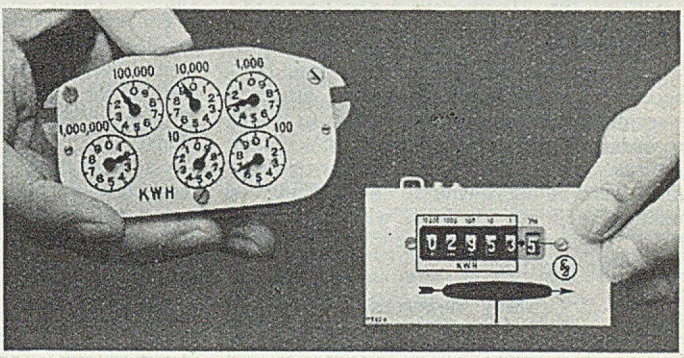
Labour charges are small, the plant being operated by two annealers and one crane driver. Electricity consumed for heating the furnaces is from 180 to 200 kWh per ton of steel annealed, varying according to the charge tonnage. The cost of the controlled atmosphere averages 3·5d to 4d per ton of steel treated.

Meter Dials

Cyclometers *versus* Pointers

By W. B. Askew, A.M.I.E.E.

ALTHOUGH circumstances have since changed somewhat the question of the relative merits of cyclometer and pointer dials for meters appears to be no different to-day from what it was in 1937 when I summarized the position in the electrical press. I then pointed out that "many large undertakings reviewed the situation some ten or fifteen years ago, when cyclometer dials, particularly the falling-weight type, were definitely unsatisfactory. They came to a decision to use only pointer dials because the defects outweighed the obvious advantage of quick and easy reading — a decision with which the writer was in entire agreement. That decision obviously reacted on the manufacturers who then began to specialize on pointer dials."



Comparative features of pointer and cyclometer dials

Then, after indicating that Continental manufacturers had fitted many devices with cyclometer dials where the torque applied was no greater than that found in an electricity meter, I went on to say : "To-day it is possible to acquire a roller cyclometer dial whose performance is eminently suitable for recording domestic electricity consumptions and which fulfils all the requirements of B.S. Specification 37, even at 1/20th load with all rollers in operation. . . . The time taken to read a pointer dial is three times greater than that of a cyclometer and in addition the number of errors made in reading is ten times greater. . . . In the handbook of the 'Electrical Association for Women' a mere sentence is sufficient to describe how to read a cyclometer dial, but a page is necessary to explain the intricacies of the pointer dial.

The public which is every day becoming more and more electrically minded, will want to know more about the individual consumption of such apparatus as water heaters, cookers, fires, etc., and I venture to think that public opinion will once again make itself felt about the type of dial to be used."

During the war, the ordinary consumer was asked to pay more attention to his meter readings and to make substantial economies in electricity. There is no doubt that he would prefer a direct reading dial. A test was made of the times taken by consumers to read thirty-six dials of each kind. These observers were selected from the type of intelligent consumers who would wish to read their own meters and the results were tabulated as shown.

	Pointer	Cyclometer
Minimum time ..	4 min. 40 sec.	2 min. 17 sec.
Maximum time ..	13 ,, 00 ,,	6 ,, 00 ,,
Skilled reader's time	7 ,, 50 ,,	3 ,, 07 ,,
Individual highest errors	2	1
Total errors ..	13	2

When one considers the various types of cyclometer dials in constant use by undertakings in this country some twenty-five years ago, it would appear that consumers were then anxious to make use of this type. The reasons for its gradual supersession by pointer-dial meters were, first, poor construction, which caused accounting troubles and, secondly, the preference of meter superintendents for testing meters fitted with pointer dials. Whilst seeking to retain the better of two types of dials as then produced, a fable was built up around the pointer dial, and accepted, that it is just as easy to read as a cyclometer. Although the time a meter reader spends in viewing the dial

represents but a fraction of his daily work, nevertheless statistics over the past fifteen years show that in a particular area where pointer dials are fitted the number of meters read per man day is eighty-seven. For a similar semi-rural area supplied solely with cyclometer dials the figure is ninety-three.

To appreciate what this apparently small increase in readings means, one must consider that most undertakings deal with thousands of meter readings four times a year. Apart, therefore, from the obvious advantage of supplying the layman with a dial which can be easily read, the undertaking would save time and money by its use. During the war, owing to numbers of premises found inaccessible during working hours, attempts were made to encourage consumers to return records of their meter readings. These returns were not wholly reliable when pointer dials were in use owing to the difficulty of reading their registrations, whereas returns from consumers using cyclometer dials showed few errors.

Many Absentees

These conditions have not materially altered now, and a recent check showed that approximately 25 per cent of the premises visited between 2.30 and 4.15 p.m. could not be entered and in one dormitory area for London workers only one entry was made in thirteen consecutive calls. It is now cheaper and sometimes imperative to read meters after 5.30 p.m. and on Sundays when double time has to be paid.

Close examination of meter cards returned by consumers often show vastly different consumptions compared with previous corresponding quarters as to necessitate re-checks, during which re-checking the number of alleged wrongly read meters is reduced because consumers have in the meantime purchased additional apparatus without informing the supply authority, and the consumption is consequently found to be high. Wrongly read meters are in the proportion of one cyclometer to eight pointer dials.

With readings showing a consumption of from 200 to 2,000 kWh per quarter, errors can be made on the two dials showing units and tens of units without affecting the presentation of accounts, since the error due to an increase or decrease of between 5 and 15 per cent in the quarterly bill is swamped during the next quarter.

This kind of "overlap error," which causes no accounting troubles but is nevertheless unjust, is almost confined to pointer dials and should be taken into account when assessing the comparative merits of the two types of dial, particularly under tariffs in which the price of the kWh varies with the season.

It has been noticed that meter readers in areas in which pointer dials predominate do not bother to get close up to the meter when, as often happens, access is obstructed, and record readings by estimating the angular displacement of the various pointers.

The writer considers that no dials registering decimals should be exposed through the meter-cover window, as these only tend to confuse the consumer and the meter reader. They are of value only to the test department, whose say in this matter has been unduly stressed by the production of figures which tend to show how cheaply a meter can be tested without due regard to the saving to the undertaking as a whole, when the meter is installed.

The anomaly of the so-called "long-range meter" may in the future be disposed of, and this would appear to benefit dial construction, since only four roller counters, perhaps slightly larger than the present form, would be required with a test dial in such a position that it could be used in the test department only when the meter cover was removed.

As to how meter readings can be brought into line with present-day conditions, the writer feels that an opportunity has been lost in post-war houses in that, apart from the tidying up of the "washing lines" between the service cutouts and the consumer's main switches by the design of service units, little action has been given to the possibility of building these service units into an outside wall, thus enabling the meter to be read without entering the premises.

Australian Telecommunications at War

THIS is the title of a special issue of the *Radio and Electrical Retailer* (Sydney). In it the Hon. Norman J. Makin, Minister for Munitions, surveys the activities of the Munitions Directorate of Radio and Signals Supplies from June, 1942, to October, 1945, in which period nearly £17,000,000 worth of radar, radio and signal equipment was manufactured in Australia and delivered to the Australian and Allied armed forces. The issue (176 pp.) is profusely illustrated.

ELECTRICITY SUPPLY

Nottingham Plant Breakdown. Sheffield "Peak Load" Poster.

Colwyn Bay.—CHEAPER ELECTRICITY.—Tariffs in the area are to be amended as from the first reading of the meters after January 1st, as follows: Colwyn Bay: "All-in" tariff reduced to 12½ per cent of the rateable value plus ⅝d. per kWh; lighting (prepayment) reduced from 5d. to 4¾d. per kWh; power (prepayment) reduced from 1¼d. to 1d. per kWh. There are also to be reductions in Penrhyn Bay and Glan Conway.

Glasgow.—MUNICIPAL AND COMPANY COSTS.—Recently the Corporation Electricity Committee agreed to support a protest to the Ministry of Fuel by the Millroad Tenants' Association and Scotstoun Tenants' Association against increased charges imposed by the Strathclyde Electricity Supply Co., a distributing subsidiary of the Clyde Valley Electrical Power Co., on consumers living in the city. In reply, the Clyde Valley Co. states that increases in the Corporation's tariffs involve the occupier of an all-electric house in an additional charge of anything up to 50 per cent compared with the 15 per cent increase introduced by the company. Regarding the examples cited showing higher charges by the company than by the Corporation, it is pointed out that the Corporation serves a compact area of about 30 square miles, compared with the company's area of 1,200 square miles.

PUMPING PLANT.—The Scottish Home Department has agreed to the installation of six new electrically driven pumps to replace steam driven plant at Kinning Park pumping station at a cost of £17,500 and the Corporation is to invite tenders for the work.

Hawarden. — H.V. EXTENSION.— The Electricity Committee has approved proposals by the electrical engineer covering the extension of the 33-kV system from the Gell Farm substation, Lower Kinnerton, to a suggested site at Saltney. The total provisional estimate is £20,460.

Ilford.—SUPPLY TO ESTATE.—The Electricity Committee is to provide a supply to Forest Road housing estate at a cost of £6,273.

Leamington. — STREET LIGHTING. — At a meeting of the Town Council attention was called to the street lighting in the borough, which was described as poor compared with other Warwickshire towns. Councillor B. A. Fetherston-Dilke, chairman of the Watch Committee, said that an experiment was shortly to be made with fluorescent lighting.

Lerwick.—TRANSFER OF THE UNDERTAKING.—The Town Council has agreed to transfer its fourteen-year-old electricity undertaking to the North of Scotland Hydro-Electric Board next May.

London.—OPPOSITION TO BANKSIDE STATION PLAN.—On January 14th Mr. K. E. Dodd is to hold an inquiry for the Minister of Town and Country Planning into the application of the City of London Electric Lighting Co. for sanction to the extension of the Bankside power station. Opposition to the proposals has been entered by the London County Council and the Southwark Borough Council on the ground that they do not fit in with the redevelopment of the area.

TRANSMISSION EXTENSIONS. — Permission to carry out extensions which are estimated to cost £564,000 is being sought from the Electricity Commissioners by the London Power Co., Ltd. The extensions are the establishment of 66- and 22-kV transmission mains and auxiliary cables between Battersea generating station, and Alpha Place and Brompton distributing stations. They are considered essential to deal with future load developments. The Finance Committee of the London and Home Counties Electricity Authority recommends that no objections be made to the proposals.

Markinch.—DOMESTIC ELECTRICAL APPLIANCES.—The Council has agreed to the conditions under which the Fife Electric Power Co. is prepared to supply and maintain electric cookers and washboilers in 38 houses on the Croft site.

Nottingham.—EXPLOSION AT POWER STATION.—Damage at the North Wilford power station, caused by a transformer failure on December 21st has been found to be not so extensive as was at first feared, and it was stated on December 23rd that cuts in electricity supplies will not be necessary. A 30,000-kW set which was damaged was started up again on the following night after continuous shift work by the engineers, but a 20,000-kW set is likely to be out of action for at least six months.

Paisley.—VOLTAGE STANDARDIZATION.—The Town Council has approved the standardization of voltage and change-over from 200 to 240-415 V.

Poplar.—BRUNSWICK WHARF STATION.—Following consideration of reports on the construction of the second section of Poplar's generating station at Brunswick Wharf, the Finance and Valuation Committee recommends the Borough Council to approve expenditure of £1,932,465.

Sheffield.—WARNING POSTERS.—Mr. J. R. Struthers, general manager of the Corporation Electricity Department, has sent us copies of a poster which is being displayed on all buses and trams and most of the city's public buildings. This stresses the necessity for reducing load between the hours of 8 p.m. and noon and 3.30

and 5.30 p.m. and gives reasons for it. The poster says that complete "blackouts" in the domestic areas have been avoided by the generous co-operation of industrialists who have adjusted their production programmes and shed load at great inconvenience and expense. On Tuesday, December 17th, the maximum load on the generating stations was 272,800 kW, the kWh generated for the day being 4,914,600 and the estimated kWh sold to consumers 3,553,000. The grid export m.d. for the day was 52,600 kW and the kWh exported 876,100. On Friday, December 21st, the maximum load on the generating stations was 274,900 kW, kWh generated 4,951,600, and estimated kWh sold to consumers 3,501,000. The grid export m.d. was 60,100 kW and the kWh exported 967,500.

Shetland.—HYDRO-ELECTRIC SCHEME.—Work on the North of Scotland Hydro-Electric Board's scheme for supplying electricity to 65 per cent of the Shetland mainland will begin in the spring if the scheme is approved by the Electricity Commissioners, and provided material is available.

Shoreditch.—NEW HIRE CHARGES.—The Electricity Committee has reviewed the existing hire charges for various domestic appliances, and its recommendations have been approved by the Council. Previously the hire charges for cookers covered the provision of an electric kettle, but in future a separate hire charge will be made for kettles, and until these are available in greater quantities, they will only be hired to consumers who also hire a cooker. The new hire charges will come into force immediately as regards all future hirers, and after requisite individual notice with respect to existing hirers.

CHANGE-OVER.—The Council has also approved the carrying out of the first stage of the change-over of the l.v. system from d.c. to a.c., which will deal with about one-third of the supply area. The estimated cost of this work, which includes substation buildings and plant, e.h.v. and l.v. mains, meters and alterations to consumers' apparatus, is £355,000, and application is to be made to the Electricity Commissioners for sanction to borrow this sum.

Southport.—DISTRIBUTION PROJECTS. — The Electricity Committee is to erect a substation in the Trafalgar Road area for additional supply and change-over at a cost of £6,000, including plant and associated equipment. Others are to be constructed at Arundel Road (£2,609) and Carr Lane (£3,386).

CHANGE-OVER.—The Committee is seeking sanction to borrow £14,000 for extensions in connection with the change-over in the Birkdale area.

South Shields.—NO INCREASE IN CHARGES.—A motion to refer back a minute in the report of the Electricity Committee showing that there had been a loss of £1,915 on the undertaking in the past year was rejected by the Town Council. Councillor Younger criticized the Committee for taking no action about increasing tariffs although the undertaking had shown a loss. Councillor Stephenson said that the Committee thought it was unnecessary to increase tariffs as it was confidently expected that for the current year there would be a surplus. He pointed out that so far in the current year revenue had increased by £6,000 and a further increase of £6,000 was expected.

Stafford.—SUPPLY TO HOUSING ESTATE.—The estimated cost, approved by the Town Council, for providing a supply to the Rising Brook housing estate is £15,600, made up as follows:—Substation and equipment, £3,615; e.h.v. equipment, £2,275; l.v. mains and services, £9,710.

Stranraer.—STREET LIGHTING.—The Lighting Committee has accepted a new agreement with Wigtownshire Electricity Co., Ltd., for street lighting for five years. The Committee has also approved the company's plan for lighting a housing estate with twenty-seven 100-W lamps at a cost of £274.

Tottenham.—REFRIGERATORS FOR COUNCIL HOUSES.—The Health Committee is to purchase 208 refrigerators at a cost of £3,432 for Council houses. To meet the cost of £16 10s. with interest at 2 per cent within a period of ten years a weekly charge of 8½d. will suffice.

Swansea.—DISTRIBUTION EXTENSIONS.—The Electricity Committee is to extend the distribution system at Upper Strand and West Cross at a cost of £17,859.

TRANSPORT

Bolton.—TROLLEY-BUSES RECOMMENDED.—The Transport Committee has decided to recommend the Town Council to adopt electric trolley-buses on suitable routes. Before coming to its decision the Committee considered two reports, one from a sub-committee which had visited a number of towns to study trolley-buses in operation, and another from the general manager on comparative operating costs and merits of trolley and oil buses.

Darlington. — TROLLEY-BUSES. — Double-deck trolley-buses ordered by the Town Council from East Lancashire Coachbuilders, Ltd., are to be of the two-axle rear entrance and staircase type. These will be the first double-deckers used in Darlington.

Edinburgh.—TROLLEY VEHICLE QUESTION.—The Public Utilities Committee has discussed a proposal to experiment with trolley-buses. Questions of amenity were raised. Four members along with officials were appointed to visit London, Belfast and Wolverhampton to inquire into the operation of trolley-buses there.

Glasgow. — MANUFACTURE OF VEHICLE BODIES.—The Corporation Act which empowers the Corporation to manufacture bodies for omnibuses and trolley vehicles has received the Royal Assent.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Tube Investments, Ltd.—Reorganization and development plans estimated to cost £6,000,000 were outlined by the chairman and managing director, Mr. I. A. R. Stedeford, at the company's annual meeting. As regards their aluminium interests, he said that the output of the two factories bought from the Government at Redditch had been good and a considerable area of additional land had been purchased with a view to extending the production there of light-alloy tubes and extrusions. They had formed the Aluminium Wire and Cable Co., Ltd., during the year jointly with the British Aluminium Co., and the Hawker Siddeley Aircraft Co., and it was hoped to establish manufacture in a "special area." Plans had been prepared for the complete modernization of plant and equipment for the production of light-alloy sheet and strip at Reynolds Rolling Mills. Regarding the development of their electrical interests, the Simplex Electric Co. had taken over a modern Government factory at Blyth Bridge on a rental basis and production had started on a moderate scale. The old "Creda" factories would be used for the time being for more specialized lines and for electrical research and development, including the building of prototypes. The acquisition of the business of A. P. Lundberg and Sons would make them less dependent upon others for components. The acute difficulties which had faced the steel tube division had been largely resolved, and good progress was being made with comprehensive plans for modernizing and reorganizing the precision tube factories.

During the year they had exported directly goods to the value of £3¾ million, the volume being double as much as in any pre-war year. New arrangements had been established in Australia where their assets in British Tube Mills (Australia) Pty., Ltd., had been transferred to a recently formed holding company, Tubemakers of Australia, Ltd. A factory had been acquired in New Zealand where they would for the present fabricate and finish exports from home factories and, when the steel strip position eased, produce electrically welded tubes. A subsidiary had been established in Argentina, and before long similar facilities would be provided in India and elsewhere.

Dictograph Telephones, Ltd.—The rate of production of telephone equipment by the company has been raised to a level four times as great as at June, 1945, when Government control of telephone apparatus terminated. This fact is given by Mr. P. V. Sumner (chairman) in his statement submitted at the annual meeting. The company has a very full order book with a substantial demand especially from Australia, South Africa and India. Grampian Reproducers, Ltd., has had an eminently satisfactory year and the increased profits have offset some of the immediate post-war difficulties encountered by the parent company.

Joseph Lucas, Ltd.—Sir Peter Bennett (chairman and joint managing director) stated at the annual meeting that after a year of strenuous effort they had restored their production to pre-war levels. Owing to the shortage of labour in Birmingham they had been compelled to re-establish one of their wartime factories at Burnley, to which had been transferred the manufacture of certain components and items of equipment; this factory was now approaching full production. One of their subsidiaries, the C.A.V. Co., made considerable progress during the year and the output of electrical equipment was well in advance of pre-war. The Rotax Co., now but a fraction of its wartime size, had the difficult task of designing and manufacturing a completely new range of electrical equipment for the post-war aircraft industry.

British Electric Resistance Co., Ltd.—A circular to shareholders states that profits for the year ended July 31st last show a decline. In view of the heavy commitments in Northern Ireland (where a Government factory has been placed at the company's disposal), and because of the present supply conditions which necessitate the holding of large stocks, resources are being conserved, at least until arrangements have been made for additional finance. No dividend is therefore being recommended for the year (against 20 per cent for 1944-45). It is added that trading conditions are now showing an improvement.

S. Smith & Sons (England), Ltd.—At the annual meeting Sir Allan Gordon-Smith (chairman and managing director) said that the change-over from war to peacetime production was complete. The expense of the transition had been borne out of the past year's revenue and the group as a whole had not had to call upon the Government for E.P.T. refunds in order to maintain its standard profits. Commenting on the activities of the various divisions, he said that the new company Radiomobile, Ltd., in which they were equal partners with the Gramophone Co., had developed a new car radio set which was now firmly established on the market. Smith's Aircraft Instruments had the problem of catering for a much smaller demand of an even larger range of instruments and they had decided to concentrate this work in one of their Cheltenham factories, freeing the other works for the expansion of the meter accessory division and, to a larger extent, the clock division.

Notable among the new lines developed was a new all-electric automatic pilot. The programme of the clock division, comprising the manufacture of all grades of electric and other clocks, watches, etc., was very extensive. The division was rapidly becoming the largest organization of its kind in the world.

Sterling Industries, Ltd., reports a net profit of £7,479 for the year ended March 31st, 1946, compared with £3,740 for the previous year. Income tax absorbs £4,200 (£2,500) and £12,642 (£9,363) is carried forward. One of the company's subsidiaries has started production of electric clocks which are now being manufactured in growing quantities.

Radio Rentals, Ltd., reports a trading profit for the year to August 31st (after charging an amount written off radio sets) of £55,585. Tax absorbs £12,750, leaving a net profit of £42,835. The ordinary dividend for the year is raised from 20 to 25 per cent and £60,153 (£55,399) is carried forward.

The Perak River Hydro-Electric Power Co., Ltd., reports a net loss for the year ended July 31st of £20,545 (against a deficit of £35,253), increasing the debit balance brought in to £91,480. H.M. Treasury, in terms of the guarantee, advanced the sinking fund instalment and interest due on the debenture stock for the year. At the meeting of the company on Monday the chairman stated that reinstatement of their properties in Malaya would cost between £750,000 and £1,000,000. Urgent representations had been made on the necessity of early advances for rehabilitation, pending settlement of war damage compensation. Owing to rising costs the company had reluctantly imposed a surcharge of 25 per cent on charges for electricity.

The Engineering & Lighting Equipment Co., Ltd., has decided not to pay an interim dividend but the matter will be further considered when the results for the year ending March 31st next are known. The board explains that the transition from war to peace production is proving longer and more difficult than was expected.

The Isle of Thanet Electric Supply Co., Ltd., is to pay the dividend on its 6 per cent cumulative preference stock for the year ended March 31st, 1944.

Aberdare Cables, Ltd., has announced an interim dividend of 6 per cent payable on larger capital.

Cable & Wireless, Ltd., has declared a further interim dividend of 3½ per cent, making 5½ per cent in all (against last year's 4 per cent plus 1½ per cent special tax-free distribution).

Metal Industries, Ltd., is paying an interim dividend of 3 per cent (same).

The Electric Furnace Co., Ltd., is maintaining its interim dividend at 3½ per cent.

Solus Teoranta (the Irish lamp-making concern) has declared an interim dividend of 5 per cent (same).

New Companies

F. T. Lovell & Co., Ltd.—Registered December 12th. Capital, £1,500. To acquire the business of an electrical engineer and contractor carried on by F. T. Lovell at Olney, Bucks, and elsewhere. Directors: F. T. Lovell and G. Thorne. Regd. office: 38, Market Square, Olney, Bucks.

Ralmor Electrical Services, Ltd.—Registered December 12th. Capital, £1,000. Radio and electrical engineers, etc. Directors: R. Levitt and M. Swerdlin. Regd. office: 16, Devonshire Chambers, Bishopsgate, E.C.2.

Twin Radio & Television, Ltd.—Registered December 10th. Capital, £1,000. Permanent directors are: G. C. Mulholland (chairman) and J. Lloyd. Regd. office: 28, Newton Road, Kingskerswell, nr. Newton Abbot.

K.M.B. Electric Co., Ltd.—Registered November 27th. Capital, £100. Directors: J. Lewington, Eva A. Massey and E. H. Buswell. Regd. office: 57, Salusbury Road, West Kilburn, N.W.6.

Beacon Electronics (Brentford), Ltd.—Registered November 21st. Capital, £1,000. Permanent directors: F. W. S. Bigsworth and two others. Regd. office: 195a, High street, Brentford.

Burn Electric Co., Ltd.—Registered December 2nd. Capital, £100. Manufacturers of, and dealers in, electrical plant and fittings, wireless goods, etc. M. Sorsky is the first director. Regd. office: 81, Crawley Gardens, N.10.

Increases of Capital

Dictograph Telephones, Ltd.—Increased by £100,000 beyond the registered capital of £250,000.

British Electronic Appliances, Ltd.—Increased by £14,000 beyond the registered capital of £11,000.

Wells Pridgeon Electrics, Ltd.—Increased by £2,000 beyond the registered capital of £1,000.

Airmasters, Ltd.— Increased by £900 beyond the registered capital of £100.

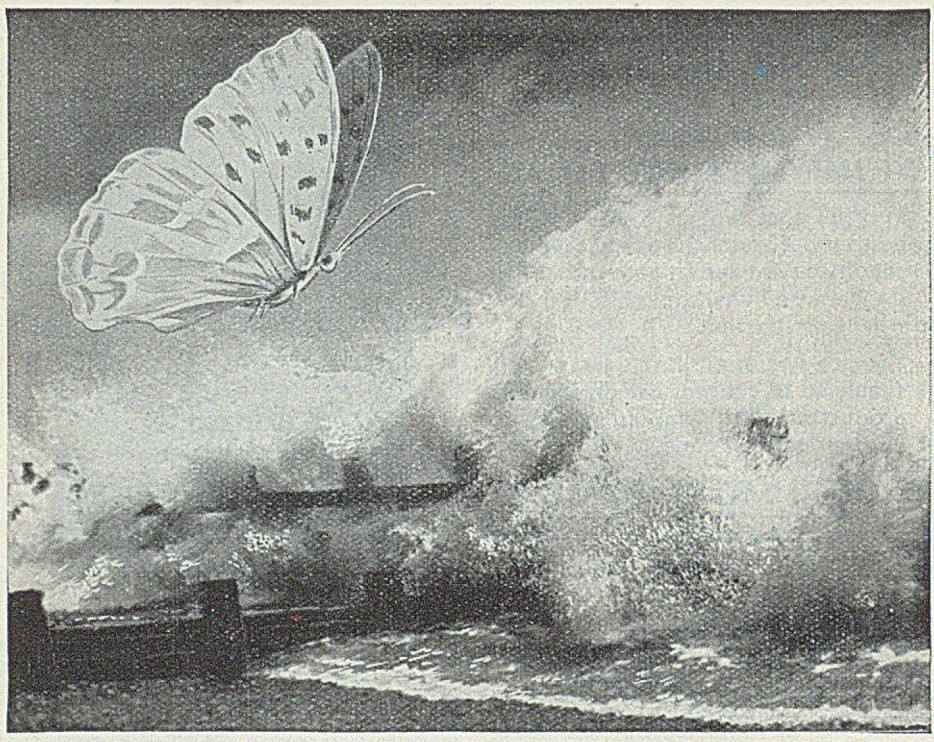
Liquidations

Electric Ignition Laboratory, Ltd.—Meeting January 29th at 5, Greaves Street, Oldham, to receive an account of the winding-up by the liquidator, Mr. S. Slater.

Bankruptcies

W. T. Spencer, electrician, 376, Oldham Road, Newton Heath, Manchester.—First meeting held December 30th. Public examination January 10th at the Court House, Quay Street, Manchester.

R. L. Newell, electrical engineer, High Bank Mill, Egremont, Cumberland.—Receiving order made December 17th, 1946, on a creditor's petition.



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GD 64

STOCKS AND SHARES

THE year 1946 will be marked in Stock Exchange annals as the testing time for stocks and shares in companies affected by nationalization. Strange switchback movements have occurred in prices. At first, the very idea of nationalization as affecting Home Railways, electricity supply companies and those engaged in the manufacturing and equipment branches were depressed at the possibilities. From the lower levels to which quotations dropped, there was a sharp rally, which was maintained in the majority of cases up to the end of the year.

Activity in Markets

The Government has deliberately abstained from announcing the terms on which Compensation Stock will be given, and this is still a matter of complete uncertainty. Nevertheless, Stock Exchange markets have spent, much to their surprise, an active and generally speaking prosperous twelvemonth. Money has been very cheap throughout the period, and to all appearance, the Government's policy of reducing interest rates is likely to be continued, the effect being, of course, to bring into prominence the claims of industrial shares, ordinary and preference alike. New issues have been readily taken, and the New Year will open with a continuance of the scramble for investments that has been a feature of the market during the last few months.

London Electricity Supply

This time last year, the prices of electricity supply shares then current showed a melancholy string of falls as compared with December 31st, 1944. In spite of the VE and VJ days, markets were depressed by the return to power of the Labour Government with a huge majority. This caused an all-round fall. Of subsequent developments that led to a change of sentiment, the cheap-money campaign stands out as the principal factor making for recovery in prices. Hopefulness looks forward to the supply companies being treated fairly. Even in the last few business days of 1946, a lively demand arose for the ordinary shares of the Home electricity companies. A representative London list shows the following changes:—

Ordinary	Dec. 31st, 1945	Now	Rise
	s. d.	s. d.	s. d.
City of London ..	27 6	34 0	6 6
County of London ..	38 0	46 6	8 6
London Assoc. Elec...	27 0	27 0	—
Metropolitan ..	40 0	46 3	6 3
Northmet Power ..	37 6	43 9	6 3
South London ..	29 0	33 0	4 0

Scottish and Provincial

The same rising tendency comes out very clearly in the Scottish and provincial companies' ordinary shares, as the following examples illustrate:—

Ordinary	Dec. 31st, 1945	Now	Rise
	s. d.	s. d.	s. d.
Bournemouth & Poole	59 0	65 6	6 6
Clyde Valley	39 6	44 0	4 6
Edmundsons	26 0	29 6	3 6
Elec. Dis. Yorks ..	40 0	48 6	8 6
Lancs Light & Power	32 6	34 6	2 0
Midland Counties ..	37 6	49 0	11 6
Midland Elec. Power	40 6	47 0	6 6
North Eastern ..	31 6	32 0	0 6
Northampton.. ..	46 6	51 0	4 6
Scottish Power ..	35 0	43 0	8 0
Yorks Electric ..	39 6	47 6	8 0

Equipment and Manufacturing

How investment has made its influence felt in the market for equipment and manufacturing shares, can be seen from this group of comparative prices:—

Ordinary	Dec. 31st, 1945	Now	Rise
	s. d.	s. d.	s. d.
Assoc. Elec. Ind. ..	55 6	74 0	18 6
British Insulated Callenders	44 0	46 6	2 6
Crompton Parkinson (5s.)	30 6	32 0	1 6
English Electric ..	54 3	66 6	12 3
Ever Ready (5s.) ..	45 0	50 0	5 0
General Electric ..	93 9	102 0	8 3
Henley's (5s.) ..	28 0	28 6	0 6
Johnson & Phillips ..	80 0	85 6	5 6
Siemens	37 0	38 0	1 0

The Rising Trend

A further dozen instances afford interesting reflection of the results so far achieved by the operation of the cheap-money policy of the Government:—

Ordinary	Dec. 31st, 1945	Now	Rise or Fall
	s. d.	s. d.	s. d.
Automatic Tel. & El.	69 0	76 3	+ 7 3
Cossor, A. C. (5s.)	45 6	28 0	— 17 6
Crabtree (10s.) ..	43 6	48 0	+ 4 6
De la Rue	10½	13¾	+ 3¼
Elec. & Musical(10s.)	33 3	26 0	— 7 3
Elec. Constrn. ..	61 0	65 0	+ 4 0
Enfield Cable ..	62 6	53 6	— 9 0
Ericsson (5s.) ..	52 6	55 0	+ 2 6
Lancs. Dynamo ..	5½	6	+ 10 0
Mather & Platt ..	53 0	58 3	+ 5 3
Reyrolle	74 6	80 0	+ 5 6
Westinghouse Brake	73 0	79 0	+ 6 0

Communication Stocks

Nationalization as applied to Cable & Wireless left substantial rises in the preference and ordinary stocks at the end of the year:—

Stock or Share	Dec. 31st, 1945	Now	Rise
Anglo-Amer. pref. ..	128½	148½	20
Cable & Wireless pref.	110	122	12
Ditto, ord.	103	119½	16½
Great Northern ..	32½	38	5½
Marconi Marine ..	32s. 3d.	33s. 6d.	1s. 3d.

Southern Railway 5 per cent preference, which started 1946 at 110½, finished at 123½. British Electric Traction deferred rose 215 points, from 1025 to 1240. Stock Exchange shares, at 160 now, compare with 94 a year ago.

NEW BOOKS

D.C. Traction Principles. Installation Methods Simply Explained.

Principles of Direct-Current Electric Traction. By D. W. Hinde and H. E. Ingham. Pp. 248; figs. 179; illus.; index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 15s.

This descriptive work on d.c. traction is rather reminiscent of the type of book on technical subjects so popular some years ago in the U.S.A. The chapter on traction motors starts right at the beginning with the principles of the d.c. machine, though it is hard to see why space should be taken up with generators including the series connection. Also, the opening statement that " the traction motor is essentially a means of converting electrical energy into rotational mechanical torque " may mislead some readers. The matter gets better as traction proper is reached, though here too some of the space might be better used for technical diagrams instead of certain photographs of exteriors which convey comparatively little. It seems a pity too that the authors stop short of calculations. How much more informative, for example, would it be to work out speed-time curves from specified data than merely to see the diagrams for the several services: the characteristic curves of motors under various conditions are given without vertical and horizontal lines. This may make the diagrams clearer, but curves cannot be used for detail work without some co-ordinates.

The chapters on controls, auxiliaries, power supply, collection, rolling stock and Diesel-electric traction contain good, up-to-date matter, though some of the material might equally well be found in makers' technical pamphlets. The last chapter on the metadyne traction equipment is the most technical of all. For all needing a sound up-to-date not-too-technical description of d.c. traction the book can be recommended.—S.P.S.

First Course for Electricians. By T. C. Gilbert, A.M.I.E.E. Pp. 62; figs. 36. Morgan, Laird & Co., Ltd., 54, Bloomsbury Street, Bedford Square, London, W.C.1. Price 3s. 6d.

This is a modest little volume written in simple language which deals with the general range of matters connected with the domestic installation. It commences with a chapter on the usual elementary considerations of current, voltage and resistance, followed by explanations of series and parallel resistances, wiring connections, and precautions to be taken against risk of fire and shock. The book then goes on to deal with lighting installations, including a chapter devoted to methods of switching and control, concluding with a description of various bell circuits.

It is possible that it has been written as a forerunner of a series of booklets, as it deals with the examination of existing domestic work rather than with the provision of new installations. Even so, a number of additional matters might with advantage have been dealt with in this volume, including equipment commonly found in domestic installations such as switch splitters, power sockets, ceiling switches, and so on, and recent developments such as service panels, ring main connections, and standard sockets. Notes on simple motor connections and on fluorescent lighting would also have been of value. The chapters devoted to fire and shock precautions ought to be extended to include an indication of the methods to be used, or the instruments required, for testing. Omissions of this nature detract from the value of the book, which otherwise fulfils a very useful function for young electricians.

There is a sweeping reference to steel conduit on page 37 and it is not possible to agree with the author's contention that the steel conduit installation has disappeared. In a number of cases a technical term is referred to without explanation; for example, reference is made on page 24 to a 3-phase transformer which it is stated will be explained later, but there is no further reference to it in the book.

The description of a method of multiple control of lighting circuits by means of a bell movement seems to indicate that full mains pressure should be applied to an ordinary bell acting as a switch, operated by a bell battery and lighting insulated wiring. In the case of a young electrician, one hopes that the author's suggestion that this method of control may come into popular use will not be realized.

No doubt future editions of the book will carry a table of contents and an index, and the list of electrical associations given at the end should be completed. At present, it includes the A.M.A. but not the C.M.A., and there is no reference to the Institution of Electrical Engineers or to the Wiring Regulations as such. Some attention should also be given to the illustrations which, while generally helpful, in some cases are drawn with the essential parts on too small a scale to be easily understood.—E.J.

Books Received

Steam Generation. By J. N. Williams. Pp. 372; figs. 93; illus.; index. Evans Bros., Ltd., Montague House, Russell Square, London, W.C.1. Price 25s.

Heaviside's Operational Calculus Made Easy. By T. H. Turney. (2nd edition.) Pp. 102; figs. 33; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 10s. 6d.

Forthcoming Events

Monday, January 6th. — BIRMINGHAM. — James Watt Institute, 6 p.m. I.E.E. South Midland Centre. "Development and Design of Colonial Telecommunications Systems and Plant," by C. Lawton, and "General Planning and Organization of Colonial Telecommunications Systems," by V. H. Winson. (Joint meeting with the Institution of Post Office Electrical Engineers.)

LONDON.—At the Institution of Electrical Engineers, 2, Savoy Place, W.C.2, 5 p.m. Institution of Post Office Electrical Engineers. "The Provision of Line Communications for the Fighting Services," by H. R. Harbottle.

BRADFORD.—Technical College, 7.15 p.m. Bradford Engineering Society. "Fuel Economy in Facts and Figures," by W. Goldstern.

LIVERPOOL.—Royal Institution, Colquitt Street, 6 p.m. I.E.E. Mersey and North Wales Centre. "Engineering Principles Applied to the Design of Domestic Water-Heating Installations of the Solid-Fuel/Electric Type," by R. Grierson and Forbes Jackson.

Tuesday, January 7th. — MANCHESTER. — Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Centre. "The Influence of Resistance Switching on the Design of High-Voltage Oil Circuit Breakers," by H. E. Cox and T. W. Wilcox.

LONDON.—Oddfellows' Hall, 186, Hammersmith Road, S.W., 7 p.m. Association of Supervising Electrical Engineers (West London Branch). "Some Applications of Electricity and Gas."

GLASGOW. — Ca'doro Restaurant, Union Street, 7.30 p.m. Electrical Society of Glasgow. "Power Factor Correction," by R. H. Bannister.

Wednesday, January 8th.—LONDON.—I.E.E. London Students' Section, 7 p.m. "Radio Transmitting Valves," by A. Mason.

At the Institution of Mechanical Engineers, Storey's Gate, S.W.1, 6 p.m. Institution of Heating and Ventilating Engineers. "Air Filtration," by N. S. Billington.

WOLVERHAMPTON.—Victoria Hotel, 7 p.m. Electrical Power Engineers' Association. Exhibition of film, "Steam" (Babcock & Wilcox, Ltd.).

MIDDLESBROUGH.—Cleveland Technical Institute, Corporation Road, 6 p.m. I.E.E. Tees-Side Sub-Centre. "The Electrical Control of Dangerous Machinery and Processes," by W. Fordham Cooper.

Friday, January 10th. — BIRMINGHAM. — Chamber of Commerce Building, New Street, 7 p.m. Society of Instrument Technology (Midland Section). "Electronic Instruments," by D. Edmundson.

Imperial Hotel. Institute of Physics (Midland Branch). "The Nature of the Electric Spark," by Prof. J. M. Meek.

BRISTOL.—Grand Hotel. Bristol Electric Club. Annual dinner.

Monday, January 13th.—NEWCASTLE-ON-TYNE. Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "The Influence of Resistance Switching on the Design of High-Voltage Oil Circuit Breakers," by H. E. Cox and T. W. Wilcox.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 5 p.m. I.E.E. Western Centre. "Industrial Applications of Electronic Techniques," by H. A. Thomas.

Tuesday, January 14th.—LEEDS.—Corporation Electricity Department, Whitehall Road, 6 p.m. I.E.E. North Midland Centre. "Silicon Carbide Non-ohmic Resistors," by F. Ashworth, W. Needham and R. W. Sillars.

GLASGOW.—Royal Technical College, 6.15 p.m. I.E.E. Scottish Centre. "Fundamental Legislation for Electricity Supply to Consumers," by W. Fennell.

LIVERPOOL.—Corporation Electricity Showrooms, Whitechapel, Liverpool, 6 p.m. Illuminating Engineering Society (Liverpool Centre). "Thoughts on Modern Lighting," by O. C. Waygood.

London J.E.A.

THE Finance Committee of the London and Home Counties Joint Electricity Authority recommends that application be made for sanction to loans of £120,000 for mains and services, £60,000 for substations and equipment, £10,000 for meters, £2,000 for substation sites, £6,000 for street lighting fittings, £10,000 for transport, £25,000 for cookers for hire and £25,000 for other apparatus for hire. The Committee has also approved estimates of the Local Distribution Committee for £16,180 for mains and services, £1,200 for a substation in Reigate Avenue, Sutton, and £38,485 for cables.

The London Power Co., Ltd., has notified the Authority of its application to the Electricity Commissioners for consent to the establishment of 66-kV and 22-kV transmission mains and auxiliary cables between Battersea power station, the Alpha Place distributing station and Brompton distributing station. The work is estimated to cost £260,000 for transmission mains and £304,000 for switchgear and transforming equipment.

Central London Electricity, Ltd., is to spend about £162,000 on the construction of a main bulk supply station for the Brompton district. The station will provide ultimate accommodation for 48 MVA of 22/6·6-kV transformers with the requisite 22-kV and 6·6-kV switchgear and control apparatus and auxiliary services. In addition there will be accommodation for 50 MVA of 60/22-kV transformers and switchgear to be installed by the London Power Co.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKT. Ges. für Technische Studien.—"Thermal power plants." 13513/44. July 17th, 1943. (583076.)

Allmanna Svenska Elektriska Aktiebolaget.—"Connection for altering an electric current in facultative dependence on two or more different currents." 7211/44. April 30th, 1943. (582946.)

C. M. C. Armstrong.—"Boiler feed and like regulators." 5357/44. November 12th, 1943. (Divided out of 561404.) (583094.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Detecting and range finding systems employing radio pulses." 16086. September 30th, 1943. (583036.)

British Thomson-Houston Co., Ltd., and H. de B. Knight.—"Electric discharge devices." Cognate applications 18654/43 and 445/44. November 10th, 1943. (583041.)

British Thomson-Houston Co., Ltd., and T. H. Mackenzie.—"Circuit arrangements for sorting impulse voltages, particularly adapted to radio echo direction finding systems." 5942. April 13th, 1943. (583065.)

British Thomson-Houston Co., Ltd., and A. H. Maggs.—"Dynamo-electric machines." 13725. July 18th, 1944. (583079.)

British Thomson-Houston Co., Ltd., H. de B. Knight and L. Herbert.—"Hermetically sealed spark gaps." 11253, June 12th, 1944. (582995.)

C. H. W. Clark and Steatite & Porcelain Products, Ltd.—"Electric resistance devices." 11692. June 20th, 1944. (583061.)

G. H. Collins and H. F. Collins.—"Terminals for electric conductors." 14986/44. July 27th, 1945. (583081.)

Compania para la Fabricación de Contadores y Material Industrial Soc. Anon., and P. Viteau.—"Devices for transmitting high-frequency currents on high-voltage energy transport lines." 14355. July 27th, 1944. (582957.)

W. W. Constantine (General Motors Corporation).—"Protector devices for electric motors in refrigeration apparatus." 14165. July 25th, 1944. (582999.)

E. C. L. Fievez.—"Process of fabrication of coated rods for welding." 10651. June 2nd, 1944. (583099.)

Mallory Metallurgical Products, Ltd.—"Electrical contacts." 18650/43. November 10th, 1942. (Addition to 540360.) (583067.)

Marconi's Wireless Telegraph Co., Ltd., J. M. Furnival, N. M. Rust and G. E. Partington.—"Apparatus for the detection by electromagnetic radiation of the presence and location of objects in space." 9958. August 5th, 1941. (582934.)

H. J. Modrey.—"Electrical plug and socket connectors with retractable contacts." 14013. August 27th, 1943. (582939.)

A. C. Morrison and A. E. Morrison.—"Electrically-driven vehicles." 7677. April 25th, 1944. (583049.) "Speed reduction gearing." 5137/45. February 1st, 1944. (Divided out of 1844/44.) (583062.)

A. Phillips, Ltd., and S. C. Hall.—"Domestic washing boilers and washing machines." 15787. August 18th, 1944. (582959.)

Siemens Bros. & Co., Ltd., and D. A. Christian.—"Electromagnetic relays." 16315. August 28th, 1944. (582960.)

Standard Telephones & Cables, Ltd., and C. H. Foulkes.—"Grid electrodes for electron discharge devices." 18159. November 2nd, 1943. (583040.)

Standard Telephones & Cables, Ltd., and R. B. Shepherd.—"Time modulation pulse systems." 12875. September 11th, 1942. (582979.)

Standard Telephones & Cables, Ltd., and S. G. Tomlin.—"Electron beam tube arrangements." 5718. May 2nd, 1941. (583024.)

Standard Telephones & Cables, Ltd., F. H. Bray and L. R. Brown.—"Electric signalling systems." 2539. February 11th, 1944. (582942.)

Standard Telephones & Cables, Ltd., P. K. Chatterjea and L. W. Houghton.—"Circuit arrangements for receiving electrical pulse signals." 4132. March 27th, 1942. (583027.)

Standard Telephones & Cables, Ltd., J. H. Fremlin and J. Foster.—"Ultra-high-frequency oscillation generators." 12066. September 19th, 1941. (582935.) "Resonator chamber systems for ultra-high-frequency devices." 16696. September 19th, 1941. (Divided out of 582935.) (582936.)

Standard Telephones & Cables, Ltd., J. H. Fremlin and C. H. Foulkes.—"Electron discharge apparatus of the velocity modulation type." 2222. February 19th, 1942. (582937.)

Board of Regents of University of Texas.—"Apparatus for treating gases with electric glow discharges." 11545/43. June 22nd, 1942. (583033.)

E. R. Watts & Son, Ltd., and G. A. Whipple.—"Magnetic compasses." 18043. September 21st, 1944. (583012.)

Westinghouse Electric International Co.—"Variable-speed electric drives." 18051/43. October 30th, 1942. (583066.)

H. D. Wheeler and A. H. Mossay.—"Speed control of electric motors supplied on the variable-voltage system." 10071. May 24th, 1944. (583053.)

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.

Brighouse.—January 31st. Electricity Department. Two 11-kV switchboards and two transformers, one 300 and one 600 kVA. (See this issue.)

Burnley.—January 20th. Electricity Department. E.h.v. cables and transformers. (See this issue.)

Cove and Kilcreggan.—Town Council. Electric lighting installation in Burgh Hall, Cove.—J. Neilson Gray, town clerk, 65, Bath Street, Glasgow.

Dundee.—January 10th. Public Lighting Department. Street lighting equipment. Forms from Public Lighting Engineer, Lochee Road.

January 15th. Corporation. Multicore, high- and low-voltage paper-insulated cables. (December 27th.)

Elland.—January 14th. U.D.C. Electrical work in houses on School Street site, Greetland. F. R. Birkhead, surveyor, Council Offices.

Gainsborough.—Electricity Department. One 6·6-kV switch unit. (December 27th.)

Kettering.—January 20th. Electricity Department. Two 400-kVA and six 500-kVA three-phase transformers. (See this issue.)

Kingston - upon - Thames. — January 13th. Borough Council. Self-interlocking type underground cable covers. (December 27th.)

Manchester.—January 13th. Electricity Committee. Supply of electric water heaters for twelve months, Spec. No. 885. (See this issue.)

Newton-le-Willows.—January 17th. Electricity Department. Two 11-kV switchboards. (See this issue.)

North Riding.—Education Committee. Installation of electric lighting and equipment at Scarborough Technical Institute. County Architect, County Hall, Northallerton.

Salford. — January 23rd. Public Health Department. Thirty electrically heated food conveyors. Secretary, Hope Hospital, Eccles Old Road.

Surrey.—January 31st. County Council. Applications are invited from contractors and manufacturers who wish to be included in the list of suppliers for electrical installations, lifts, refrigeration, and X-ray apparatus and hospital equipment. County architect, County Hall, Kingston-on-Thames.

Weymouth and Melcombe Regis.—Electricity Department. Two 500-kVA three-phase transformers. (December 27th.)

Orders Placed

Darlington. — Town Council. Accepted. Switchgear (£5,065).—A. Reyrolle & Co.

Ealing.—Electricity Committee. Accepted. Switchgear £934).—Ferguson, Pailin.

Ilford.—Electricity Committee. Accepted. Cables (£9,499).—Metropolitan Cable & Construction Co. Three transformers (£589 10s. each). — British Electric Transformer Co.; Ferranti; Johnson & Phillips (one each). Two switchboards (£670 each).—A. Reyrolle & Co. Meters.—Sangamo Weston; Met-Vick; Ferranti.

London.—Joint Electricity Authority. Recommended. 33-kV cable (£38,485).—British Insulated Callender's Cables.

Middlesbrough.—Town Council. Accepted. Cable—Hackbridge Cable Co. Transformers—Electric Construction Co. Substation panel and circuit breakers.—English Electric Co. Traction battery—Crompton Parkinson.

Town Council. Accepted. Columns, lanterns and associated equipment for street lighting on the Thorntree estate.—G.E.C.

Wood Green.—Highways Committee. Accepted. Traffic signals at Bounds Green Road (£901).—Automatic Telephone & Electric Co.

Contracts in Prospect

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

Aberdeen.—Reconstruction of Palace Hotel, destroyed by fire (£500,000); engineers, L.N.E.R. offices, Edinburgh.

Birkenhead.—Rebuilding Argyle Theatre, Argyle Street; W. & S. Owen, architects, Palmyra Square.

Blackburn. — Extensions to Queen's Park Hospital (operating theatre, X-ray department, and 60 additional bedrooms at nurses' home); W. Pickstone, borough surveyor.

Adaptations at Atholl House for extensions for Queen Elizabeth Grammar School; secretary to the Governors.

Blackpool.—Dwellings (32), Grange Park (£46,196), for T.C.; W. R. Ward & Co., builders, 292, Whitegate Drive.

Boldon (Co. Durham).—Paint factory, Cleadon Lane, for Wards Paints, Ltd.; H. Hill, architect, 10, Winchester Street, South Shields.

Bredbury and Romiley.—Permanent houses (100), on two sites; T. B. Kenyon, clerk, U.D.C. Offices, Bredbury, Stockport, Cheshire.

Brighouse.—Houses (198), Cain Lane estate; H. A. Sneezum, borough surveyor.

Chesterfield.—Works, Brimington Road, for Kennings, Ltd.; F. W. Tempest, architect, Mottistone Chambers, Regent Street, Mansfield.

Cockfosters. — Houses (28), Gloucester Gardens; Huckle & Hall, 61, Truro Road, N.22.

Consett.—Houses (20) at Hamsterley Colliery; H. Ayton & Son, builders, Blackhill.

Coventry.—Municipal restaurant off Corporation Street for T.C.; D. E. E. Gibson, city architect, 1a, Warwick Row.

Dalkeith.—Extension of Westfield Carpet Works (£4,500) for H. Widnell & Stewart, Ltd.; the manager.

Darlington.—Developments at works for the Cleveland Bridge & Engineering Co., Ltd. (£50,000).

Devizes.—Permanent houses (38), Brickley Lane Estate; J. D. Sheasby, borough engineer.

Dublin.—New factory for Cerebos, Ltd.

Dumbarton.—Conversion of mansion house into maternity home (£13,340); burgh surveyor.

Ealing.—Flats (52), Barnham Road; Comben & Wakeling, Ltd., 603, Kenton Road, Harrow.

Easington.—Houses (108) for the R.D.C.; C. W. Clarke, surveyor.

East Sussex.—Secondary schools at Crowborough (£160,000), Heathfield (£105,000), and Uckfield (£99,000); county architect, County Hall, Lewes.

Gateshead.—Factory for A. O. Moffitt, Ltd.; Arthur & Kirkup, architects, 13, Swinburne Street.

Hackney.—Flats (100), Banister House estate (£169,570); H. J. Walker & Sons, Station Road, Fishponds, Bristol.

Huddersfield.—Houses (36) for T.C.; J. Wimpenny & Co., Ltd., builders, Spurn Point, Linthwaite, Huddersfield.

Ilford.—Works additions, Grove Road; Metropolitan Cables, Ltd.

Inverness-shire.—Houses (300), schools, community centres, etc.; county architect, Inverness.

Jarrow-on-Tyne.—Factories for Steel & Co. and Sharp's Footwear Repairs, Ltd., at trading estate; J. Walter Hanson & Son, Northumberland Street, Newcastle-on-Tyne.

Lisburn.—Extensions, Ravarnette Mills for H. R. Carter & Son.

Liverpool.—Factory for W. Flanagan & Son, 33, Kirkdale Road.

Manchester.—Petrol filling station; Halwyn Motor Tyre Co., Cornwall Street, Openshaw.

Offices and workshop, Chapel Street; W. Dale & Co., chainmakers, Ancoats.

Reconstruction of office block, Cross Street, Blackpool Fold and Newmarket Lane; Manchester Commercial Buildings, Ltd., 15, Cross Street.

Offices and additions to buildings, Travis Street and Boardman Street; Carter Paterson & Co., Ltd., 150, Goswell Road, London.

Matlock.—Secondary and junior and infants' schools for Derbyshire E.C.; F. H. Crossley, county architect, County Offices, Derby.

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

Houses (22), Stonecleigh Avenue; T. Pearson & Son, builders.

Newcastle-on-Tyne.—Additions to engineering department at King's College; College Council.

Rebuilding of 21 houses in Sturdee Gardens, destroyed during war; Marshall, Tweedy & Bourn, Grainger House, Blackett Street.

Newport (Mon.).—Permanent houses (341), Gaer Estate; Johnson Blackett, borough architect, Town Hall.

North Riding.—Secondary schools at Stokesley, Easingwold and Catterick Camp, for North Riding E.C.; county architect, County Hall, Northallerton.

St. Pancras.—Secondary school, Sidmouth Street (£180,000); L.C.C. architect.

Salford.—New offices; Raleigh Cycle Co., Ltd., Eccles New Road, Weaste.

Scarborough.—Dormitory block at Scarborough Hospital; E. Hunter, builder, Beaconsfield Road.

Sligo.—Factory at Deepwater for Cook & McNielly, Ltd.

Stockton-on-Tees.—Adaptation of premises in Devonshire Street as factory for Hansen Paper Products, Ltd., London; H. C. Constantine, architect, Marlow, Buckinghamshire.

Sunderland.—Cinema at the Green, Southwick; J. H. Morton & Son, architects, Martins Bank Chambers, Fowler Street, South Shields.

Swansea.—Temporary shops, central area (£19,000); borough architect.

Extensions to Unit Superheater works, Sun Fuel Yard; Stewarts & Lloyds, Ltd.

Tynemouth.—Developments at the Fish Quay for the T.C. (£250,000); borough engineer, 19, Howard Street, North Shields.

Factory, Bird Street; Mallins Food Products (North Shields), Ltd.

Uxbridge.—Houses (58), Church Hill, Harefield, for U.D.C.; William L. Eves, Council's architect, 54, High Street.

Wallsend.—Houses (20), Sunnholme estate; W. C. Leech, builder, 2, Clayton Street, Newcastle-on-Tyne.

Temporary extensions to Buddle and Western Schools; county architect, County Hall, Newcastle.

Washington (Co. Durham).—Temporary houses at Washington Station and Usworth for the U.D.C.; N. Harrison, surveyor.

Woolwich.—Houses (88), various sites (£140,186); borough engineer.

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First Post on Monday**, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

THE CHARGE for advertisements in this section is 2/6 per line (approx. 7 words) per insertion; ***ONLY OFFICIAL AND GOVERNMENT ANNOUNCEMENTS CAN NOW BE DISPLAYED:***—35/- per inch. Where the advertisement includes a Box Number this counts as six words and 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.

SURREY COUNTY COUNCIL

Selected Contractors

A List of Contractors is now being prepared for the Council's building and maintenance works. Contractors and manufacturers are therefore invited to make application for consideration in respect of one or more of the following classes of work or materials:—

1. General building.
2. Redecorations and repairs.
3. General maintenance and repairs.
4. Tar paving and tar macadam.
5. Heating, hot water and gas installation.
6. Electrical installations.
7. Fencing and railings and gates.
8. Lifts.
9. Refrigeration and cold storage.
10. Sterilizing and disinfector plant.
11. Swimming pool filtration and treatment plants.
12. Water softeners.
13. X-ray apparatus and hospital equipment.
14. Land works.
15. Cooking equipment.
16. Structural steel.
17. Reinforced concrete.
18. Masonry (natural and artificial).
19. Ironmongery.
20. Sanitary fittings.
21. Roof tiling and slating.
22. Joinery.
23. Plastering (general and fibrous).
24. Asphalte, etc., water proofings.
25. Paints, varnishes and distempers.
26. Floor finishing (all types).
27. Patent roof coverings.
28. Metal windows.
29. Plumbing installations.

Those contractors applying in connection with Items 1, 2 and 3 should state the limit of cost (maximum and/or minimum) of work for which they are prepared to tender, and also some indication of the labour force normally employed.

Applications should be addressed to the County Architect, County Hall, Kingston-on-Thames, to be received not later than 31st January, 1947.

DUDLEY AUKLAND, Clerk of the Council.

4077

BOROUGH OF KETTERING ELECTRICITY DEPT.

TENDERS are invited from British manufacturers for: Specification No. 106. Two 400-kVA. three-phase Transformers, ratio 11,000/420 volts: Six 500-kVA. three-phase Transformers, ratio 11,000/420 volts.

Specification and form of tender, in duplicate, may be obtained from the Borough Electrical Engineer, Rockingham Road, Kettering, upon receipt of one guinea, which will be refunded upon receipt of a bona fide tender and the return of the specification. Extra copies of the specification may be purchased at a cost of 5s. each.

Tenders must be submitted in a plain sealed envelope, supplied by the Corporation, endorsed "Tender for Specification No. 106," and must be received by me not later than Monday, 20th January, 1947. The Corporation do not bind themselves to accept the lowest or any tender.

JOHN CHASTON,
Town Clerk.

Town Clerk's Office,
High Street, Kettering.
19th December, 1946. 4153

COUNTY BOROUGH OF BURNLEY ELECTRICITY DEPARTMENT

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

Specification No. 1—Extra High Tension Cables.
Specification No. 2—Transformers.

Copies of the specifications, conditions and form of tender may be obtained on application to the Borough Electrical Engineer, 43, Grimshaw Street, Burnley.

Tenders, in plain sealed envelopes, endorsed respectively "E.H.T. Cables" or "Transformers," to be delivered to the undersigned not later than the first post on the 20th January, 1947. The Council does not bind itself to accept the lowest or any tender.

C. V. THORNLEY,
Town Clerk.

Town Hall, Burnley.
December, 1946. 4176

BOROUGH OF BRIGHOUSE ELECTRICITY DEPT.

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

(a) Two 11,000-volt Switchboards.
(b) One 300-kVA and one 600-kVA Transformers.

Specifications and forms of tender can be obtained from the Borough Electrical Engineer, Huddersfield Road, Brighouse. Tenders must be received by the undersigned not later than Friday, the 31st January, 1947, in plain sealed envelopes endorsed "Tender for Switchboard" or "Tender for Transformers" as the case may be. The Corporation do not bind themselves to accept the lowest or any tender.

ERNEST H. CLEGG,
Town Clerk.

Town Hall,
Brighouse. 4222

CITY OF MANCHESTER

THE Electricity Committee invites tenders for the supply and delivery over the twelve months ending 31st January, 1948, of Electric Water Heaters (Specification No. 885).

Specification, etc., may be obtained from Mr. R. A. S. Thwaites, Chief Engineer and Manager, Electricity Dept., Town Hall, Manchester, 2, on payment of a fee of one guinea, which amount will be refunded on receipt of a bona fide tender.

Tenders, addressed to the Chairman of the Electricity Committee, to be delivered not later than ten o'clock a.m. on Monday, 13th January, 1947. The Committee does not bind itself to accept the lowest or any tender.

PHILIP B. DINGLE,
Town Clerk.

Town Hall, Manchester, 2.
24th December, 1946. 4221

NEWTON-LE-WILLOWS URBAN DISTRICT COUNCIL ELECTRICITY DEPARTMENT

TENDERS are invited for the supply and delivery of two 11-kV Switchboards.

Specification, form of tender, and full particulars can be obtained upon application to the Council's Electrical Engineer, Mr. W. Phœnix, M.I.E.E., Electricity Offices, Old Town Hall, Newton-le-Willows.

Tenders, enclosed in plain, sealed envelopes, and endorsed "Tender for Switchboards," must be delivered not later than noon of Friday, 17th January, 1947, to the undersigned.

M. W. COUPE,
Clerk to the Council.

Town Hall, Market Street.
Newton-le-Willows, Lancs. 4216

CITY OF PORTSMOUTH ELECTRICITY UNDERTAKING

TENDERS are invited for the supply, delivery and erection of three 1,500-kVA 11/6.3-kV Transformers, connected delta/interstar for direct connection to existing 30-MW alternators for works auxiliary supplies.

Specification, conditions and form of tender may be obtained from the Engineer and Manager, Electricity Undertaking, 111, High Street, Portsmouth, on receipt of £1 1s., which will be refunded on receipt of a bona fide tender. Additional copies may be purchased at a cost of 10s. 6d. per copy. Tender forms must be returned to the undersigned in a plain sealed envelope, marked "Tender for Transformers," without bearing any name or mark indicating the sender, on or before the 30th January, 1947.

V. BLANCHARD,
Town Clerk.

Portsmouth.
December, 1946. 4198

SITUATIONS VACANT

METROPOLITAN BOROUGH OF FULHAM ELECTRICITY DEPARTMENT

THE Council invites applications for the following positions in the Fulham Base Load Generating Station, Townmead Road, Fulham, S.W.6.

GENERAL ENGINEER, not over 40 years of age, education up to Inter.B.Sc. standard, with technical and practical experience in the erection and maintenance of heavy mechanical, electrical and steam-raising plant, preferably with experience of base load power station work, experience in acting as site engineer or clerk of works, and with practical knowledge of mechanical fitting and/or electrical testing and steam-raising plant. Salary in accordance with the National Joint Board Schedule, Class L, Grade 8, at present £624 15s. per annum. It is anticipated that the station will be reclassified in 1947 to Class M, when the commencing salary would be £666 15s. per annum.

ASSISTANT ELECTRICAL PLANNING ENGINEER, not over 40 years of age, education up to Inter.B.Sc. standard, with technical and practical experience in the maintenance, testing and operation of electrical plant, preferably in the types of plant associated with a base load power station, and proved ability in organisation and planning of work. Salary in accordance with the National Joint Board Schedule, Class L, Grade 9a, at present £468 6s. per annum. It is anticipated that the station will be reclassified in 1947 to Class M, when the commencing salary would be £501 18s. per annum.

ASSISTANT INSTRUMENT ENGINEER, not over 25 years of age, with sound technical training and education up to Inter.B.Sc. standard, at least three years' practical experience with a manufacturing firm of instruments of the type used in a power station and at least two years' experience in servicing and calibrating such instruments, more particularly analytical temperature, and flow types for gas, water and steam, and capable of supervising mechanics on repair work and of diagnosing faults. Salary in accordance with the National Joint Board Schedule, Class L, Grade 10b, at present £374 17s. per annum. It is anticipated that the station will be reclassified in 1947 to Class M, when the commencing salary would be £400 1s. per annum.

ELECTRICAL TESTER, not over 35 years of age, education up to Inter.B.Sc. standard, at least five years' experience of working on H.T. and E.H.T. circuits and in testing of electrical apparatus, including all types of generators, relay and protection systems, switchgear, feeders and cables, and capable of carrying out maintenance and operation testing of all types of electrical apparatus associated with a large base load power station, from the diagnosis of faults to the calibration of relays on all voltages from 400 to 66 kV. Salary in accordance with the National Joint Board Schedule, Class L, Grade 9a, at present £468 6s. per annum. It is anticipated that the station will be reclassified in 1947 to Class M, when the commencing salary would be £501 18s. per annum.

The successful candidates will be required to pass a medical examination and the appointments are subject to the Local Government Superannuation Act, 1937.

Forms of application and conditions of appointment may be obtained on sending stamped addressed foolscap envelope to the undersigned, to whom completed applications must be returned not later than 12 noon on the 28th January, 1947.

CYRIL F. THATCHER,
Town Clerk.

Town Hall, Fulham, S.W.6.
December, 1946. 4162

METROPOLITAN BOROUGH OF ISLINGTON ELECTRICITY DEPARTMENT

Appointment of General Clerks—Meter Reading Section

APPLICATIONS are invited from persons of not less than 21 years of age for the permanent positions of Male or Female General Clerk (two vacancies) in the Meter Reading Section of the above undertaking.

The salary and conditions of service will be in accordance with the General Division of the National Joint Council Scheme, as follows:—

Male.—From £180 per annum at 21 years of age, rising by annual increments to £330 at 30 years of age, plus temporary cost-of-living bonus, at present £59 16s. per annum.

Female.—From £144 per annum at 21 years of age, rising by annual increments to £264 per annum at 30 years of age, plus temporary cost-of-living bonus, at present £48 2s. per annum.

The commencing salary will be the salary appropriate to the age of the successful candidate at the date of his/her appointment.

Applicants should have a sound general education, aptitude for accurate figure work, and preferably some experience in dealing with filing systems and records similar to those used in a meter reading records department.

The appointments 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. Candidates are required to disclose in writing whether, to their knowledge, they are related to any member or holder of any senior office under the Council. Canvassing, either directly or indirectly, will be a disqualification. The Council are unable to make any arrangements whatsoever for the provision of housing accommodation for the successful candidate.

Applications, stating age, particulars of education, qualifications and experience, accompanied by copies of not more than three recent testimonials, should be forwarded to the Engineer and General Manager, 341/343, Holloway Road, N.7, so as to reach him not later than noon on Friday, 17th January, 1947.

W. ERIC ADAMS,
Town Clerk.

Town Hall,
Upper Street, N.1. 4130

COUNTY BOROUGH OF WARRINGTON ELECTRICITY DEPARTMENT

Switchboard Attendant

APPLICATIONS are invited for the appointment of Switchboard Attendant for shift duties at the Corporation's Selected Generating Station.

Applicants must have had experience in the operation of high tension and low tension switchgear in a modern generating station.

The appointment is a permanent one, and will be subject to the Local Government Superannuation Act, 1937. The conditions will be in accordance with the District Council No. 3 N.W. Area, the present rate of pay, including war bonus, being 2s. 8½d. per hour.

Applications, on forms to be obtained from the undersigned, must be accompanied by copies of not more than 2 recent testimonials and delivered in sealed envelopes, endorsed "Application for Switchboard Attendant," not later than first post on Monday, January 20th, 1947.

N. T. SMITH, M.I.E.E., A.M.I.Mech.E.,
Borough Electrical Engineer.

Electricity Works,
Howley, Warrington. 4186

FIRST GARDEN CITY LIMITED

THE following vacancies are open:—

(a) FITTER AND TURNER for general maintenance work, experience with Brush-Ljungstrom turbines desirable.

(b) FITTER for water-tube boiler and pump maintenance, experience with Babcock & Wilcox stoker-fired units desirable.

Rates of pay 2s. 4d. per hour for day work, plus extra for superior ability and experience.

(c) CONTROL ENGINEER, experienced with E.H.T. feeders and turbo-alternators, also D.C. rotary plant, rate 2s. 7½d. per hour for shift work.

The above to be in accordance with J.I.C. (No. 9 Area) conditions; subsistence allowances will be considered pending permanent settlement in the district. Applications to the undersigned by 11th January, 1947.

W. A. BROWN,
Electrical Engineer and Manager.

Works Road,
Letchworth, Herts. 4060

SHEFFIELD CORPORATION ELECTRICITY DEPT.

Appointment of Assistant Power Station Superintendent

APPLICATIONS are invited for the position of Assistant Power Station Superintendent at the Neepsend Generating Station of the above undertaking. Applicants must have had a thorough mechanical and electrical engineering training, preferably including experience in a manufacturing engineerig works, and possess a degree or equivalent technical qualifications admitting to Corporate Membership of the Institution of Mechanical and/or Electrical Engineers. He must also have had experience in the operation and maintenance of a modern selected power station.

The salary will be in accordance with Class J, Grade 5, of the National Joint Board Scale (present value £651, rising to £682). Extensions are now in progress at this station which, when completed, will place the station in Cass K.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and candidates must have previous local authority service carrying a transfer value within the meaning of the Act or otherwise be not more than 40 years of age. The successful candidates will be required to pass a medical examination.

Form of application may be obtained from the undersigned and is to be returned to me in an envelope marked "Assistant Power Station Superintendent" not later than 17th January, 1947, and accompanied by copies of not more than three recent testimonials. Canvassing or any communication with a member of the Council, either directly or indirectly, is prohibited and will be a disqualification.

(Signed) JOHN R. STRUTHERS.
Commercial Street, General Manager and Engineer.
Sheffield, 1.
27th December, 1946. 4225

METROPOLITAN BOROUGH OF FULHAM ELECTRICITY DEPARTMENT

APPLICATIONS are invited from candidates not more than 40 years of age for two positions of Temporary Draughtsman (one Architectural and one Mechanical) in connection with the Council's Base Load Electricity Generating Station and Distribution Department. Applicants must have had respectively five years' practical experience of architectural and mechanical draughtsmanship, sound technical training and education up to Inter. B.Sc. or equivalent, and be capable of carrying out their own calculations and of preparing working drawings from site measurements.

Salary up to £10 per week according to age and qualifications, plus cost-of-living bonus. The successful candidates will be required to pass a medical examination.

Forms of application and conditions of appointment may be obtained on sending stamped addressed foolscap envelope to the undersigned, to whom completed applications must be returned not later than 12 noon on 28th January, 1947.

CYRIL F. THATCHER.
Town Hall, Fulham, S.W.6. Town Clerk.
December, 1946. 4163

METROPOLITAN BOROUGH OF FULHAM ELECTRICITY DEPARTMENT

THE Council invites applications for the position of Assistant Contract Engineer in their electricity distribution department from candidates not over 35 years of age for supervision of electrical installation work during progress and on completion and measuring up for and providing data for the costing department. Education standard up to matriculation required and possession of Higher National Certificate in electrical engineering; practical experience of domestic and industrial electrical installation work, and supervisory experience and ability to control and discipline men.

Salary in accordance with the National Joint Board Schedule, Class G, Grade 9a, at present £360 3s. per annum. The successful candidate will be required to pass a medical examination and the appointment is subject to the Local Government Superannuation Act, 1937.

Forms of application and conditions of appointment may be obtained on sending stamped addressed foolscap envelope to the undersigned, to whom completed applications must be returned not later than 12 noon on 28th January, 1947.

CYRIL F. THATCHER.
Town Hall, Fulham, S.W.6. Town Clerk.
December, 1946. 4164

METROPOLITAN BOROUGH OF ISLINGTON ELECTRICITY DEPARTMENT

Appointment of Engineering Draughtsman

APPLICATIONS are invited for the position of Engineering Draughtsman on the permanent staff of the Council.

The salary and conditions of service, in accordance with the National Joint Board Schedule, will be from Grade 9a, £360 3s. per annum, to the maximum of Grade 8, £499 16s. per annum, in Class G, according to the qualifications and experience of the successful candidate.

The position offers scope for initiative in design connected with the development of a superimposed 33 kV transmission scheme, the reinforcement of the existing distribution system and future planning in connection with the standardisation of voltage and supply.

The appointment 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. Candidates are required to disclose in writing whether, to their knowledge, they are related to any member or holder of any senior office under the Council. Canvassing, either directly or indirectly, will be a disqualification. The Council are unable to make any arrangements whatsoever for the provision of housing accommodation for the successful candidate.

Application forms, which may be obtained from the Engineer and General Manager, Electricity Department, 341/3, Holloway Road, N.7, should be completed and returned to him, endorsed "Engineering Draughtsman," by not later than noon on Friday, 10th January, 1947.

W. ERIC ADAMS.
Town Hall, Town Clerk.
Upper Street, N.1. 4129

METROPOLITAN BOROUGH OF WOOLWICH ELECTRICITY DEPARTMENT

Radio Engineer

APPLICATIONS are invited for the position of a Radio Engineer in the Electricity Department, at a commencing salary of £446 5s. per annum and increases in accordance with the National Joint Board Schedule, Grade 9, Class J.

Applicants should be (a) Associate Members of the Institute of Radio Engineers or hold equivalent technical qualifications on radio; (b) Have had at least one year's apprenticeship with a firm of communication engineers; (c) Have had necessary practical experience to take complete control of radio repair shop, including diagnosing and testing.

The appointment 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 age, qualifications and experience, together with not more than three recent testimonials, should be made to the undersigned not later than Saturday, 11th January, 1947. Canvassing members of the Council, directly or indirectly, will be a disqualification.

DAVID JENKINS.
Town Hall, Town Clerk.
Woolwich, S.E.18. 4122

METROPOLITAN BOROUGH OF WOOLWICH ELECTRICITY DEPARTMENT

Appointment of Two Junior Mains Engineers

APPLICATIONS are invited for the position of Junior Engineers in the Mains Section of the Woolwich Electricity Department at a commencing salary of £408 9s. per annum, in accordance with the National Joint Board Schedule, Grade 9a, Class J.

Applicants should have had experience in (a) The laying and jointing of medium and high-voltage underground cables; (b) The operation of an urban district network; (c) Should be a Graduate Member of the Institution of Electrical Engineers, or possess equivalent qualifications.

The appointment 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 age, qualifications and experience, together with not more than three recent testimonials, should be made to the undersigned not later than Saturday, 11th January, 1947. Canvassing members of the Council, directly or indirectly, will be a disqualification.

DAVID JENKINS.
Town Hall, Town Clerk.
Woolwich, S.E.18. 4123

ALDERLEY EDGE AND WILMSLOW ELECTRICITY BOARD

Appointment of Lady Demonstrator

APPLICATIONS are invited for the position of Lady Demonstrator at a commencing salary of £252 per annum, rising by annual increments of £12 to £288 per annum. In addition a cost-of-living bonus will be paid which is at present £48 2s.

Candidates must have a good general education, and must be able to conduct lecture-demonstrations in the showroom and on consumers' premises. They must have a wide knowledge of domestic electrical appliances, and be able to advise customers on their selection and uses, and should possess a Diploma in Domestic Science and/or the E.A.W. Electrical Housecraft Diploma.

The appointment 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, on forms to be obtained from the undersigned, endorsed "Lady Demonstrator," stating age, whether married or single, and giving details of qualifications, experience and appointments held (including present position), to be submitted to the undersigned not later than the 12th January, 1947.

C. CAMERON KIRBY,
Engineer and Manager.

13, Water Lane,
Wilmslow, Cheshire. 4128

COUNTY BOROUGH OF ST. HELENS ELECTRICITY DEPARTMENT

APPLICATIONS are invited for the appointment of Power Station Superintendent at a salary in accordance with Class C, Grade 3, of the N.J.B. Schedule, commencing at £681 per annum.

Candidates must have had a good engineering training, followed by experience in the operation, maintenance and installation of plant in generating stations. They should preferably be under 45 years of age and must be Corporate Members of one of the leading Engineering Institutions.

Applications, accompanied by copies of not more than three testimonials, must be made on the form obtainable from the undersigned, and be received not later than 15th January, 1947, in an envelope clearly endorsed "Power Station Superintendent." The appointment 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.

P. BREGAZZI,
Engineer and Manager.

Carlton Street,
St. Helens, Lancs.
14th December, 1946. 4143

BOROUGH OF TIVERTON ELECTRICITY UNDERTAKING

APPLICATIONS are invited for the position of Mains Foreman. Applicants must have had experience of laying and jointing E.H.T. and L.T. cables and maintenance of distribution systems. Wages and conditions of employment will be in accordance with the District Joint Industrial Council rate for Area No. 12. The successful applicant will be subject to the provisions of the Local Government Superannuation Act, 1937.

Applications, stating age, training and experience, together with copies of not more than three recent testimonials, must reach the undersigned not later than the 4th January, 1947.

W. F. PUGSLEY,
Town Clerk.

Tiverton.
19th December, 1946. 4152

ENGINEERING APPRENTICESHIPS IN MINISTRY OF SUPPLY ESTABLISHMENTS

AN Open Competitive Examination for Engineering Apprentices in the Royal Ordnance Factories in various parts of the country and in the Royal Aircraft Establishment, Farnborough, will be held at local centres in March, 1947.

Engineering apprentices are expected to reach Higher National Certificate or equivalent standard by the end of their apprenticeship. Candidates must be not less than sixteen and not more than eighteen years of age on 1st March, 1947.

Copies of the regulations and forms of application may be obtained from the Secretary, Ministry of Supply, Room 268 (Exam.), Shell-Mex House, Strand, London, W.C.2. The latest date for the receipt of applications is 31st January, 1947. 4013

COUNTY COUNCIL OF THE STEWARTRY OF KIRKCUDBRIGHT

Appointment of County Electrical Engineer

APPLICATIONS are invited for the above post from Engineers who are Corporate Members of the I.E.E. or who possess equivalent qualifications. Applicants must have had a thorough training and experience in the work of public electricity supply, and must be conversant with the administrative, engineering and commercial requirements of an extensive rural undertaking serving an area of 1,000 square miles and operating some 360 miles of H.V. and L.V. mains and 500 substations.

The salary scale is £900 rising by annual increments of £50 to £1,000 per annum, plus war increase at the appropriate rate (meantime £105 per annum). The appointment will be subject to the Local Government Superannuation (Scotland) Act, 1937, and the selected candidate will be required to pass a medical examination.

Terms of appointment may be obtained from the undersigned, with whom applications, giving full details of previous experience, etc., and accompanied by not more than three testimonials, should be lodged not later than 18th January, 1947. Applicants placed on the short list will be required to submit a further 20 copies of their applications and testimonials. Canvassing, directly or indirectly, will be a disqualification.

ROBT. C. MONTEATH,
County Clerk.

County Offices,
Kirkcudbright. 4172

STOKE-ON-TRENT CORPORATION ELECTRICITY DEPARTMENT

Appointment of (a) Installation Engineer; (b) Assistant Installation Engineer

APPLICATIONS are invited for the above appointments from persons with sound technical training and who have had considerable experience in the installation and maintenance of electric lighting, heating, cooking, etc., who are able to prepare complete schemes and estimates for all classes of electrical installation work in public buildings, schools, canteens, commercial and domestic premises, and competent to control staff and supervise the carrying out of the work. Applicants should be Corporate Members of the Institution of Electrical Engineers.

The salaries will be in accordance with (a) Class H, Grade 4 (£666/682/698) and (b) Class H, Grade 6 (£571/586/601) of the National Joint Board Schedule.

The successful candidates will be required to pass a medical examination and the appointments will be subject to the Local Government Superannuation Act, 1937.

Applications on the forms obtainable from the General Manager, Electricity Department, 31, Kingsway, Stoke-on-Trent, to be sent to the undersigned in the envelopes provided, not later than first post on Monday, 27th January, 1947.

HARRY TAYLOR,
Town Clerk.

Town Hall,
Stoke-on-Trent. 4220

BOROUGH OF BARKING ELECTRICITY DEPT.

APPLICATIONS are invited for the position of Meter Test Room Superintendent at a salary in accordance with the N.J.B. Schedule, Class F, Grade 8, commencing at £464 per annum.

Candidates should preferably have passed the Associate Membership Examination of the Institution of Electrical Engineers or its equivalent, and should have had technical and practical experience in the operation of a Class A polyphase testing station complying with the requirements of the Electricity Supply (Meters) Act, 1936, and be conversant with the testing, erection, maintenance and repair of all types of D.C. and A.C. (single and 3-phase) meters and instruments.

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

Applications must be submitted in the appropriate form, which may be obtained from the Borough Electrical Engineer, Electricity House, Ripple Road, Barking, and should be returned to me, together with three recent testimonials, by Tuesday, the 14th January, 1947, endorsed "Meter Test Room Superintendent."

E. R. FARR,
Town Clerk.

Town Hall, Barking, Essex.
18th December, 1946. 4229

COUNTY BOROUGH OF HUDDERSFIELD ELECTRICITY DEPARTMENT

Appointment of Two Switchboard Attendants

APPLICATIONS are invited for the position of Switchboard Attendant at the St. Andrew's Road Generating Station of the Huddersfield Corporation, at a salary in accordance with the National Joint Board Scale, Class II, Grade 9a, £365/381.

Applicants should have had experience in the operation of large power station plant, together with E.H.T. switchgear and Central Electricity Board grid supplies. Applications stating age, qualifications, practical and technical experience, and accompanied by at least two copies of recent testimonials, should be submitted.

The appointments will be subject to the Corporation's conditions of service and to the provisions of the Local Government Superannuation Act, 1937. The successful candidates will be required to pass a medical examination.

Applications should be forwarded to the undersigned not later than the 10th January, 1947, and enclosed in a sealed envelope endorsed "Switchboard Attendant."

F. A. ELLIS, M.I.Mech.E., M.I.E.E.,
Market Street, Borough Electrical Engineer
Huddersfield. and Manager. 4154

BOROUGH OF WILLESDEN ELECTRICITY DEPT.

Appointment of Mains Superintendent

APPLICATIONS are invited for the above position; salary Class H, Grade 4, at present £699-£735 per annum, plus car allowance in accordance with the Council's scale, at present £75 per annum.

Applicants must be Corporate Members of the Institution of Electrical Engineers, and have had a sound technical education and experience in the design, installation maintenance and operation of H.V. and M.V. networks. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, after a probationary period of six months. The selected applicant will be required to pass a medical examination.

Applications must be made on the application forms to be obtained from the undersigned, and should be returned to the undersigned together with copies of three recent testimonials, not later than 9 a.m. Monday, 20th January, 1947, endorsed "Mains Superintendent."

W. T. PIRIE,
Dyne Road, Town Clerk.
Kilburn, N.W.6. 4219

MANCHESTER MUNICIPAL COLLEGE OF TECHNOLOGY

(Faculty of Technology in the University of Manchester)

Assistant Lecturer in Electrical Engineering

THE Governing Body invites applications for an Assistant Lectureship in Electrical Engineering in the College of Technology, with the title and status of Assistant Lecturer in the University of Manchester. Importance is attached to practical works experience in electrical engineering.

Salary £420 per annum, rising by annual increments of £20 to £500 per annum. Commencing salary according to qualifications.

Conditions of appointment and form of application may be obtained from the Registrar, College of Technology, Manchester, 1. The last day for the receipt of applications is Friday, 31st January, 1947. Canvassing, directly or indirectly, will disqualify a candidate for appointment.

J. E. MYERS, Principal of the College.
4182

LONDON POWER COMPANY LIMITED

Senior Control Room Operator

APPLICATIONS are invited from men having experience in the control of large electric supply systems and paralleling of large turbo-generators. Applicants must have received a sound technical training and had good general engineering experience.

Salary would be in accordance with the E.P.E.A. Schedule, Grade 9, Class K; the successful candidate would be required to pass a medical examination in order to qualify him for the Company's Pension Scheme.

Applications, stating age, qualifications and experience, and enclosing copies of testimonials, should be addressed to—Superintending Engineer, Deptford East Generating Station, London Power Company Limited, Stowage Wharf, S.E.8. 4208

BOROUGH OF DARWEN

Junior Mains Engineer

APPLICATIONS are invited for the above appointment with salary in accordance with Class D, Grade 8b, of the N.J.B. Schedule, at present £340, rising to £354, per annum.

Candidates must possess the Higher National Certificate in Electrical Engineering and must have had experience in the installation and operation of E.H.T. and L.T. underground mains and overhead lines, also the installation and operation of transformer substations. Some mains drawing office experience would be an advantage. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the selected candidate will be required to undergo a medical examination.

Applications, stating age and giving details of experience, also copies of three testimonials, should be addressed to the undersigned not later than 17th January, 1947.

ALEX WATSON,
Electricity Department, Borough Electrical Engineer.
Robin Bank Road, Darwen. 4224

COUNTY BOROUGH OF BURY ELECTRICITY DEPT.

Appointment of Switchboard Attendant

APPLICATIONS are invited for the above appointment at a salary in accordance with Class G, Grade 9a, of the National Joint Board Schedule, at present £343 per annum.

The station is a "selected" one and candidates should have had experience in the operation of E.H.T. switchboards. The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, and to the successful candidate passing satisfactorily a medical examination.

Applications, giving details of training, with copies of recent testimonials, to be sent to the Engineer and Manager, Electricity Department, Bury, endorsed "Switchboard Attendant," not later than Wednesday, the 15th January, 1947.

EDWARD S. SMITH,
Municipal Offices, Town Clerk.
Bank Street, Bury.
19th December, 1946. 4228

BOROUGH OF HIGH WYCOMBE ELECTRICITY UNDERTAKING

Appointment of Draughtsman and Mains Recorder

APPLICATIONS are invited for the above appointment at a salary in accordance with Class F, Grade 9, of the N.J.B. Scale (£358/365/373). The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination. Candidates must have had practical experience in the preparation of mains plans and records and layout of substation plant and buildings.

Applications, setting out qualifications and experience, and accompanied by recent testimonials, should be addressed to the undersigned and received not later than 17th January, 1947.

HENRY ROBSON,
Electricity Offices, Borough Electrical Engineer.
Frogmoor,
High Wycombe, Bucks. 4157

LONDON COUNTY COUNCIL

ELECTRICAL Engineers required in Chief Engineer's Department, with experience in drawing office work and preparation of specifications for electrical installations in large buildings. Should hold the Higher National Certificate or its equivalent.

Salary according to qualifications and experience up to £420 a year plus cost-of-living addition, at present from £78 to £90 a year (for men) according to basic salary. Selected candidates will be subject to the provisions of the Local Government Superannuation Act, 1937.

Application forms, obtainable by sending stamped addressed foolscap envelope to the Deputy Chief Engineer (quote 46/19), County Hall, Westminster Bridge, London, S.E.1, returnable with copies of three recent testimonials within 14 days. All other things being equal, preference will be given to candidates registered under the Disabled Persons Employment Act, 1944. Canvassing disqualifies. 4168

COUNTY BOROUGH OF BLACKBURN

APPLICATIONS are invited from Corporate Members of the Institution of Electrical Engineers for the position of Chief Engineering Assistant in the Electricity Undertaking. The conditions of employment will be as prescribed by the National Joint Board and the salary will be in accordance with Grade 2, Class H, at present £800 per annum. An additional sum will be paid to the person appointed at the discretion of the Council, as a temporary measure, in respect of extensions to the power station, which will extend over the next three years. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937.

Applicants must have had a sound training, possess good technical qualifications, and have a wide experience in the construction, maintenance and operation of the various sections of modern supply undertakings operating selected power stations. Applications from engineers who have gained an extensive knowledge in the design and construction of power stations will be specially considered.

Applications, stating full details of training, experience and qualifications, together with copies of three recent testimonials, to be delivered to R. H. Harral, Esq., M.I.E.E., Engineer and Manager, Electricity Offices, Jubilee Street, Blackburn, in an envelope endorsed "Chief Engineering Assistant," by 18th January, 1947.

CHAS. S. ROBINSON, Town Clerk.

4227

BOROUGH OF CONWAY ELECTRICITY DEPT.

Appointment of Mains Assistant Engineer

APPLICATIONS are invited for the above appointment at a salary in accordance with Class A, Grade 6, of the National Joint Board Schedule (£368 rising to £391 per annum).

Applicants must have had a sound technical training and practical experience in the installation, maintenance and operation of E.H.T. and L.T. underground cables and o/h systems and substations, and be able to undertake work of layout, design and planning and the keeping of records and drawings. Candidates must be Graduates I.E.E. The appointment will be subject to the provisions of the Local Government Superannuation Acts, and the successful applicant will be required to pass a medical examination.

Applications, endorsed "Mains Assistant Engineer," stating age, full particulars of experience and qualifications, together with copies of three recent testimonials, must be received by the undersigned not later than Saturday, 11th January, 1947.

ARTHUR L. RALPHES,
Town Clerk's Office, Town Clerk.
Bodlondeb, Conway.
12th December, 1946. 4144

BOROUGH OF HASLINGDEN ELECTRICITY DEPT.

Mains Assistant

APPLICATIONS are invited for the position of Mains Assistant in the Electricity Department at a salary in accordance with Grade I of the Administrative, Professional and Technical Division, National Joint Council's Scale for Local Authorities' Staffs (£330 × £15 to £375 per annum, plus bonus at present £59 10s. per annum).

Candidates must possess the Higher National Electrical Engineering Certificate or equivalent technical qualification, and must have had experience in the laying of 6.6-kV high tension mains, three-phase distribution, and maintenance and operation of static substations. The appointment is subject to the provisions of the Local Government Superannuation Act, 1937. The successful candidate will be required to pass a medical examination by the Council's Medical Officer of Health.

Applications, stating age, whether married or single, giving details of training and experience, and accompanied by copies of three recent testimonials, must be forwarded to the Borough Electrical Engineer, John St., Haslingden, Lancashire, not later than Wednesday, 8th January, 1947.

L. M. BURTON,
Municipal Offices, Haslingden. Town Clerk.
13th December, 1946. 4142

A Senior Electrical Sales Engineer is required for service in Malaya. Applicants should be fully qualified electrical engineers, preferably with steam turbine experience. Reply, giving full details of experience, age, and salary required, to—The Labour Dept., Brush Electrical Engineering Co. Ltd., Loughborough. 4039

CITY OF LEICESTER EDUCATION COMMITTEE

College of Technology—School of Engineering

APPLICATIONS are invited for the full-time post of Lecturer in Electrical Engineering. Candidates should preferably possess an Engineering Degree or Corporate Membership of the Institution of Electrical Engineers. They must have had adequate industrial experience and be capable of teaching electrical engineering subjects up to the standard of Ordinary National Certificate and electrical installation technology up to the standard of the City and Guilds of London Institute's Certificate.

Forms of application, which may be obtained from the Principal of the College, should be returned to him within 21 days of the appearance of this advertisement. Salary in accordance with the new Burnham Scale.

ELFED THOMAS,
Education Dept., Director of Education.
Newarke Street, Leicester.
17th December, 1946. 4160

ALBRIGHT & Wilson Ltd., invite applications for their technical sales staff in the South Eastern area in connection with development of the uses of Dow Corning Silicone products. Applicants should preferably hold a science degree or its equivalent and be between the ages of 23 and 33. Details of experience and qualifications, should be sent to—49 Park lane, London, W.1. 4213

AN exceptional opportunity for all grades of Draughtsmen is provided by the opening of new drawing offices for the Liverpool transformer and switchgear works of The English Electric Co. Ltd. Electrical engineering drawing office experience preferred, but those with good mechanical engineering drawing office experience also required. Basic salary according to experience and ability plus staff war bonus of 29s. 6d. per week single, 32s. 6d. per week married. Security and good prospects to suitable men. Apply—The English Electric Co. Ltd., Queens House, Kingsway, London, W.C.2. 4178

APPLICATIONS are invited for the appointment of experienced Storekeeper to take charge of and reorganise miscellaneous store for a mixed electrical contracting business with staff of 100 and turnover of £200,000 per annum. Several years' similar experience essential. Attractive salary and good conditions await the right man. —Box 4226, c/o The Electrical Review.

APPLICATIONS are invited for the position of Paper Cable Manufacturing Department Manager. Applicants must have received a sound technical training and have had experience of modern methods of paper cable manufacture, up to and including 33 kV. The position offers good prospects and a superannuation scheme is available. All applications will be treated in the strictest confidence. Reply, giving full details of experience, age and education, to the Chief Personnel Officer, Crompton Parkinson Ltd., Electra House, Victoria Embankment, W.C.2, marked "P.M." 4185

ARMATURE Winder and Improver wanted, top rates and good conditions. House or flat available for permanent satisfactory applicant. Apply—Gill & Son Ltd., 46/48, High Street, Brighton, Sussex. 5105

ARMATURE Winders required, also Chargehand or Foreman, also Improvers for fractional motors up to 50 h.p. Standard rates, good prospects.—D.C. Engineering, Sherborne, Dorset. 5096

ARMATURE Winders and Improvers required, A.C. and D.C., top rates, good working conditions.—Electrical Power Repairs (Gillingham) Ltd., Strover Street, Gillingham, Kent. 5065

ARMATURE Winders and Improvers urgently required. Top rates and good conditions.—Box 113, c/o The Electrical Review.

ARMATURE Winders and Improvers urgently required. Top rates and good conditions.—Collins Electrical Ltd., 22, St. Alban's Place, London, N.1. 85

ASSISTANT Electrical Engineer required for development work on specialised contactors and electro mechanical auxiliary equipment. Applications, stating fully, qualifications, experience and salary expected, envelopes endorsed "Assistant Engineer," to—South Wales Switchgear Ltd, Blackwood, Mon. 4140

CHIEF Draughtsman required for progressive position with well-established firm in North-West manufacturing domestic electric appliances, including cookers. Production and design experience of domestic appliances essential. Company's staff have been notified of this vacancy. Write, stating age, salary required and details of experience, to—Box 4076, c/o The Electrical Review.

CLERICAL Assistant required for stores office. Must have good knowledge of electrical material.—London Electrical Co., 92, Blackfriars Road, S.E.1. 104

CABLE Jointers urgently required by large industrial concern operating in Middle East. Applicants for two of these vacancies must be thoroughly experienced in jointing 11,000 volts and 33,000 volts paper insulated, lead covered armoured cables. Age under 35, salary in sterling according to experience but not less than £600/620/640 for a three years' agreement plus generous allowance in local currency, together with free furnished bachelor accommodation, free passages out and home, free medical attention, kit allowance and Provident Fund benefits. Apply, stating age, qualifications, experience, etc. to Dept. F.39. Further vacancies exist for Cable Jointers with experience in jointing on L.C.P.I. armoured cables up to 440 volts. Experience in house service supply mains work essential. For these vacancies candidates, who should be under 40 years of age, will be required to sign an 18 months' agreement at a salary of £50 per month with allowance in local currency. Similar benefits to the above but no membership of Provident Fund. Apply, stating age, qualifications, experience, etc. to—Dept. F.40, Box 4135, c/o The Electrical Review.

COIL Winding Foreman required by the Phœnix Telephone & Electric Works Ltd. at their works at The Hyde, Hendon, London, N.W.9. Must be experienced in all types of coils used in the manufacture of telecommunication equipment. Apply in writing, giving full particulars and salary required. 4194

COMPETENT Installation Electrician required, permanency to suitable tradesman.—Davis & Hadley, Weymouth. 4233

DEPARTMENTAL Manager responsible for purchasing, progressing, stores control and despatching required, by London firm engaged in electronic engineering. Knowledge of electronic engineering and export shipping an asset, but not essential. Must have had previous experience similar duties and in personnel control. Only men resident within daily travel distance Central London considered. Applicants should give details of age, education, experience, and salary required in confidence, to—Box 4212, c/o The Electrical Review.

DESIGNER-Draughtsman, with telecommunication experience, required for work on electronic measuring apparatus. Write, giving details of experience, age and salary required.—L.M.K. Manufacturing Co. Ltd., Harlequin Avenue, Brentford, Middlesex. 4070

DRAUGHTSMAN to train for Development and Publicity Manager to progressive and expanding firm of concrete column makers. Knowledge of street lighting practice an advantage. Must have ideas and capable of working on own initiative. Give experience and salary required to—Box 4179, c/o The Electrical Review.

DRAUGHTSMEN, preferably with telecommunications experience, required by large firm in the Midlands. Maximum salary £350 plus cost of living bonus. Write, giving details of experience, age, and salary required.—Box 11, c/o The Electrical Review.

DRAUGHTSMEN required by switchgear engineers. Experienced in contract work, protective gear diagrams or design. Applications in writing, with full particulars, to—Ferguson, Pailin Ltd., Manchester, 11. 86

ELECTRICAL Assistants (Outdoor). Two required (one for Edinburgh, one for Glasgow) by railway company. Must have Higher National Certificate or equivalent and be fully experienced in installation, operation and maintenance of A.C. and D.C. electric lighting and power equipment, and be able to prepare schemes and estimates for lighting and power installations, including substations, E.H.T. and M.T. equipment. Commencing salary £305 p.a. plus war bonus of £72 16s. p.a. Applicants should give full details, including technical qualifications and practical experience.—Box 4165, c/o The Electrical Review.

ELECTRICAL Engineer required as Personal Assistant to the Chief Engineer of a large industrial organisation operating from the Birmingham area. Applicants must have received technical training up to Higher National Certificate standard and served an apprenticeship with a supply authority or electrical contractor. First-class knowledge of factory installation work and plant is essential. Duties will entail preparation of layouts, specifications, drawings and estimated costs for lighting schemes, power installations, substation layouts, etc., and the supervision of electrical installation work in the various factories controlled by the organisation. A sound knowledge of industrial electrical plant and its application is essential and applicants must possess knowledge of office routine and be able to handle technical correspondence. Applicants should state age, training, qualifications, details of experience and salary required, to—Box 4203, c/o The Electrical Review.

ELECTRICAL Showroom Salesman required for old-established company in South Kensington, age under 45. Must have knowledge of electrical and radio trade. Permanent position. Write, stating age, salary and experience, to—Box 4018, c/o The Electrical Review.

ELECTRICIAN wanted by small contractor for general installation work.—Box 5118, c/o The Electrical Review.

ELECTRICIANS wanted for large factory in Essex, under good conditions, including a 5-day week, good wages paid, in agreement with trade unions. Experienced in factory maintenance, wiring and plant installation, A.C. and D.C.—Box 4012, c/o The Electrical Review.

ENGINEERS and Draughtsmen are invited to apply to a large electrical engineering firm in the Midlands which has vacancies in the switchgear department for Technical Sales, Contract, Costing and Design Engineers; also experienced Technical Engineers capable of handling large projects for generation, transmission and distribution. Vacancies also exist for Draughtsmen for circuit diagram and general work.—Box 69, c/o The Electrical Review.

ENGINEERS with experience of design of electronic test equipment required by large London firm. Previous experience in the design of test equipment for radio or radio components industry is essential. Reply, stating full details of technical qualifications, experience, age, and salary required, to—Box 4206, c/o The Electrical Review.

ESTIMATOR and Draughtsman required, with good knowledge of installation work. Write, giving full particulars, to—Troughton & Young Ltd., Imperial Court, Basil Street, Knightsbridge, S.W.3. 5071

JOURNEYMAN Electrician for South-East London. First class man only for factory and private house work.—Box 5112, c/o The Electrical Review.

JUNIOR Mains Assistant required, preferably with some experience of the erection of high and low tension lines in rural areas. Commencing salary £6 per week with good prospects of advancement. Applications, with copy testimonials, to—The Boston & District Electric Supply Co. Ltd., Besco House, Boston, Lincs. 4084

LADY Shorthand Typist required in electrical contractors' office in the City. Please apply, giving details as to experience, salary required, to—Box 4061, c/o The Electrical Review.

LARGE iron and steel group operating blast furnaces, coke ovens, rolling mills, steel plant, etc., invite applications for the position of Electrical Engineer. Applicants should preferably have had an extensive experience in the design, layout and installation of H.T. and L.T. gear, A.C. and D.C. distribution systems, rolling mill drives, and auxiliary electrical equipment associated with a large iron and steel works. The selected applicant will be required to take charge under the Chief Engineer of the general design, layout and installation of all the electrical gear included in a large modernisation scheme which the company is carrying through. Applicants should submit full details of education, experience, appointments held, age, salaries earned, etc. The salary range will be dependent on experience and qualifications, but will be in the order of £750/£900. The position is permanent and subject to the conditions of the Company's Pension Scheme. Applications, which will be treated as confidential, should be submitted to—Box 4231, c/o The Electrical Review.

LARGE London firm requires Engineer to take charge of electrical standards laboratory. Previous experience in A.C. and D.C. bridge techniques meter standardising and frequency of measurement is essential. Reply, stating full details of technical qualifications, experience, age and salary required, to—Box 4205, c/o The Electrical Review.

LARGE manufacturing organisation in North England has openings for Contracts Engineers with experience in estimating for electrical switchgear. Applications should state age, experience, present employment and salary required. Successful applicants will have opportunity for overseas post after satisfactory performance.—Box 4166, c/o The Electrical Review.

LEADING Draughtsman to take charge of production of schedules and drawings of centrifugal pumps and electrical motors. Apply in writing to—Chance Brothers Limited, Smethwick. 4232

LONDON electrical wholesalers require Representative with car to cover London area and outskirts. Good commission paid with small car allowance. Write, stating experience, to—Box 4005, c/o The Electrical Review.

MANAGER or Manageress of good appearance and personality required for high-class electrical and radio retail and art goods business, 30 miles from London. Must be thoroughly capable and able to take full control. Write with particulars, stating age, experience and salary required.—Box 115, c/o The Electrical Review.

OLD established firm of electrical contractors, headquarters Glasgow, require first-class Estimator, accustomed to estimating for lighting and power contracts. Good salary to suitable person. Apply, giving particulars, to—Box 4209, c/o The Electrical Review.

MERSEYSIDE firm of electrical contractors require first-class Estimating/Supervising Engineer. Must be capable of preparing complete schemes, taking off quantities, costing and supervising all types of electrical installation work. Give full details of age, training, qualifications and experience. State salary required and send copies of references to—Box 4031, c/o The Electrical Review.

PERSONAL Secretary (single woman), aged 30-40, to managing director of well-known electrical installation contractors. Good personality, capable organiser and good shorthand-typist. Write full details of experience, age and salary required to—Box 4201, c/o The Electrical Review.

PRODUCTION Development Engineers required by a large firm in Essex, engaged on the manufacture of radio and allied equipment. Applicants must have sound technical education, practical experience of production planning, design of tools and fixtures, time and motion study, and estimating. Applicants should write, stating age, technical qualifications, experience and salary required, to—Box 4159, c/o The Electrical Review.

REPRESENTATIVE required, Lincolnshire area, for firm of electrical engineers. Preference to car driver with electrical knowledge. Apply by letter only—R. J. Kemp & Co. Ltd., Ashby Road, Coalville. 5116

REQUIRED, Assistant Test Engineer, electrical plant maintenance, higher national certificate standard. Commencing salary in accordance with N.J.B. schedule, Grade 11A/1, Class "M" at present £333 per annum. Apply in writing, with details of training and practical experience—Superintending Engineer, London Power Company Ltd., Battersea Generating Station, Kirtling Street, Battersea, S.W.8. 4207

ROYAL Air Force. There are still several hundred vacancies for Short Service Officers in the recently formed Education Branch. Candidates should be between 23 and 31 and should have a university degree in Mathematics, physics or engineering. A man age 25 may draw pay at £310, £347 or £420 a year on entry, according to qualifications and experience. In addition to pay, single men receive free furnished accommodation and married men receive married allowance of £228; in both cases rations are provided in kind or a ration allowance of £57 a year paid in lieu. A gratuity is payable on completion of 5 years' service. This will ultimately be £500, but for officers appointed until further notice it will be £562 10s. Gratuity will be reduced for men in contributory service for civil teacher's superannuation by the amount of the superannuation contributions, which will be paid by the Air Ministry. Opportunities will arise for appointment to permanent commissions. Full details and application forms from Air Ministry (A.R.1), Kingsway, London, W.C.2. 3995

SENIOR Tool Draughtsman, preferably experienced in moulding tools, able to work entirely on own initiative. Reply, stating age and salary required, to—Box 4171, c/o The Electrical Review.

SEVERAL first class Electricians wanted in East Midlands district, fully conversant with industrial installations and all wiring systems. Permanent employment for suitable applicants.—Box 4130, c/o The Electrical Review.

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TECHNICAL Representative required by firm of Wholesale Electrical Suppliers for South London area. Experienced individual with industrial and contracting connections preferred. Must possess own car. Salary, commission and expenses to—Box 4215, c/o The Electrical Review.

TEST and Calibration Engineer with telecommunication experience. Must be capable of diagnosis and trouble shooting electronic measuring apparatus. Write, giving details of experience, age and salary required.—L.M.K. Manufacturing Co. Ltd., Harlequin Avenue, Brentford, Middlesex. 4071

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TELEPHONE Engineers. Required for Hongkong four Assistant Engineers for public telephone service. Two with practical experience of underground cables and ducts and lay-out of development schemes and two with subscribers' automatic and C.B. apparatus and line construction experience. For terms of engagement and forms of application apply—Secretary, 11, Money Hill Parade, Rickmansworth, Herts. 4223

TRADE Counter Assistant required. Good knowledge of electrical material essential.—London Electrical Co., 92, Blackfriars Road, S.E.1. 125

URGENTLY required for service in the Middle East, Electrical Engineer Instructor. Applicants should have served a five-year apprenticeship and have had extensive experience in installation and maintenance work. Experience in armature winding and all types of switchgear an advantage. Must be able and willing to instruct 40-60 apprentices in the classroom and A.T. shop. Should possess Ordinary or Higher National Certificate in Electrical Engineering and have preferably instructional experience. Age 25-35. Salary in sterling not less than £540 p.a. plus a generous allowance in local currency. Free furnished bachelor accommodation (no married accommodation available), free passages out and home, kit allowance. Provident Fund benefits, free medical attention. Applicants must be of full British parentage and should write stating age, qualifications and experience to—Dept. F.44, Box 4148, c/o The Electrical Review.

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YOUNG Electrical Engineer, B.Sc. honours, required for development laboratory of large electrical concern, S.W. London area. Some experience electronics essential. Apply in writing, stating age, experience and salary required, to—Personnel Manager, 45, Nightingale Lane, S.W.2. 4184

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TECHNICAL Engineer, A.M.I.E.E. (42), extensive experience electricity supply routine, including consumers' and mains work, specialised knowledge tariffs, metering, relays, general testing, including h.v. work, conversant some aspects generation, seeks change, preferably North or Midlands. Mod. salary.—Box 5091, c/o The Electrical Review.

AUCTION NOTICES

G.R.

BY ORDER OF THE MINISTER OF SUPPLY

On WEDNESDAY and THURSDAY, 15th and 16th JANUARY, 1947, commencing at 11 a.m. and 2 p.m. each day

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THE Corporation have for disposal one Petrol-driven Generator Set, the engine and generator being on a common bedplate. Output 230 volts D.C., loading 7 kW. The set is arranged for manual starting and is complete with switchboard, cooler tank, petrol tank and silencer. The set may be inspected by arrangement with my department.

Tenders in a plain sealed envelope endorsed "Tender for Generator Set" are to be posted so as to reach me not later than 9 a.m. on Monday, 20th January, 1947. The Corporation do not bind themselves to accept the highest or any tender.—Town Clerk's Office, Middlesbrough. 4177

A. Cooksley & Co. Ltd. offer large selection of used Electric Motors, A.C. and D.C. Write—21/25, Tabernacle Street, London, E.C.2 (Monarch 3357/58). 46

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A.C. Motors, 1/75th h.p. to 5 h.p., all voltages. Also D.C.—The Johnson Engineering Co., 319, Kennington Road, London, S.E.11. Telephones, Reliance 1412/3. 57

AUTO Bulbs. Side and Tail and Head Bulbs, prompt delivery. Wholesalers send purchase tax number for samples and price.—J. N. Somers Ltd., 10/12, Cricklewood Broadway, London, N.W.2 (Tel. GLA. 3005.) 5033

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BATTERY Chargers for home and export. 4 models. 2-6-12 v., 1, 2 or 4 amp. D.C., any mains voltage. Generous trade terms. Write for catalogue.—The Banner Electric Co. Ltd., Hoddesdon, Herts. Tel.: Hoddesdon 2659. 97

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B.T.A. A comprehensive service is now available for all classes of tools and equipment for the accumulator trade. — B.T.A., 246, Cavendish Road, London, S.W.12. Tel.: Balham 6691/2. 10

CANDLE Lamps, limited supply available, 230 volts, olive and twisted, 40 watts S.B.C. caps.—Box 4169, c/o The Electrical Review.

CHOKES, suitable for 80-w. fluorescent tubes, reputable manufacture, very reliable, totally enclosed, compound filled, complete with fixing brackets. Available tapped 200/250 v. or untapped 220/230 v., 50 cycles. Ex stock. —Hardman & Company Ltd., The Baum, Rochdale, Lancs (Tel. 4151). 4089

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DIESEL Alternator Sets, consisting of Paxman Ricardo vertical engines, radiator-cooled, direct coupled to 35-kVA Mawdsley Alternators, 400/3/50, or 230/1/50, self-contained modern units, complete with fuel tank, silencer, etc. Three available.—Stewart Thomson & Sons (L'pool) Ltd., Fort Road, Seaforth, Liverpool 21 (Bootle 2697-8) or Dacre House, Victoria Street, Westminster, London, S.W.1 (Abbey 4017). 55

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REBUILT Motors and Generators. Long deliveries can often be avoided by purchasing rebuilt secondhand plant. We can redesign or replace surplus plant of any size. Send us your enquiries. Over 1,000 ratings actually in stock here.—Dynamo & Motor Repairs Ltd., Wembley Park, Middlesex (Telephone, Wembley 3121, 4 lines); also at Phœnix Works, Belgrave Terrace, Soho Road, Handsworth, Birmingham (Telephone, Northern 0898). 2

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ROTARY Converters, 200-kW, 6,600/3/50 input, 230 volts, 2-wire D.C. output, complete with Transformer and switchgear, seen running in Liverpool. 2,000-kW, 6,600/3/50 input, 418/462 volts, three-wire D.C. output, complete with transformers, starting panels, D.C. machine panels. First-class condition. Two sets available.—Stewart Thomson & Sons (Liverpool) Ltd., Fort Road, Seaforth, Liverpool, 21 (Bootle 2697); or Dacre House, Victoria Street, London, S.W.1 (Abbey 4017). 72

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

STEAM Generating Plant. The following is a selection of sets available in our comprehensive stock: 2,000-kW B.T.H. Turbo-Alternator, 6,600/3/50, 180/210-lbs. pressure, complete with surface condenser and all auxiliaries, seen running. 1,250-kW Brush Ljungstrom Turbo-Alternator, 400/3/50, 200 lbs. pressure, complete with surface condenser and all auxiliaries, seen running. 750-kW Adamson/Mather & Platt High-pressure Pass-out Turbo-Generator, 200-lbs. initial steam pressure, passing out 25,000 lbs. per hour at 80-lbs. pressure, 500 volts, three-wire D.C., with balancer, complete with surface condenser and all auxiliaries. First-class condition. Full particulars from—Stewart Thomson & Sons (Liverpool) Ltd., Fort Road, Seaforth, Liverpool, 21 (Bootle 2697); or Dacre House, Victoria Street, London, S.W.1 (Abbey 4017). 98

SUPERIOR Type Builders' Ladders now in production; also Steps, Trestles and Extension Ladders. Phone—Shaftesbury Ladders Ltd., 453, Katherine Road, E.7, Grangewood 3363/4. 15

SURPLUS Stock: 600 1-kW, 250-v. "Universal" Pencil Elements with extending rods and clips in cartons. To clear at 6s. 11d. each. Cash with order. Minimum lots 1 doz.—Messrs. Brady (Nelson) Ltd., Water Street, Nelson, Lancs. 4200

SW/FUSES 15a., good sec.-hand. Quantity transf. 50 V.A. output. E.S. holders in 4" round moulded box. Transf. 230 v.-230 v.-3½ amps. 3 gr. 3½ sq. blocks. 1 doz. 2 kW. immersion water heaters. Transf. & rect. 230 v.-12 v.-40 a. 400 15-a. Slydlok fuses.—Robert Ford, 126, Cottingham Road, Hull. 5128

SWITCH Blocks, walnut finish, superior pattern, fully recessed, 6" x 3" x 1" 120/- grs., 3" x 3" x 1" 78/- grs., 3½" x 3½" x 1" 80/- grs., 3" x 3" x ½" 67/- grs., 3½" x 3½" x ½" 69/- grs. Cash with order, carr. fwd.—Davell Service Co. 138b, Stoke Newington Rd., London, N.16. 5121

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THERMOSTATS, Unity, variable, 50/70° F., secondhand, in good order, ex stock, price 40s.—B. & S. Electrical Contractors Ltd., 1, Bridge Street, Guildford, Surrey. 4217

TRANSFORMER "Welders" to BSS/171/1936 4 kVA, 1-phase, 50, type AN, 400/230-0-90 volts, excellent condition, £50, carriage paid. Apply—J. Thorn & Sons Ltd., Brampton Road, Bexleyheath, Kent (Bexleyheath 305). 122

UNUSED D.C. Motors for sale, mostly with starters. Fourteen 21 h.p., 220 v.; two 22 h.p., 220 v.; six 26 h.p., 220 v.; one 31.25 h.p., 220 v.; six 21 h.p., 105 v.; one 22 h.p., 110 v., and many others.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 4190

VACUUM Cleaner Parts. Hoses, braided, all diameters. Commutators, bearings, fans, carbon brushes, driving belts, brushes, attachments and fittings for all makes. Wholesale only. Send for price list.—Vacuum Cleaner & Electrical Supplies Ltd., 543, Moseley Rd., B'ham, 12. 80

VACUUM Cleaner Spares and Accessories. Bags, bearings, belts, brushes, fans, switches, etc. Repairs, rewinding, rebristling. Send for price list.—Reliance Vacuum Cleaner Service, 152-154, Broadway, Bexleyheath, Kent. 93

VOLTMETERS, total quantity available 200. New, 6", 50 cy., 0-300 v., even scale. Govt. surplus. Offered subject to remng. unsold. 25s. each.—113, Southwark Street, S.E.1 (TEM. 3866). 4158

WEE Meggers, 500 v., in case, £12 5s. 6d.; Record 500-v. Test Set, £11. C.O.D. (new).—Robins, 222, West End Lane, N.W.6 (HAM. 0879). 82

2 Vent-axia Fans, 9" A.C.; 1 Crompton Parkinson 3-phase ½-h.p. Motor.—Keenan, 7, Parkmount, Bangor, Co. Down. 4234

5-kW and 2½-kW, 230/250-volt D.C. Generating Sets, complete with 4-cylinder, 10-h.p. Austin Engines, with petrol tanks, radiators, fans and switchboards. Large number available.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 103

100 Unused Flat Top Bogie Trolleys, oak platforms, 5' × 3' × 15½" high, oak bearers, swivelling bogie with 36" drawbar; with 4 iron wheels, 11" dia., £7 10s. each; with 4 solid rubber-tyred wheels, 12" dia., £10, delivered. Also 100 Unused Samson Type Trolleys for machinery handling, oak, 22" × 17" × 5½" high, 4 iron wheels 3" dia. and central wheel 3½" dia., 70s. each, delivered. Inspection works, 40, Cuba Street, Millwall (East 3958).—Reed Brothers (Engineering) Ltd., Bevis Marks House, London, E.C.3. 3752

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500 Electric Motors, Dynamos, Transformers, Converters, etc., etc., at low prices.—S. C. Bilsby, A.M.I.C.E., A.M.I.E.E., Crosswells Road, Langley, near Birmingham. Phone, Broadwell 1359. 21

5,000 good strong Crates, inside measurements 29" × 9½" × 9¾". ½" thick, battened all round, at 1s. 9d. each, ex works.—K. Goldser & Sons, 14a, Rectory Square, London, E.1 (Tel. Stepney Green 2550). 75

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A.C. and D.C. Motors and Transformers urgently wanted. Burnt-out machines acceptable.—Max Electric Co. Ltd., 190, Thornton Rd., Croydon. 12

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[*Continued on page* 72]

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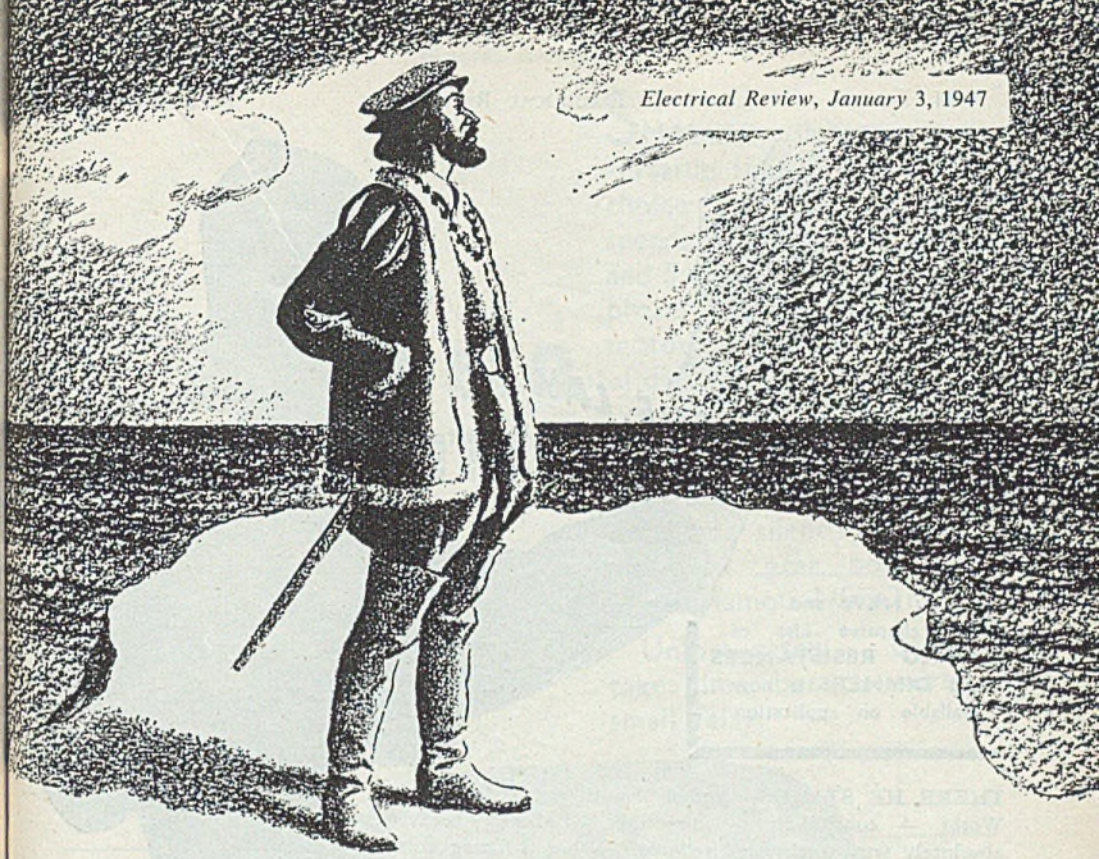

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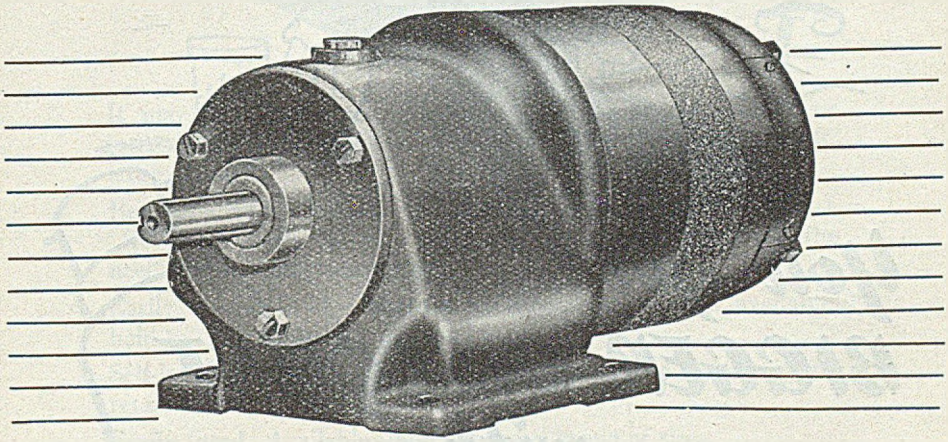

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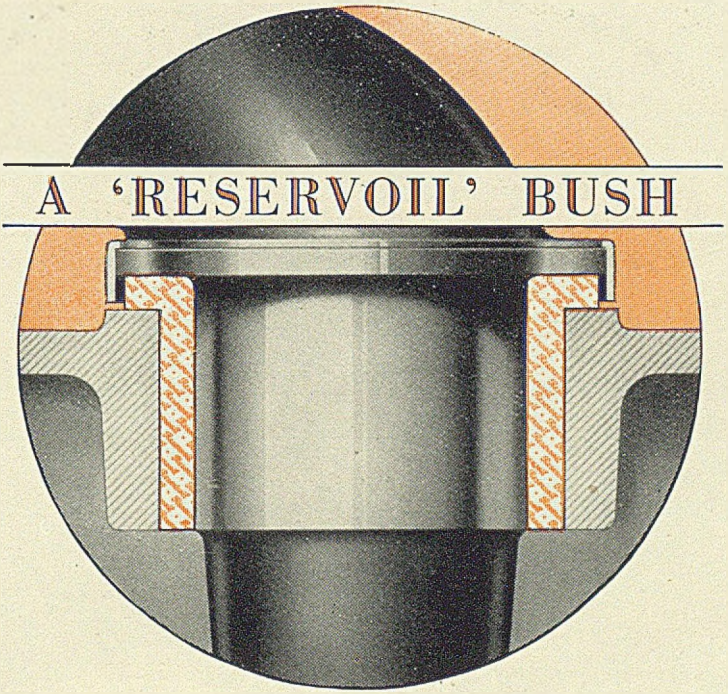

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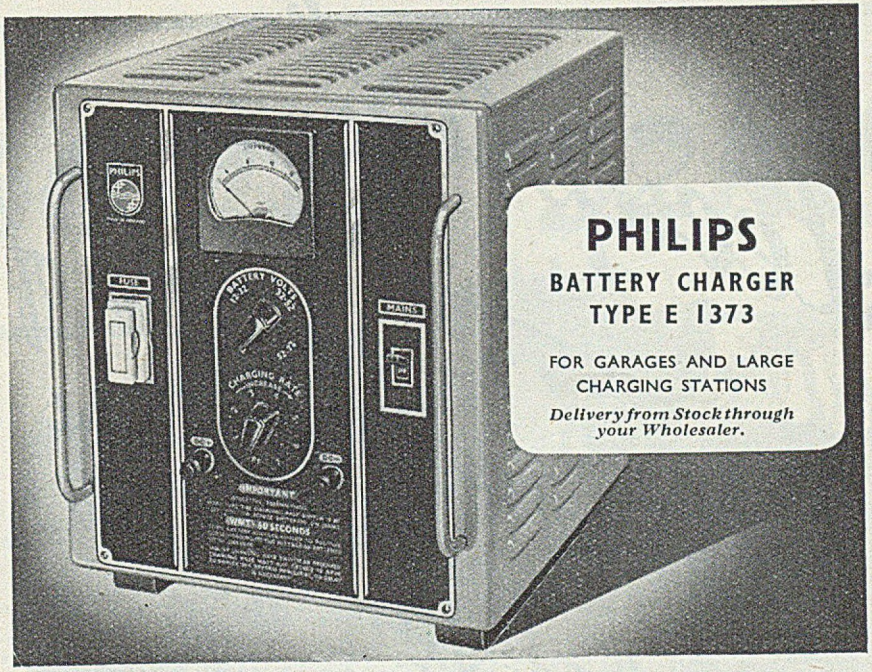

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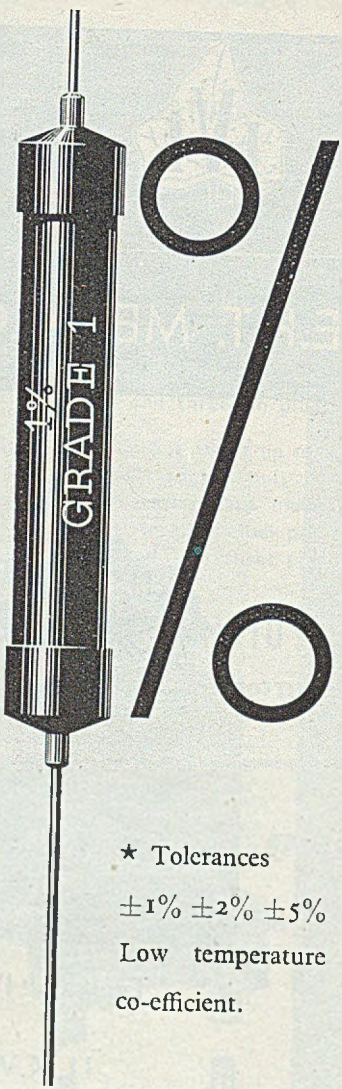

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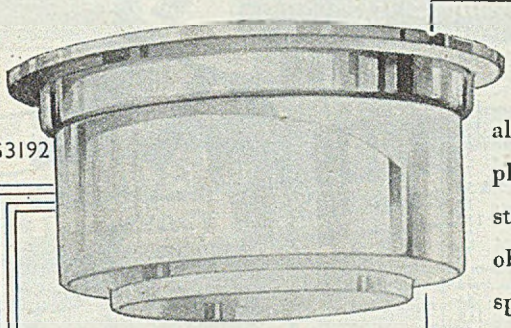
Simple Ceiling Fittings

FOR DOMESTIC AND GENERAL PURPOSES LIGHTING

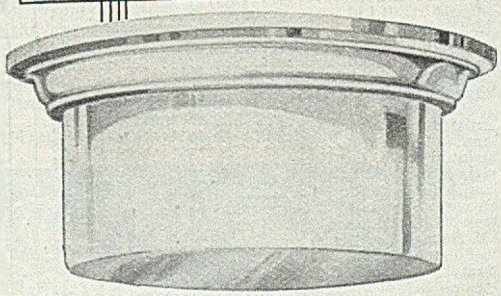


G3192

AVAILABLE ex-stock in alternative finishes of chromium plated, coinage bronze or ivory stoved enamel, British-made obscured flint lipped glass dishes, special single screw fixing.

These fittings are suitable for 60 or 100 watt lamp. Stove enamelled reflector interior. Glass 10" dia., overall dia. 12½", overall depth 5¼"

Fittings complete with Lampholders. Arranged for Standard 2" Centres Fixing.



G3191

NOTE: **Stepped or Flat-bottomed Glass, as illustrated, can be supplied to either model at same price and is available in Champagne or Peach Colour at extra cost.**

GEORGE
FORREST
& SON LTD.

OSBORNE RD., ACTON, LONDON, W.3

Designers and Manufacturers of all types of Tungsten and Fluorescent Decorative Lighting Fittings.

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ESTABLISHED 1780

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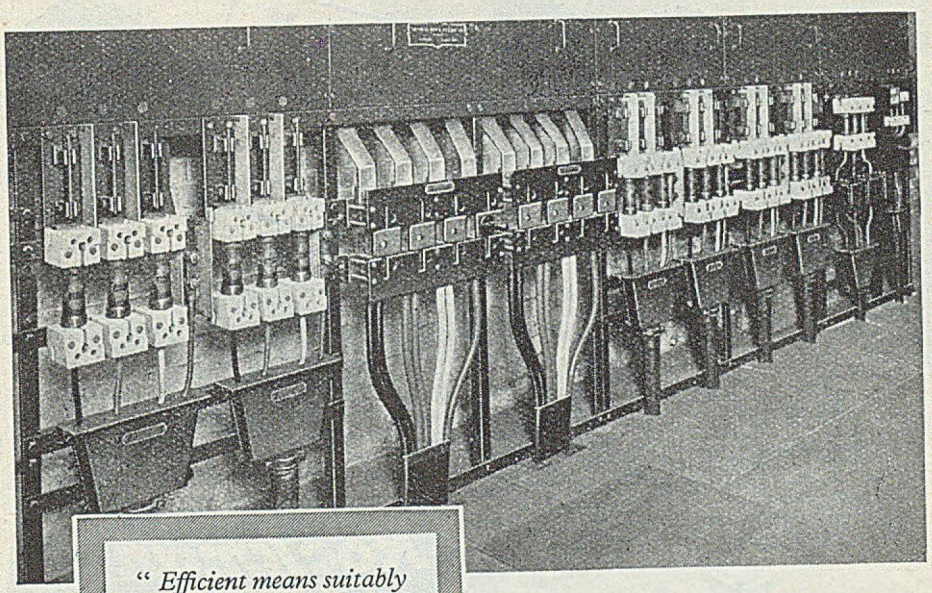

" Efficient means suitably located shall be provided for protecting against excess current every part of a system."
—*vide* Electricity Regulations.

AEROFLEX
Fluvent
HOPE'S PATENTS

AEROFLEX-FLUVENT SWITCH & FUSE GEAR

Efficient means are embodied by the modern Aeroflex high-breaking capacity, rewireable cartridge fuse, which combines the property of opening circuit on comparatively low overloads if continuously maintained, with time-lag without ageing under operational peaks of a permissible character, at the same time offering ample breaking capacity to meet all requirements.

Suitable location consists in grouping the fuses in safe and properly designed distribution boards, so that each cable and conductor is fused at the origin where it is supplied from another of larger capacity, and in providing that each group can be isolated at will by adequate switchgear, for inspection, renewal or extension.

These requirements are met by installing Aeroflex-Fluvent switch and fuse gear, the product of continued experience and contact with practical conditions of service.

For Thermal Capacity

For Breaking Capacity

The illustration shows a sub-station type of switch and fuse board suitable for use in guarded areas. Iron clad interlocked switchgear is provided for general distribution in the open factory.

PARMITER HOPE & SUGDEN LIMITED

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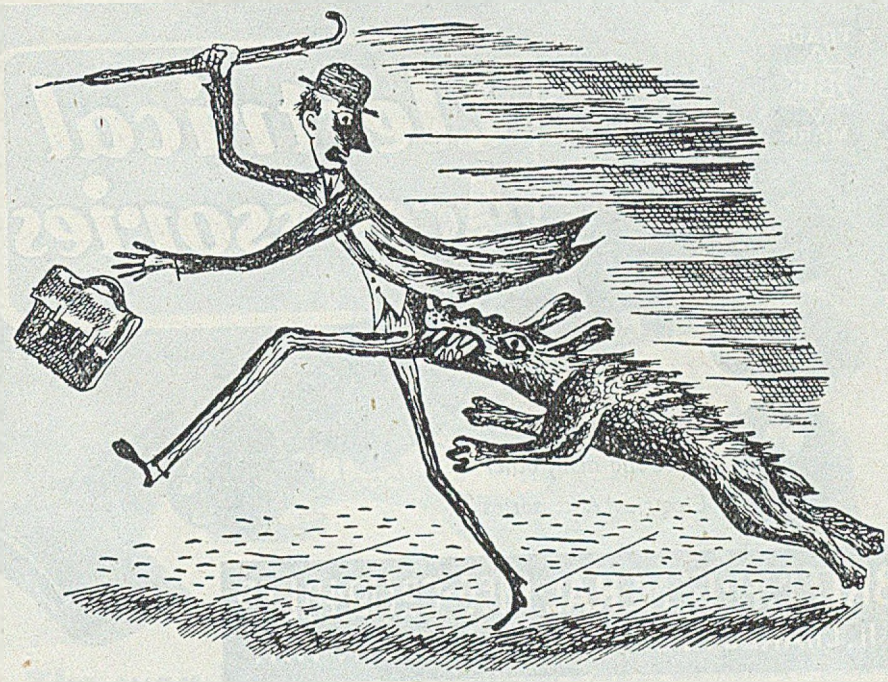
d.m. PH. 5



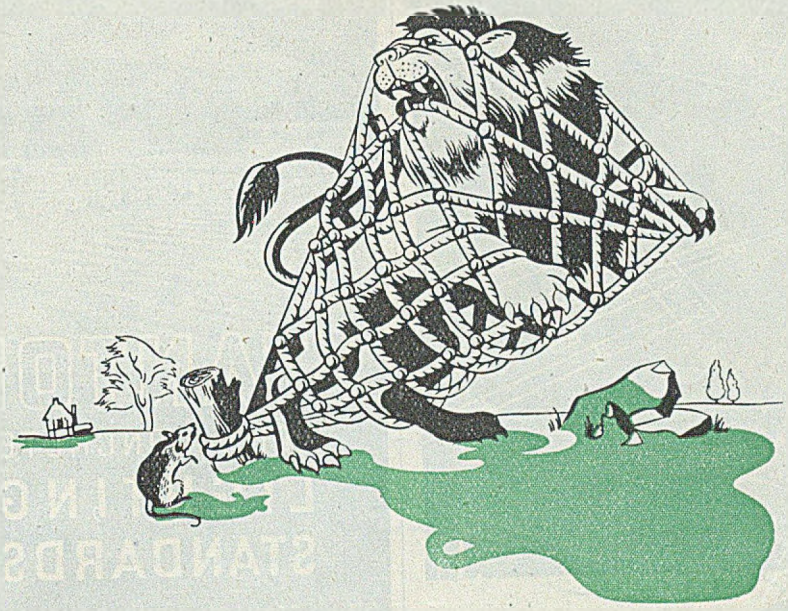
Gets its teeth into it!

The "special cutting teeth" of the new SIMPLEX Terra-Grip screw score right through the enamel, biting deeply into the steel and giving perfect continuity, and proof against vibration. A Terra-Grip junction between conduit and fitting can be installed in a few seconds and official tests have shown that with a single screw the joint will withstand a direct pull equal to 500 lbs. weight without the slightest signs of loosening

THE TERRA-GRIP CONDUIT WIRING SYSTEM

SIMPLEX

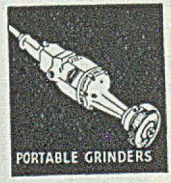
MADE BY SIMPLEX ELECTRIC CO. LTD. OLDBURY, BIRMINGHAM



The way is open . . . **Hearing a cry in the woods, a mouse came running and found a lion entangled in a net. Some days before she had fallen under the paw of this very lion, who had generously let her go. She therefore gnawed through the threads and delivered her preserver.**

In industry, the biggest undertakings often find that an item as small as a portable electric tool can disentangle them from production problems. For just this reason the Black & Decker range plays an important part in the engineering industry and allied trades; handling a host of routine operations with speed and flexibility, they open the way to unimpeded output. Write for particulars of the Black & Decker tools, including drills, portable grinders, bench grinders, screwdrivers, sanders and the 'Holesaw'

Obtainable only from B & D Distributors



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