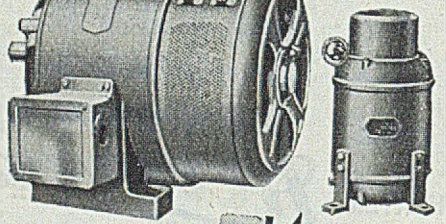
ELECTRICAL REVIEW

VOL. CXLI DECEMBER 19, 1947 NO. 3656

FOUNDED 1872 NINEPENCE WEEKLY

TO HARNESS AND CONTROL ELECTRIC POWER -



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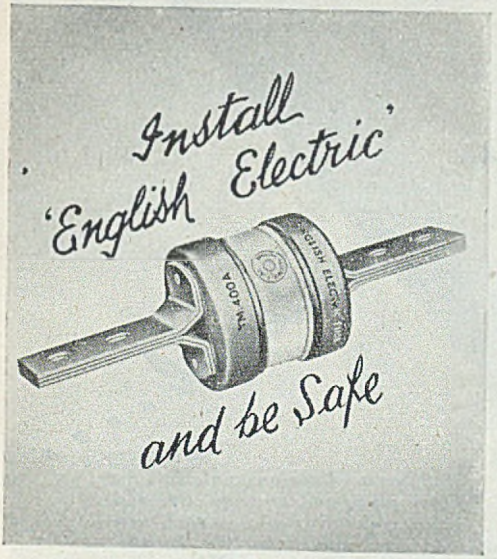

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251	200	TF 200	125 to 200 Amps.
252	300	TKF 300	250 to 300 Amps.
629	400	TM 400	350 to 400 Amps.
354	500	TTM 500	450 to 500 Amps.
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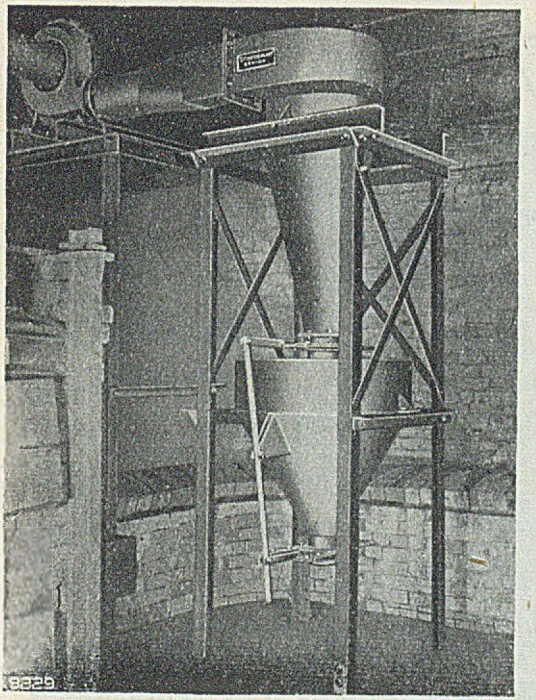

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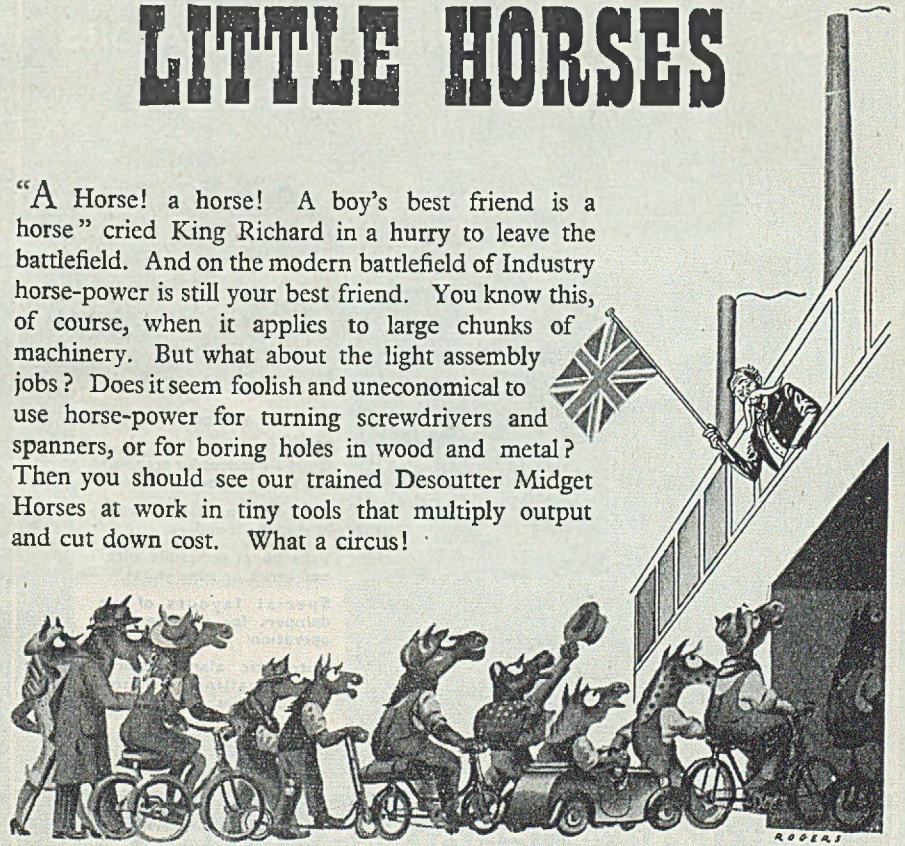

DESOUTTER

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CARBON: AN ENGINEERS' MATERIAL

UNTIL 'MORGANITE' CARBON WAS TRIED for this part, no other material had given satisfaction, for the qualities demanded were a rare combination of those listed on the right, and not to be found in other materials commercially available.

Carbon solved the problem, as it may solve some of yours. May we suggest that you send us particulars of any difficult duties which are not being met in an efficient or economic manner with your present materials.

It would be of assistance if you would send this page to us, ticking on the list the properties required to meet the conditions, and — if you care to—a print of the troublesome part.

KINDLY *tick your requirements on this abridged list of attributes.*

PHYSICAL.
RESISTANCE TO:—heat: thermal shock: acids: corrosive salts: caustic alkalis.
IMPERVIOUS:—yes, no.
THERMAL CONDUCTIVITY:—high: low.
RETENTION AT HIGH TEMPERATURE OF:—shape: strength.
ABSENCE OF:— odour: taste.

ELECTRICAL.
CONDUCTIVITY:— high: low.
PRESSURE SENSITIVITY: contact resistance varied by mechanical pressure.

MECHANICAL.
BEARING QUALITIES:—unlubricated: lubricated with water: strong chemicals (state which).
FRICTIONAL COEFFICIENT:—high: low.
CHIEF CONSIDERATION:—quietness or load capacity.
TOLERANCES: . . . . . .

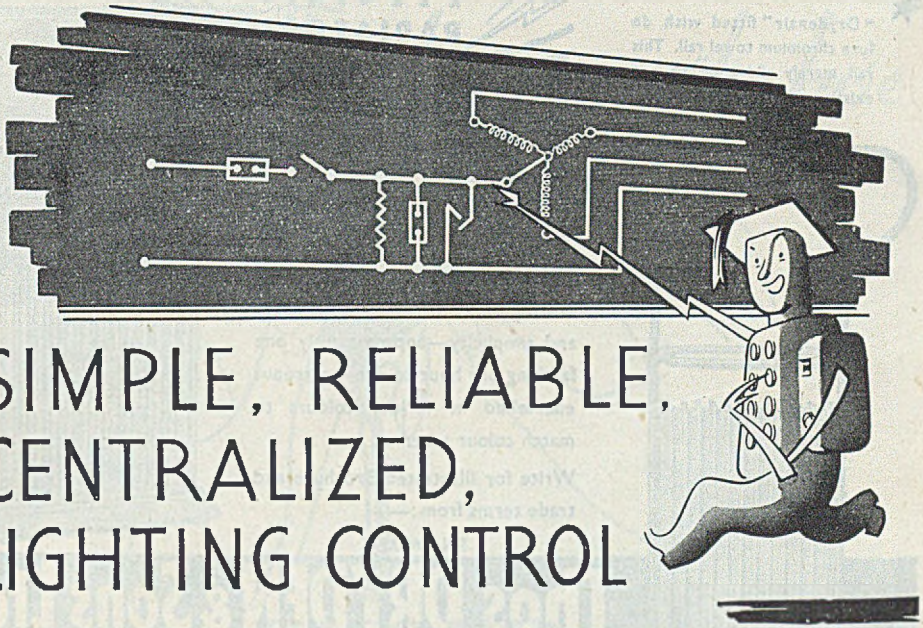
GENERAL.
Qualities include high thermal radiation, low reversible coefficient of expansion, absence of wetting by molten glass or metal, absence of seizure, and non-melting at any temperature.

Morganite products include carbon-pile resistors, all-carbon dashpots, welding rods and blocks, trolley-bus and crane current collectors.

In the boiler house, carbon solves the chain-grate bearing problem, being run quite 'dry' and with a considerable resistance to high temperature and abrasive conditions.

A **MORGAN** product

THE MORGAN CRUCIBLE COMPANY, LTD., LONDON, S.W.11



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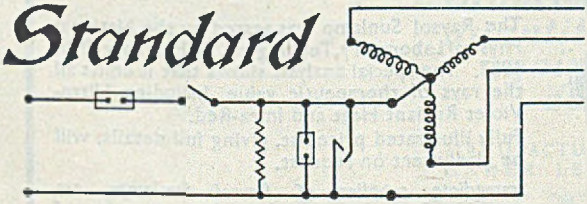
Yes—it's as simple as that, and by the way, D.C. Bias needs no precautions in order to prevent it from interfering with neighbouring networks—it goes where you route it, and nowhere else.



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Standard Telephones and Cables Limited

(Remote Control Section)

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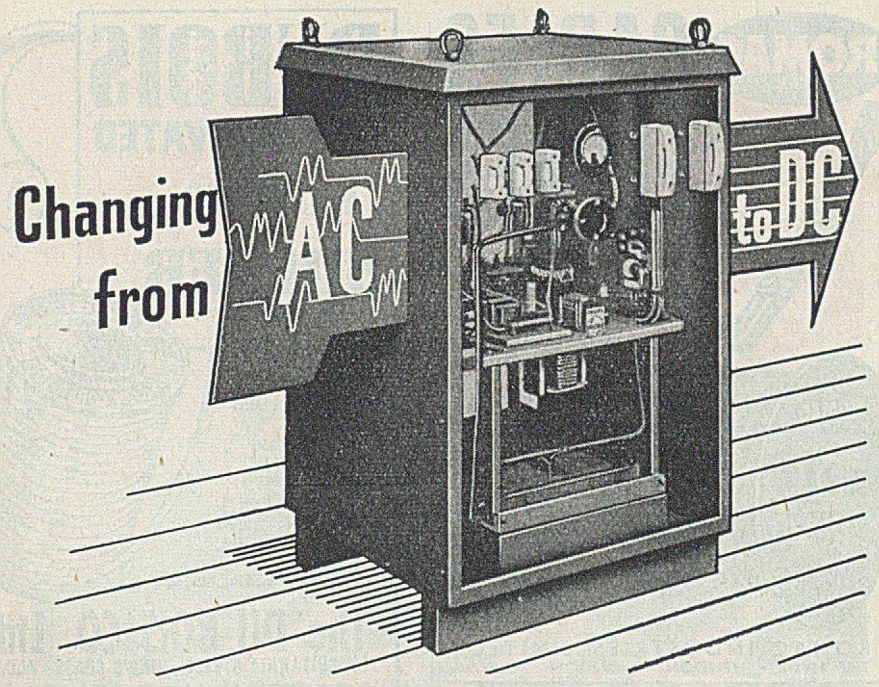
Branches in London and Manchester.



Additional or alternative electrical equipment these days is in very short supply.

Where consumers find it essential to retain their D.C. machines the installation of a Philips Mercury Vapour Rectifier will provide a quick and ready answer to their conversion problems. Illustrated is a typical 25 kilowatt, 230 volt rectifier suitable for this purpose. These efficient Rectifiers are notable for their low initial cost, low current consumption, small dimensions and above all, reliability.

Send for full details to the address below

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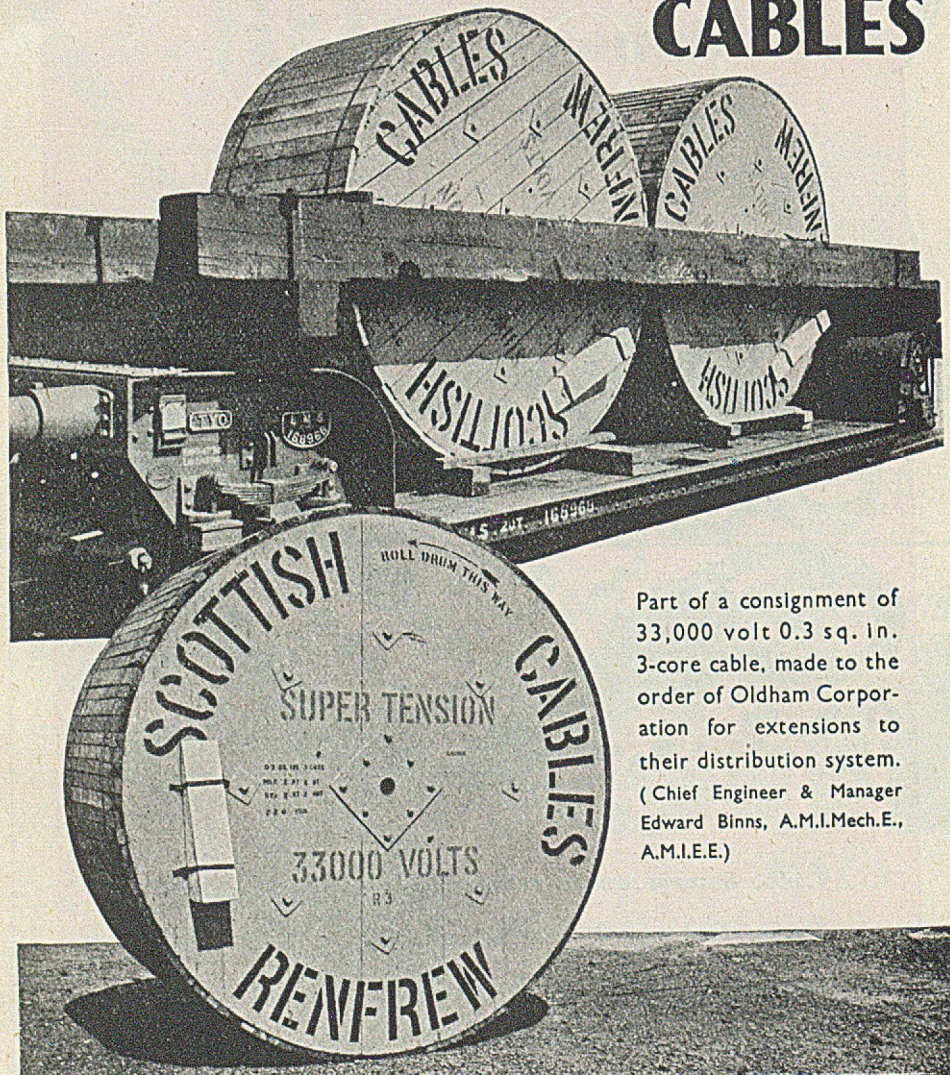

Part of a consignment of 33,000 volt 0.3 sq. in. 3-core cable, made to the order of Oldham Corporation for extensions to their distribution system. (Chief Engineer & Manager Edward Binns, A.M.I.Mech.E., A.M.I.E.E.)

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REGISTERED TRADE MARK

Please call upon us to help you solve any Resistance problem.

Resistances

ARMS OF THE OHM'S LAW

May we quote you for any of the following :—

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

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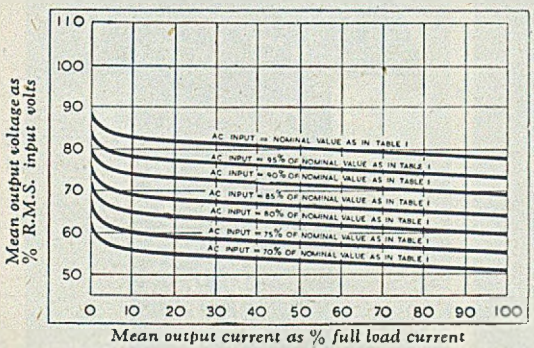
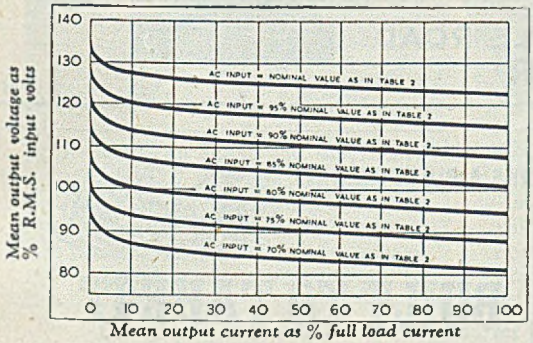
for resistive and inductive loads



Voltage regulation curve of a single-phase rectifier

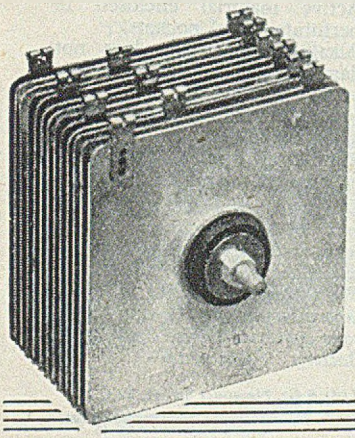


Voltage regulation curve of a three-phase rectifier

OUTPUTS UP TO 6 kW

A range of Westalite rectifiers, with outputs from 12 V, 0·07 A, up to 550 V, 10 A, is available for industrial use. Single-phase rectifiers may be used for outputs up to 1kW and three-phase units when the required output is 3 kW or more. When connected direct to the mains, the D.C. output voltage is about 75% of the R.M.S. input voltage, or about 120% of the R.M.S. input line voltage on a three-phase system.

The voltage regulation curves show that the rectifiers deliver a practically constant voltage down to one-fifth full load, the voltage scale showing the mean value of output voltage expressed as a percentage of R.M.S. input voltage, and the current scale a percentage of the maximum output current.



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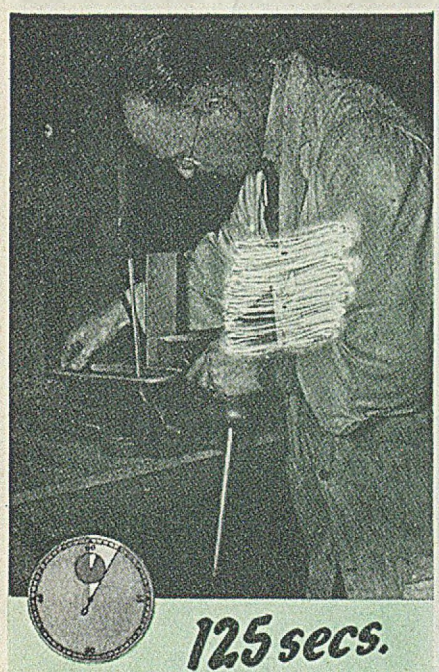
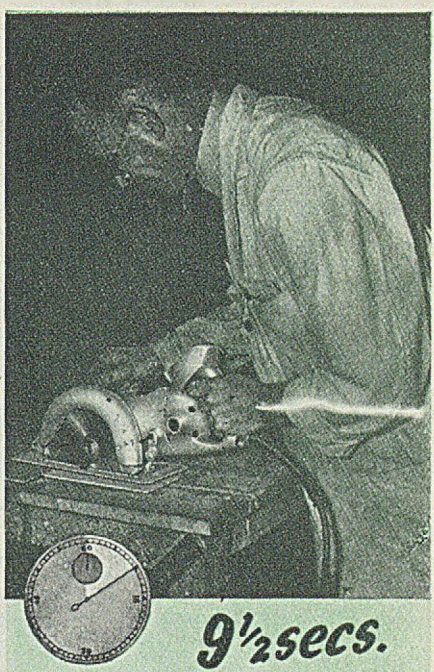


125 secs.

The test is an 8" saw cut in 1/8" hard duralumin. Tell-tale light on our Research Engineer's wrist records the effort needed for the hack saw to make its slow, laborious progress. Time taken, 125 seconds.



9½ secs.

Continuing the test, he makes another 8" cut in the same material —but uses a B & D 'Ripsnorter' Saw with appropriate blade for cutting non-ferrous metals. Movement is fast, even, effortless; time, 9½ secs.

Everybody knows a B & D 'Ripsnorter' saves time and energy by comparison with a hand saw; this 'Time and Motion' study, made by our Research Department, photographs the actual *movement*— shows just how vast the saving is.

Thirteen times faster than hand sawing—ten times in the case of timber— is the 'Ripsnorter's' performance on test. In practice the contrast is even greater; fatigue element increases with every cut. 'Ripsnorters' cut sheet metals, cast iron piping, corrugated iron, sheet asbestos, etc.

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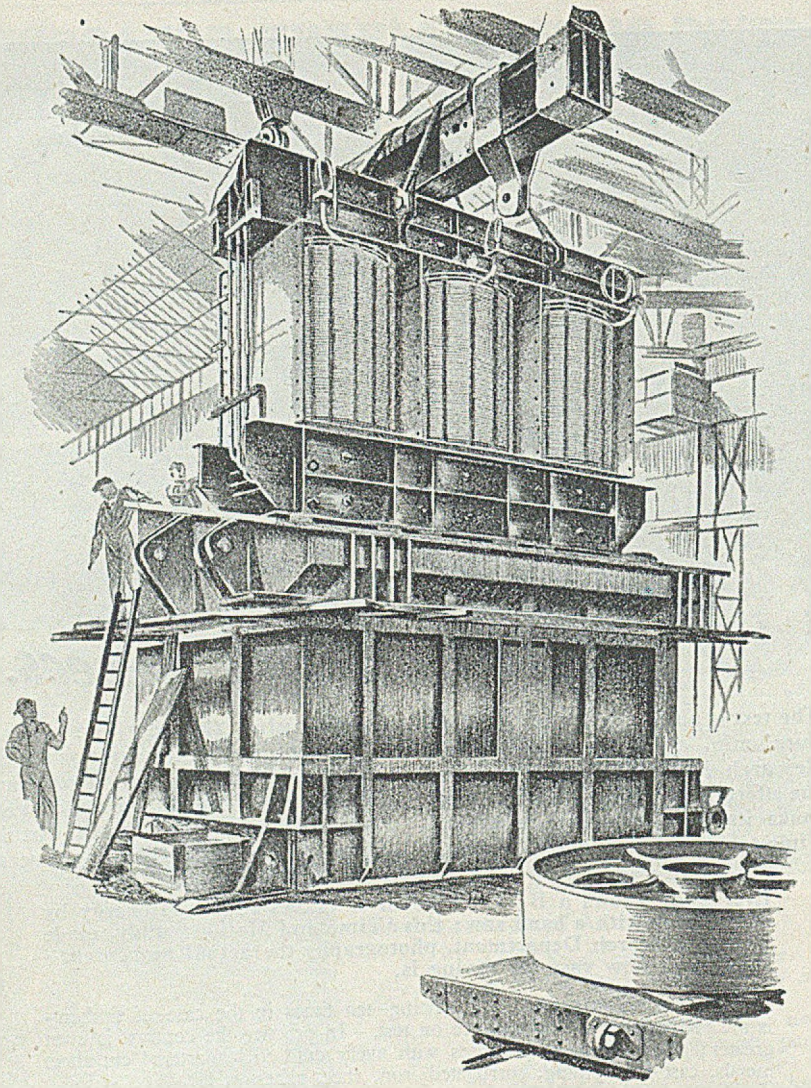

45,000 kVA 3-phase transformer 132/33 kV under construction for the Central Electricity Board

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ELECTRICAL REVIEW

December 19, 1947

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

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

Industrial Editor : J. H. Cosens

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXLI. No. 3656 DECEMBER 19, 1947 9d. WEEKLY

Tropical Conditions

Problems for Export Manufacturers

AMONG the many requirements of export none merits more consideration than the ability of plant and apparatus to stand up to local conditions of use. British electrical manufacturers with well-established overseas connections are doubtless familiar with the kind of experiences described at the Institution of Electrical Engineers in Mr. R. Allen's paper (see page 933). They are likely, however, to gain a more comprehensive picture from the author's summary and analysis of the principal troubles met with in the tropics, largely in regard to electrical insulation, and his suggestions for their prevention, mitigation or cure. Relatively new entrants into foreign markets will find the paper a valuable guide to what may be expected in such regions, not overlooking the possibility of arduous conditions in transit.

Is All-Climate Design Possible ?

It would certainly be an advantage if standard designs could be economically produced to suit all circumstances abroad as well as at home, but a large proportion of consumers' apparatus, at any rate, would call for more than a major degree of adaptation in order to give reliable service in the less climatically favourable countries. We have in mind not so much the most extreme cases, many of which seem fantastic to those at home, but rather those typical of day-to-day working. Even these, the author complains, sometimes strain the credulity of designers.

High temperatures in association with great atmospheric humidity are, of course, not unknown in temperate climates. The point is that in the tropics these may continue without intermission for months at a stretch, and their effect in disintegrating insulation is cumulative. On the other hand, where a daily heat cycle is usual, a fall in temperature of a few degrees may cause a precipitation of moisture several times the normal in this country. Apart from complicating factors of humidity, direct sunlight and, in coastal regions, very heavy salt deposits, high temperatures may necessitate the drastic de-rating of machines built for the standard rise in degrees.

Ventilation Difficulties

While good ventilation is accordingly essential (high-pressure air is said to be most beneficial), air ingress and egress must be to some extent impeded by gauze protection against the destructive attention of pests, including small insects. There is also the exclusion of dust to be provided for in certain seasons and districts where excessive dryness can be responsible for insulation breakdown.

Although Mr. Allen's conclusions are based on conditions in India, they were accepted as of far wider application by those with first-hand experience of tropical and sub-tropical regions who took part in the discussion. Most divergence of opinion related to the efficiency of local labour. Favourable reports come from the larger power plants where manual workers have been trained under a sound apprenticeship scheme by supervisors able and willing to give practical demonstrations of how a job should be done. Results

are not so happy, however, where operatives have no tradition of craftsmanship or natural mechanical aptitude. This is especially so if their fellow nationals of superior technical education lack practical experience or, as a result perhaps of native customs, are unable to make full use of it. Machinery cannot be easily returned to manufacturers or well-equipped depots for repair, and this implies a need for simple design, robust construction and very clear operation instructions. The author suggests that the B.S.S. relating to tropical conditions should be brought up to date. When that is done, no doubt full scope will be allowed to those abroad to comment upon the revisions proposed.

Insulating Oil

How much there is yet to be learned about the electrical use of oil was illustrated by two I.E.E. Transmission Section papers last week. Although definite contributions towards the subject, their main effect was to suggest lines of further inquiry. One of these arose out of Mr. H. Hurworth's study of the effect of oxygen-pressure gradient on oil deterioration. His view that viscosity might be increased runs counter to the second function of oil as a cooling medium, but the balance between the two will probably pay investigation. Mr. J. S. Forrest established his claim for the d.c. resistance test to be the most satisfactory single method, as it is the only convenient one for field work. Here again, however, finality seems not to have been reached.

Balanced Area Boards

IT is evident from the particulars published on page 919 of the deputy-chairmen appointed to the Area Electricity Boards that an attempt has been made to balance company and public authority representation. The attempt has been generally successful although there is a slight bias in favour of public authorities. In the case of nine of the fourteen boards where the chairman is a company man the deputy is with a public authority or *vice versa*. In two instances trade unionist chairmen have, respectively, company and local authority deputies. The Yorkshire Board has a C.E.B. engineer as chairman and the Hull Electricity Department manager as deputy. One of the remaining boards has a civil servant chairman and a public authority deputy and the other a public authority chairman with a local government deputy. Of the twenty-eight appointments twenty-three are from the electricity supply industry—a most satisfactory showing.

Trade with Russia

MR. WILSON, President of the Board of Trade, appeared to be well satisfied last week with the results of his discussions in Moscow. Apart from his general references to our need for Russian timber and grain and the Russian need for British engineering equipment little is yet known of the nature of the agreement now being negotiated. Discussions earlier this year had little result on account of difficulties with regard to delivery dates, credit conditions and the interest on credits arranged in 1941. Last year Sir George Nelson, chairman of the English Electric Co., took a party to Moscow and reported satisfactory progress in his negotiations with the Russians for future trade. There is no doubt that an exchange of commodities with Russia would be of mutual benefit and we hope that it will be possible for the electrical industry to make a valuable contribution.

I.E.E. President's Appeal

MR. PERCY GOOD, the President of the I.E.E., has made an appeal to members on behalf of what is now the *Incorporated* Benevolent Fund of the Institution of Electrical Engineers. He refers particularly to the need for £50,000 to develop the site in New Malden, Surrey, generously given by Mr. C. W. Speirs, and provide homes for necessitous members. The pamphlet containing Mr. Good's message also mentions that the amount contributed to the Fund in 1946-47 was 5s. 4d. per member, an amount which could easily be increased; the necessary forms are incorporated in the pamphlet and are commended to members' favourable attention.

Greetings

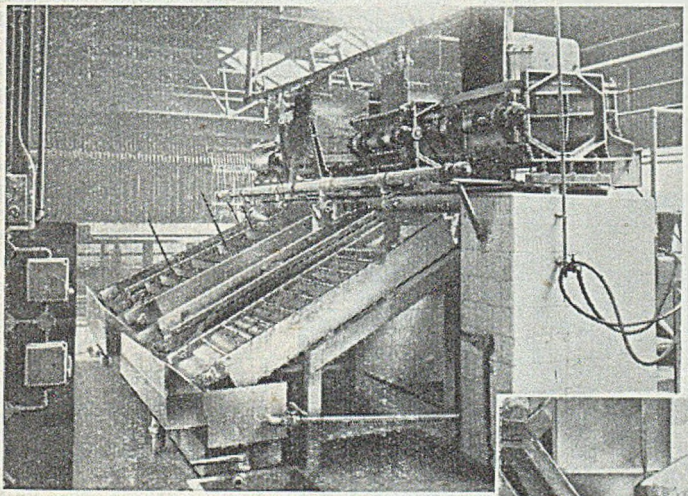
AT each Christmas during the last eight years we have wished readers better times in the coming year. Although, so far, our hopes have not been conspicuously fulfilled we remain incorrigibly optimistic and, once again, look forward to a happy Christmas and improved conditions in the New Year.

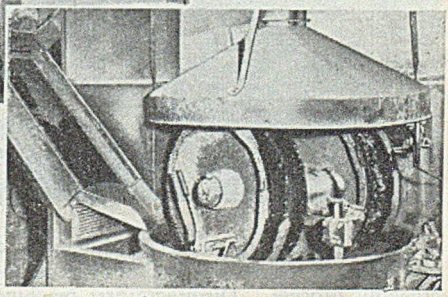
TILE MAKING

Electrical Aids to Increased Production

WITHIN the past few months we have published a series of articles dealing with the use of electricity in the pottery industry. To-day we propose to describe further applications peculiar to a specialized branch of the industry, namely, glazed and floor tiles, and show how here too electricity is helping to secure that increase in production which is so much needed to meet demands both in this country and abroad.

Recently, thanks to the good offices of the Stoke-on-Trent Electricity Department, arrangements were made for us to visit the works of three of the larger tile producers in its area, H. & R. Johnson, Ltd., Richards Tiles, Ltd., and the Campbell Tile Co., Ltd. The methods adopted by all three companies are very similar and it is only in the matter of individual preferences for certain types of machine and in the degree of utilization of electricity that differences are apparent. A description of the main processes, rather than of the three separate works, will therefore suffice to give a fair picture of electricity's part in modern tile-making technique.





Above: Vibrating screens and electromagnetic separators remove grit and metallic particles from the slip. Right: Pan grinders have certain advantages for crushing the material to dust

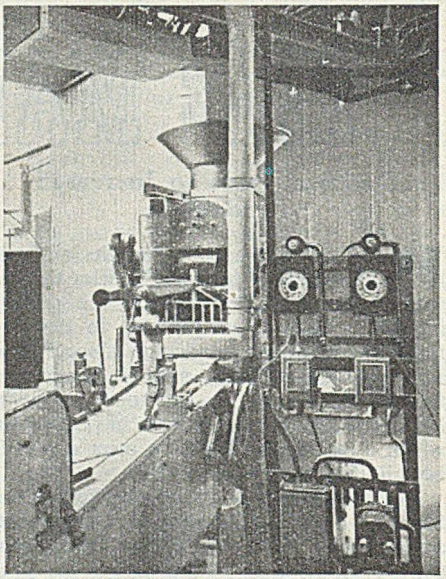
The "body" from which tiles are made consists of china clay, ball clay, flint and Cornish stone. The various processes of grinding up the flint and stone were fully described in the article on "Potters' Mills" in our issue of October 11th, 1946. The resulting material in "slip" form (i.e., very fine particles suspended in water) is added in carefully determined proportions to the china and ball clay slips which have been prepared by about five hours' treatment in electrically driven "blungers," large mixers or churns each holding about 1·75 tons of material. In the "mixing ark" or vat which is commonly

beneath the sliphouse, agitators thoroughly mix the four ingredients together, a pump then carrying the mixture to sifting machines.

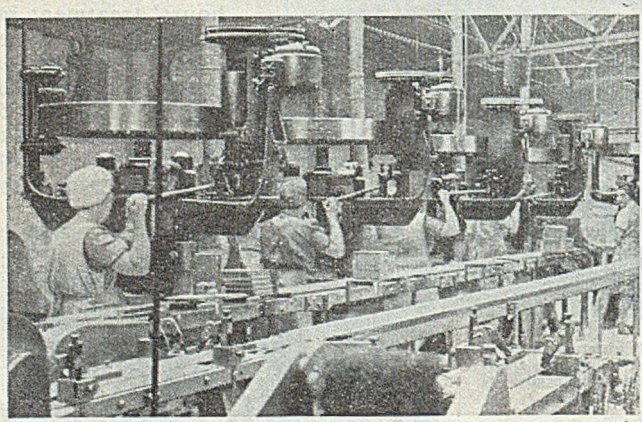
In the sifting machines a series of vibrating "lawns" or sieves with mesh as fine as 20,000 holes to the square inch separates out the larger particles, dirt and other impurities from the slip which then passes through electromagnetic separators to extract any particles of iron which would otherwise cause dark specks in the finished tile. From the separators the slip is run into the storage or "finished ark" where it remains, still under agitation, until required.

To remove the water the slip is pumped to filter presses, electrically driven dead-weight or fixed pressure pumps being employed for this purpose to avoid any risk of overloading the presses. These machines, which consist of a series of large canvas envelopes held between concave-faced iron plates, are generally hand hydraulic operated. Electrically operated ones are in use but hand operation is preferred by most manufacturers as avoiding any possibility or over-compression and consequent spillage of the slip.

The clay comes from the presses in the form of flat cakes about 36 in. (91 cm) square and weighing about 1 cwt (50 kg.) After being broken in two these cakes spend 32-36 hours in a drying room at a temperature of about 100 deg F (38 deg C). The hardened cakes are then crushed to a fine powder, just sufficient water being added to ensure that it will bind together under pressure.



This fully-automatic press produces about 7,000 6-in. (15·2 cm) square tiles a day



Row of semi-automatic presses

There appears to be some difference of opinion as to the best method of effecting this crushing process. Disintegrators, machines embodying small rotary breakers revolving at a speed of about 2,500 r.p.m., and sifters are employed in the most modern methods and they lend themselves best to high-speed continuous production. They do, however, suffer from various disadvantages, principal among which are the difficulty of cleaning and the necessity for fairly frequent replacement of the beaters. (This latter failing is now being largely overcome by the use of chromium-plated blades which last about five times as long as plain steel). There is, therefore, a tendency to revert to the use of the older pan grinders (5 to 10 h.p. motors) which have the merit of being easily cleaned and consequently readily changed over from one coloured material to another and also produce a somewhat coarser dust, an advantage for certain types of tile.

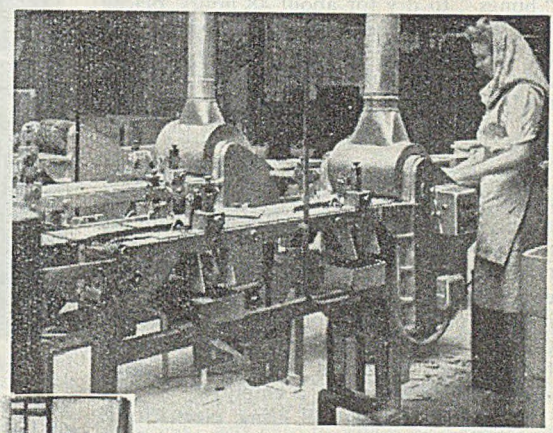
Both in the dust mill and in the later "making" (tile shaping or forming) processes

the presence of dust in the atmosphere presents a considerable problem both in relation to the danger of silicosis and also to the spoiling of the finished tile. For this reason the use of dust extraction plant is widespread and this is commonly supplemented by both central and individual vacuum cleaning plant for cleaning machinery, etc.

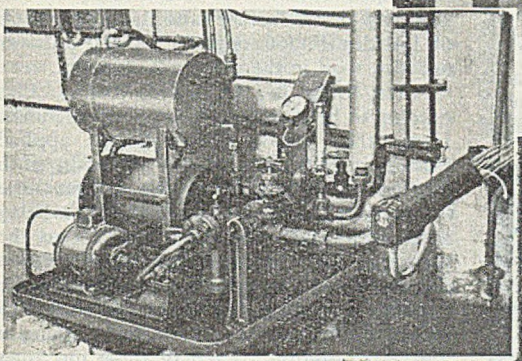
From the disintegrators or pan grinders, conveyors of the worm or *en masse* types are often used to carry the dust to the storage arks whence it is withdrawn as required for " making " in the presses. Three main types of presses are employed—the hand, semi-automatic and fully automatic. The semi-automatic type is most generally favoured, though the fully automatic has many points in its favour. The method of operation is essentially the same in all three types. A steel-well or " box " sunk in the bed of a press is filled with dust and a heavy steel die descends into it forcing the dust against another die forming the bottom of the box. The method of imparting the power from the electric motor used (generally 1½ h.p.) is similar in all cases, friction drives raising or lowering the top die according to which of two rollers (belt driven from the motor) engages the large flywheel.

In some machines the dies are electrically heated to around 65 deg C. A fully automatic press produces about 7,000 6-in. square tiles a day compared with 2,500 to 3,000 for a semi-automatic machine and 1,700 for the hand press. Some machines are filled with split dies to produce two 6 by 3-in. (15·2 by 7·6 cm) tiles at a time. The two sizes mentioned, together with the 4-in. (10 cm) square types, in thicknesses of $\frac{3}{16}$, $\frac{1}{4}$ and $\frac{3}{8}$ in. (4·8, 6·4 and 9·6 mm) are the most popular sizes and form by far the largest proportion of the output.

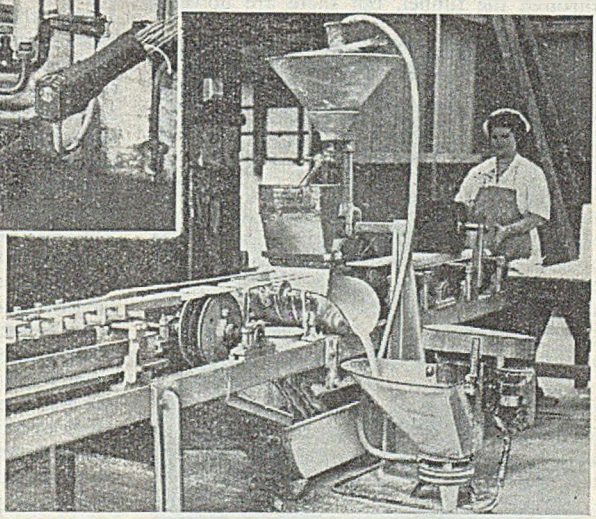
When they leave the presses the tiles in their " green " or unfired state are hard enough to withstand reasonable handling. Placed on conveyors, they are mechanically fettled or trimmed by means of



Above : After pressing, the tiles are automatically fettled and brushed
Below : Waterfall type of glazing machine



Though electricity has not yet been adopted for the actual firing it is used extensively for incidental operations involved in gas and oil firing. Here are a pump and electric heating device used in oil firing



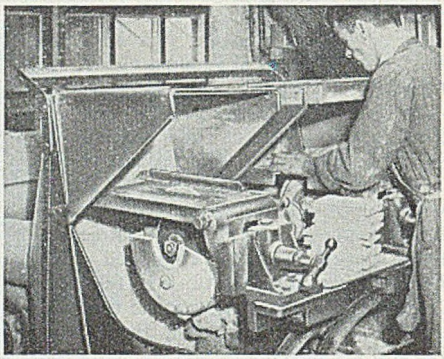
carborundum stones on springs to remove loose dust first on two sides and they are then automatically turned and the process repeated on the other two sides. From the fettling machines the tiles are stacked in " bungs " to dry for about 48 hours, placed in " saggars " (the containers in which they are fired) and then carried, usually by overhead conveyor, for stacking on the kiln cars ready for firing in the biscuit oven for 100 hours at a peak temperature of about 1,200 deg C.

This first or biscuit firing is still to some extent carried out in the old bottle ovens, mainly in the smaller factories, but there are now several continuous ovens of the tunnel type in use. At present these are fired either by town gas, producer gas or oil, but it seems only a matter of time and the easing of the electricity generating plant situation before the improved and more easily controlled electric firing is employed.

Even with gas and oil firing, electricity is extensively employed in the operation of the ovens. Not only is electrically operated propelling gear used to push the trucks through the tunnel, but there are powerful

One type of sizing machine. Another is to be seen in the title picture on page 911

electric fans for the primary or burner air, the secondary and cooling air, exhaust and waste heat circulation systems. In oil firing too there are further applications of electricity in the pumping of the oil from the storage tanks and for warming it before use. In the storage tanks 6-kW immersion heaters raise the temperature to 80 deg F (27 deg C) to maintain it at the correct viscosity, while just before burning two 9-kW units in the



Carborundum wheels cut the finished tiles

pumping circuit further raise the temperature to 150 deg F. (66 deg. C). Electric drives are also used in the gas producer plant.

After firing in the biscuit ovens, tiles needing to be glazed go to dipping machines. Here the glaze is generally applied mechanically by one of two methods, both continuous. One of these utilizes the " waterfall " principle, the glaze being applied through a long fine slot on to the tiles travelling horizontally beneath on a belt conveyor. In the other type of machine the tiles pass face downwards between two rollers, the bottom one of which is running in the glaze solution. Each of these machines is capable of dealing with about 4,800 tiles an hour. Air pressure spraying is also employed to some extent.

To fuse the applied glaze to the face of the biscuit, the tiles are fired again in a glost oven where they spend 40 hours and in which the peak temperature is about 1,100 deg C. Here even more than in the biscuit stage does there appear to be great scope for electric heating, particularly on the score of quality production, since the firing on of glazes demands a very critical control of temperature. The firing completed, the tiles are sorted, cut and polished if required, graded and sized. Conveyors and hoists facilitate the packing and dispatch.

Our thanks are due to members of the staff of the tile works concerned and also to Mr. Thomas Lockett, general manager of the Stoke-on-Trent Electricity Department, his distribution engineer, Mr. L. Goodall, and his technical assistant, Mr. H. McCartney.

Views on the News

Reflections on Current Topics

I AM afraid that I cannot agree with a member of the Bingley (Yorks) Fuel Economy Committee who suggested that the displaying of electrical apparatus in showrooms was a great temptation to the public and should be suspended during the fuel crisis. Surely members of the public may be allowed to see a few of those things that may be theirs when fuel and production difficulties have been overcome. For all their apparent plenty, supplies of all but a few appliances (and the poorer quality at that) are still insufficient to meet the demand. The Board of Trade and the Ministry of Supply will undoubtedly keep it that way for the present and Sir Stafford Cripps can be relied upon to discourage, by means of purchase tax, the buying of any but the most essential appliances. By waiting purchasers are likely to get better value for less money.

* * *

Familiarity certainly tends to breed contempt in taking elementary safety precautions when using electrical appliances. I suppose this is inevitable and is likely to become more and more prevalent as the use of electricity continues to expand. If only a few fundamental principles are observed any slight danger is rendered practically non-existent. It is bad enough when there is carelessness in the home liable to endanger one's own family but it becomes a criminal matter outside where the general public is likely to be affected. I noticed a very bad case of this a few days ago in London where some building alterations were being carried out. Electric lamps used to indicate the position of metal scaffolding on the footpath were connected up by means of ordinary cotton-covered flexible cable. This was draped round any convenient protuberances and it must be providential if the whole of the metalwork does not become live after a shower of rain if not before.

* * *

Ministry of Fuel and Power officials are still enforcing the strict letter of the 1942 Control of Fuel Order and incidentally making the Ministry look ridiculous. The latest case is that of a shopkeeper at Torquay who was stopped from using a small wind-driven generator supplying energy to lamps in a shop window. I suppose the idea was to prevent him from enjoying any advantage over other traders for, of course, no fuel was used. By the way is electricity "fuel?" Although it is included in the definition of fuel in the Order that does not make it so. I am reminded of the classic *Punch* railwayman who ruled that: "Dogs is dogs and cats is dogs but tortoises is hinsects." Electricity is only a manifestation of the consumption of fuel—and when it is wind-generated it is not even that.

* * *

This fact was tacitly recognized when restrictions were imposed last February on the use of electricity during certain hours. Paragraph 1 (*a*) (ii) of S.R. & O. 1947 No. 267 excepted "any case in which such electricity is supplied by any body or person who is not an authorized undertaker . . . and is generated by means other than coal." The main object of this permit under the principal Order was to exempt water-power undertakings' consumers from the ban.

* * *

During the war gas (produced from imported coal) was strictly rationed in Switzerland and electric boiling plates were adopted on a large scale. Now the gas undertakings, attempting to retrieve their financial position, are claiming that domestic cooking and water heating should be left to them. However, their former consumers, as in Great Britain, increasingly show preference for electricity on the grounds of amenity and lower cost and, according to the *Bulletin* of the Swiss Electrotechnical Association, new buildings are being equipped with electrical installations only. As thermal plant is used in the winter to supplement the output of the hydro-electric stations, it is suggested that gas fuel from the carbonization of coal should be used in the latter, and not oil-fired gas turbines, with a view to maintaining the supply of by-products.

* * *

The *Daily Express* has discovered "an electric nightgown in which you curl up on a cushion in any corner of the house near a wall plug." This is all very well, but it prejudices the plea that there is no room when an unwanted would-be visitor makes inquiries. —**REFLECTOR.**

PARLIAMENTARY NEWS

By Our Special Reporter

IN the House of Commons on December 11th the Minister of Town and Country Planning, Mr. Silkin, said that the Royal Fine Art Commission had indicated that, within the limitations imposed by the choice of site, it had no criticism to offer of the design for the Bankside power station proposed by Sir Giles Gilbert Scott. He had always been satisfied that the burning of oil fuel would be without deleterious effects on buildings in the neighbourhood.

Cutting Off Supplies

Mr. Leslie asked the Minister of Fuel and Power if he would make representations to electricity authorities, not to cut off supplies of electricity before 9 a.m. as an earlier hour created inconvenience to many householders to be without light and heat in the dark winter mornings.

Mr. Robens said that cuts in electricity supplies had to be made when total consumers' demand exceeded the generating capacity of the supply undertakings. It was therefore not possible to postpone cuts. The representations suggested in the question were in the circumstances hardly appropriate.

Cable-Laying Ship

Speaking of his recent trip in the cable laying ship *Monarch*, Mr. Paling, the Postmaster-General, said that the ship was the largest cable ship in the world, equipped for laying cables and maintaining them in all waters. The cable which she had just laid [see page 917] was of very modern design, and would provide eighty-four telephone circuits from this country to Holland, and in a year or two, to all the Scandinavian countries. The *Monarch* was the only ship capable of laying the 80 odd miles in one piece. In spite of a considerable storm, the laying of the cable was completed successfully in five days. Great credit was due to the skill and enterprise of the British company, Submarine Cables, Ltd., who designed and produced the cable itself.

Teleprinters

Mr. Paling said that there were approximately 11,750 Post Office teleprinters in use in Great Britain, 2,500 by private renters and the remainder by Government Departments. At present, there was no difficulty in meeting applications for private teleprinter services, subject to availability of line plant.

Prisoner-of-War Labour

The Secretary of State for Scotland said that at December 5th 405 German prisoners of war were employed on hydro-electric schemes in Scotland. It was intended to increase this number to about 700 in the near future. The pay of the men was a matter for the Secretary of State for War, but he understood that German prisoners of war were paid for all the hours they work at their normal rates of 1½d. per hour for skilled work and ¾d. for unskilled, with bonuses for good work.

Anglo-Soviet Trade

Mr. H. Wilson, the President of the Board of Trade, in a statement about Anglo-Soviet trade, said that in addition to the immediate supply of certain goods from the United Kingdom, provision was made for the Soviet importing organizations to enter into contracts with the appropriate British firms for the supply of engineering equipment from the United Kingdom.

Area Board Appointments

THE recent notice regarding appointments to be made by the British Electricity Authority (December 5th issue) is followed by another setting out the terms of appointment of senior officers for the Area Electricity Boards and inviting applications to the Boards from those who wish to be considered for these positions. This will be found in the Classified Advertisements section of this issue.

It is stated that the Boards will probably make the following initial appointments:—Chief engineer, chief accountant, chief commercial officer and secretary. The salaries will fall between £2,000 and £3,250 according to the responsibility of the post.

Any further appointments necessary before the vesting day will be advertised. There will be a limited number of these. The great majority of the industry's personnel will continue in their present employment although, of course, they will be transferred to the employment of the Central Authority or the appropriate Area Board.

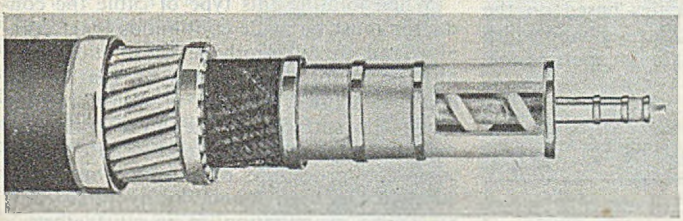
E.A.W. Activities

THE S.E. London Branch arranged its annual Christmas luncheon at Lewisham on December 2nd, when members were present from Gravesend, West Kent, Woolwich, and London Branches. The chair was taken by Mrs. R. T. G. French, president of S.E. London Branch, and Mr. French, late secretary of the Electricity Commission, was also present. Mr. H. E. White, area manager of the South Metropolitan Electric Light & Power Co., proposed the toast of the E.A.W. and the response was made by Dame Caroline Haslett, the director, taking as her subject "The E.A.W. and the Future."

Anglo-Dutch Telephone Cable

First Submarine Example of its Kind

THE successful laying last month by the Post Office cable ship *Monarch* of a new Anglo-Dutch submarine telephone cable between Aldeburgh in Suffolk and Domburg in Walcheren in Holland marks an advance in under-sea cable engineering. It is a coaxial type and will enable eighty-four conversations to be conducted simultaneously without the aid of submerged repeaters.



Air-spaced coaxial Anglo-Dutch submarine telephone cable

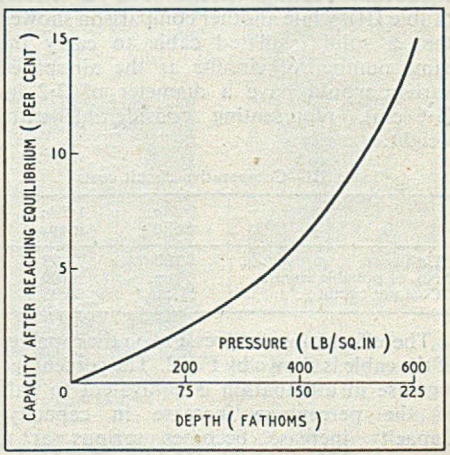
The cable (Fig. 1) is air-spaced and is intended to go into public service early in the new year. It was manufactured by Submarine Cables, Ltd. (owned jointly by Siemens Brothers & Co., Ltd., and the Telegraph Construction & Maintenance Co., Ltd.) its main insulation being "Telcothene," a mixture of polythene and polyisobutylene, which was extruded around a central conductor to a diameter of 0·473 in. (1·2 cm). Over the solid dielectric six tapes were applied helically with a copper tape folded longitudinally over them to form the main (inner) conductor. Over the latter a circular polythene cord of 0·225 in. (0·6 cm) diameter was wound so as to form an effective air space. Solid "Telcothene" was extruded over the cord to a total diameter of 1·7 in. (3·8 cm) and the outer (return) conductor consists of copper tapes applied with a long lay. A teredo tape of copper was wound over the conductor tapes and the cable completed with jute and armouring in the normal manner.

The need was for a cable which, over a distance of 85 nautical miles (1 n.m. = 2,029 yards = 1·6 km) would provide the minimum of one "supergroup" (60 duplex circuits) to be laid at depths not exceeding 50 fathoms (300 ft, 90 m) without undersea repeaters which were considered (in 1945) not sufficiently developed. The cable would be particularly liable to damage by ships anchors so that heavy armouring had to be envisaged. A bottom frequency of 12 kc/s was essential to match the transmission and amplifying equipment at the ends, while the equipment could tolerate 100 db maximum attenuation.

Assuming the normal band of 4 kc/s per circuit, then the cable must operate at a minimum top frequency of about 550 kc/s, a value then unheard of for practical submarine cable operation over such a length.

At that time machine limitations were the deciding factors in fixing the maximum diameter of the core which could be manufactured within reasonable time at 1·7 in. The small air space had a major effect upon the characteristics and brought that diameter of core within the range of possibility with respect to the operational requirements.

Calculated on a conductor ratio D/d = 3·59 for the minimum attenuation of a copper



Graphical representation of water pressure upon cable capacity

to copper coaxial and fixing the inner diameter of the outer conductor at 1·7 in., the inner conductor diameter becomes 0·473 in.

For both air space and solid dielectric cables with conductors of the above dimensions Tables I and II give comparative values of attenuation at different frequencies

TABLE I.—Attenuation of 1·7 in. cable at 60 deg F (db per nautical mile)

kc/s	Air-space	Solid
10	0·22	0·26
20	0·24	0·28
50	0·32	0·37
100	0·42	0·50
200	0·57	0·69
500	0·90	1·10
1,000	1·28	1·58
2,000	1·85	2·32
5,000	3·0	3·9

and also of circuit capacities based on the lower frequency limit of 12 kc/s, a band width of 4 kc/s and the maximum permissible attenuation of 100 db.

TABLE II.—Number of possible duplex telephone circuits on 1·7 in. cable (assuming permissible attenuation of 100 db)

Length (nm)	Air-space	Solid
20	1,380	840
30	660	420
40	390	250
60	180	120
80	105	70
100	65	45
200	15	10

The fact that a solid 1·7 in. core would carry fewer circuits than an air-spaced core and, at the same time, cost more because of the extra insulating material involved had a significant bearing on the cost per circuit (Table III), while another comparison showed that a solid insulated cable to carry the same number of circuits as the air-spaced variety would have a diameter of 2·2 in. (5·6 cm), representing considerable extra weight.

TABLE III—Comparative circuit costs

	1·7 in. Solid	1·7 in. Air-space
Unit cost	100	93
No. of possible circuits	66	100
Cost per circuit	1·51	0·93

The effect of water pressure on the capacity of the cable is shown by Fig. 2. The percentage increase in attenuation is equivalent to half of the percentage increase in capacity. Capacity increase becomes serious at a pressure of 200 lb/sq in. (14 kg/cm²) and the unprotected cable is therefore not suitable in depths greater than say 75 fathoms (137 m) (for each fathom depth the pressure increase is 2·7 lb/sq in., 0·19 kg/cm²).

In order to prevent water circulating through long lengths of the air space should a break or other damage occur, the cable is provided with injection moulded blocks at 750 yd (686 m) intervals. These bulk-heads have been tested experimentally and will resist hydrostatic pressures up to 1,000 lb/sq in. (70·3 kg/cm²).

Because of the more rapid and greater temperature changes which may occur in shallow water the shore end portions have solid insulation. Thus the possibility of water vapour distilling from low to high pressure areas due to temperature change along the length is eliminated.

When jointing this type of cable the conductor must be made continuous longitudinally, and the "Telcothene" insulation must also be continuous radially so that in the event of a break the risk of water creeping along the surfaces of the inner conductor may be completely prevented. After many trials the procedure of injection moulding adopted has been found, by hydraulic tests and X-ray examination, to be satisfactory.

This class of cable opens up new fields for submarine communication. Not only can it be made to carry a "super group" of 60 duplex circuits over distances of over 100 n.m., but when repeaters are inserted at appropriate intervals either the number of circuits or the length of span, land to land, can be increased. As a result it is not unreasonable to state that all old ideas of the limitations of telephone communication between England and the Continent have been altered. Belgium, Denmark, Holland, Norway and Sweden can now all be linked by multi-channel telephone cables to Britain in such a way that "on demand" calls can be effected, and the increase in traffic when such services are provided is well known.

TABLE IV.—Electrical Characteristics

Effective dielectric constant	1·66
Capacity	0·134 μF/nm
Power factor	Approx. 0·0002
Impedance	60 ohms from 10 kc/s upwards
Attenuation at 0·55 Mc/s ..	0·95 db/nm

I.M.E.A. Convention Exhibition

THE British Electrical Development Association has been asked to arrange an exhibition in connection with the Incorporated Municipal Electrical Association's Convention which is to be held at Eastbourne from June 7th to 11th next. Manufacturers wishing to take part in the exhibition should notify the general manager and secretary of the Association, 2, Savoy Hill, London, W.C.2, immediately.

Area Board Deputy-Chairmen

Brief Notes on Their Careers

ON Tuesday last week, Mr. H. Gaitskell, Minister of Fuel and Power, announced the names of the deputy-chairmen-designate of the fourteen Area Boards. We give below particulars of their careers.

Mr. E. A. Mills, M.Inst.C.E., M.I.E.E., M.I.Mech.E. (London Area) is borough electrical engineer of Hackney, a position he has held since 1934. He was previously engineer and manager of the Halifax Corporation electricity undertaking (1931-34), and earlier in his career he was with the Yorkshire Electric Power Co., the Northmet Power Co. and the Birmingham, Leeds, Shanghai and Leicester electricity supply undertakings.

Mr. E. A. Mills
(London)

Mr. W. R. T. Skinner, B.Sc., A.M.I.Mech.E., A.M.I.E.E. (South-Eastern Area) is general manager of the Yorkshire Electric Power Co. and the Electrical Distribution of Yorkshire, Ltd., and its subsidiary and associated companies. In 1919 he entered King's College, London, where he obtained an honours degree (B.Sc. Eng.) in mechanical and electrical engineering and the College diploma in engineering with advanced mathematics. On completing his engineering training in 1921, he joined the Yorkshire Electric Power Co., with which he has been associated ever since. He is vice-chairman of the Electricity Supply Joint Committee and a member of the Council of the Incorporated Association of Electric Power Companies.

Mr. R. R. B. Brown
(Southern)

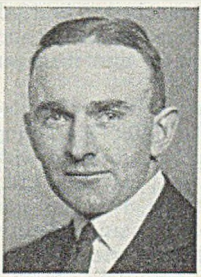
Mr. E. Jones
(South Wales)

Mr. E. Jones, M.I.Mech.E., M.I.E.E. (South Wales Area) is city electrical engineer and manager of Cardiff. He had several years' experience in marine and colliery work before joining the Cardiff Electricity Department in 1913 as deputy mains superintendent. He became "chief" of the Department in 1935.

Mr. W. R. T. Skinner
(South-Eastern)

Mr. R. R. B. Brown, B.A., B.Sc., M.I.E.E. (Southern Area) graduated in mechanical science at Cambridge in 1932 and became a student apprentice with the English Electric Co., Ltd. He joined Edmundsons Electricity Corporation in 1934, and after a period as a trainee with an associated company, the Shropshire, Worcestershire & Staffordshire Electric Power Co., and two years in the position of personal assistant to the general manager and managing director of Edmundsons, he was appointed deputy general manager of the Wessex Electricity Co. in 1938. He served in the Royal Armoured Corps in Libya and Normandy from 1940 to 1945, and returned to the Wessex Co. as general manager on being demobilized.

Mr. R. A. S. Thwaites
(North-Western)



Mr. T. E. Daniel
(North-Eastern)

Mr. T. E. Daniel, M.Eng., M.I.E.E., A.M.I.Mech.E. (North-Eastern Area) is borough electrical engineer of Darlington.

His early experience was gained with the Northmet Power Co. and Battersea Borough Council, after which he became deputy

Mr. J. Mould
(East Midland)

Mr. D. P. Oliver
(Mersey and North Wales)

borough electrical engineer of Ashton-under-Lyne in 1932 and borough electrical engineer in 1933. He went to Darlington Corporation as chief electrical engineer in 1937.

Mr. H. Midgley
(South-Western)

Mr. R. A. S. Thwaites, B.Sc.(Engineering), M.Inst.C.E., M.I.Mech.E., M.I.E.E. (North-Western Area) is chief engineer and manager of the Manchester Corporation Electricity Department. In 1922 he joined the Yorkshire Electric Power Co. which he served in various capacities for the next thirteen years, after which he joined the North Wales Power Co., becoming in 1939 chief engineer and manager. He went to Manchester in 1941 as assistant deputy electrical engineer, and was appointed chief engineer and manager in 1944.

Mr. D. P. Oliver (Mersey and North Wales Area) is secretary of the Milk Marketing Board. He was previously associated with Lewis's, Ltd., Liverpool, and Harrods, Ltd., London, and from 1922 to 1927 he was assistant solicitor, senior assistant solicitor and assistant prosecuting solicitor on the staff of the Town Clerk, Liverpool.

Mr. H. Midgley, M.Sc. (Eng.), M.Inst.C.E., M.I.E.E. (South-Western Area) is city electrical engineer of Plymouth. Following his apprenticeship with R. & W. Hawthorne, Leslie & Co., Ltd., he spent some time with the Metropolitan-Vickers Electrical Co. Ltd., Trafford Park. This was followed by thirteen years in various capacities in the Electricity Supply Department, Liverpool, latterly as chief technical assistant, when he supervised the early stages of the construction of Clarence Dock station. He took up his present position as city electrical engineer at Plymouth in 1934.

Mr. D. Bellamy, O.B.E., Companion I.E.E. (Yorkshire Area) is general manager of the Hull Corporation Electricity Department, a position he has held since 1938. He commenced his career with the Kettering Electricity Department and after service in France during the 1914-18 war he joined the Hull undertaking in 1919 as a clerk in the consumers' section.

Mr. W. Hutton, M.A., LL.B. (South-West Scotland Area) has been senior Depute Town Clerk at Edinburgh since 1939, and was previously Town Clerk of Kirkcaldy and before that appointment was legal assistant to the Department of Health for Scotland.

Mr. D. Bellamy
(Yorkshire)

Mr. J. Mould, A.M.I.E.E. (East Midland Area), has been general manager of the Leicester City Electricity Department since 1927. After three years as personal assistant to Professor Silvanus P. Thompson, he was for six years machine designer with Siemens Bros., Dynamo Works, Stafford. He went to Leicester in 1919 as deputy chief engineer. Mr. Mould is a past-president of the I.M.E.A., and was for many years chairman of the Generation Committee of the Association.

Mr. W. S. Sawtell
(South-East Scotland)

Mr. W. Hutton
(South-West Scotland)

Mr. W. S. Sawtell, M.I.E.E. (South-East Scotland Area) has been general manager

of the Fife Electric Power Co. since the beginning of 1947. For twenty-four years he was general manager of the Scottish Southern Electric Supply Co., Ltd., and was previously with the Dundee Corporation Electricity Department.

Mr. H. C. Waters, A.M.I.E.E. (Eastern Area) is general manager of the East Anglian Electric Supply Co., Ltd., and the Bedfordshire, Cambridgeshire & Huntingdonshire Electricity Co.

Mr. D. H. Kendon, M.I.E.E. (Midland Area) is general manager of the Shropshire, Worcestershire and Staffordshire Electric Power Co., having been appointed to that position in May, 1939.

PERSONAL and SOCIAL

News of Men and Women of the Industry

LAST week we reported the appointment of **Mr. R. Halsall** as deputy secretary to the British Electrical Authority, and of **Sir Norman Duke** as chairman-designate of the South-East Scotland Area Board. We now have pleasure in reproducing their portraits.

Mr. R. Halsall

Sir Norman Duke

London Area Board.—We understand that the Minister of Fuel and Power has invited the following to become members of the London Area Electricity Board of which Mr. H. J. Randall is chairman and Mr. E. A. Mills deputy-chairman:—Mrs. G. H. Dunbar, O.B.E., vice-chairman of the Women's Voluntary Services; Dr. P. Dunsheath, C.B.E., past-president of the I.E.E. and a director of W. J. Henley's Telegraph Works Co., Ltd.; Alderman C. W. Dixon, J.P., chairman East Ham Electricity Committee and a member of the I.M.E.A. Council; Mr. G. C. R. Eley, a director of the National Gas & Oil Engine Co., Ltd., and financial director and deputy chairman of British Drug Houses, Ltd.; Alderman I. J. Hayward, J.P., Leader of the L.C.C. and a member of the London J.E.A. since 1925; Mr. W. A. Jones, A.M.I.E.E., former general secretary of the Electrical Power Engineers' Association; and Mr. W. J. H. Wood, director and joint general manager of the County of London Electric Supply Co.

Following a recent decision of the Bolton Electricity Committee not to make a permanent appointment of an electrical engineer and manager in view of the imminent transfer to the British Electricity Authority, **Mr. H. E. Annett,** the present engineer, has been asked to remain for a further period.

C†

Mr. F. H. E. Myers, M.I.E.E., A.M.I.Mech.E., has been appointed technical manager to Export and Technical Services Ltd. He was previously on the H.Q. staff of the Director of the Electrical Industries Branch, Control Commission for Germany. He was with the British Thomson - Houston Co., Ltd., nineteen years, and was chief test engineer before leaving in 1946.

Mr. D. Baird, A.M.I.E.E., who has been assistant installation inspector with the Edinburgh City Electricity Department since 1935, has been appointed chief installation inspector in succession to **Mr. T. Buist** who is retiring on January 15th after forty-four years' service.

Mr. R. E. Davis, who became secretary of Thorn Electrical Industries, Ltd., in January, 1946, has been appointed a director. Mr. Davis is a chartered accountant and was for many years with the County of London Electricity Supply Co.

Mr. R. G. Clark, M.I.E.E., manager of the Engineering Department of Ferguson Radio Corporation, Ltd., has been appointed a director. Formerly he was head of the Research and Development Department of Philips Lamps, Ltd.

Mr. J. McGrath and **Mr. O. Schorah,** have joined the board of directors of Lionel Robinson & Co., Ltd.

Mr. E. S. Booth, M.Eng., has been appointed city electrical engineer and manager at Salford where he has been acting "chief" since May this year. Mr. Booth was educated at the Liverpool University where he was awarded the Degree of Bachelor of Engineering with first class honours. He was elected an honorary scholar of the University in 1936 and was further awarded the degree of Master of Engineering in 1940. After leaving the University he served for two years as a college apprentice with the Metropolitan-Vickers Electrical Co., Ltd., after which he joined the Yorkshire Electric Power

Mr. E. S. Booth

Co., as a member of the power station and substation engineering staff. He was appointed deputy city electrical engineer at Salford in August, 1946. Mr. Booth is an associate member of the Institutions of Electrical and Mechanical Engineers.

To mark his retirement from the service of the Burton-on-Trent Corporation, with which he has been associated for over fifty years, including thirty-one as borough electrical engineer, **Mr. Thomas Hall** was presented with gifts from the staff and employees of the Department at a recent gathering. Mr. G. A. Adams, chief commercial assistant, presided. Mr. G. Lakin, the oldest serving member of the Department, presented Mr. Hall with a canteen of cutlery together with a gift of cut glass for Mrs. Hall.

Mr. S. J. Dyal has been appointed a director of Thos. W. Ward, Ltd. He has been chief valuer of the company for many years.

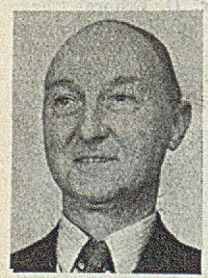
Mr. H. Broadbent, A.M.I.E.E., of Birkby, has been appointed technical assistant to the Brighouse Electricity Department.

Mr. H. Pointer, traffic superintendent with Sunderland Corporation, has been appointed traffic manager to Christchurch Transport Board, New Zealand.

Mr. J. Hellawell, of Dewsbury, has been appointed commercial assistant to the West Hartlepool Electricity Department.

Mr. H. Shackleton, representative since 1924 in the North of England, for the Wandsworth Electric Manufacturing Co., Ltd., Birmingham, has recently rejoined the company after over five years' service with the Admiralty in various North of England W/T Depots.

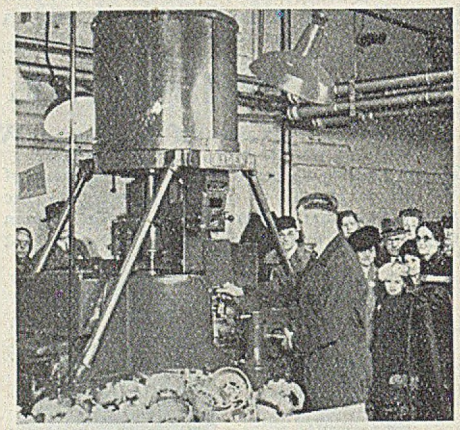
Mr. B. Chapman, A.M.I.E.E., is relinquishing his position with Measurement, Ltd., at the end of this year, ot join the Martindale Electric Co., Ltd., as sales director, and will also be associated with Mr. H. L. Kirby Johnson in the development of the "Elevicon." Before joining Measurement, Ltd., Mr. Chapman was for some years connected with the works and sales organization of the British Westinghouse Co. and Metropolitan - Vickers.



Mr. B. Chapman

Brooks Motors, Ltd., organized a "Family Day" on December 6th so that all its employees, 25 per cent of whom are shareholders in the company, could bring their families or friends to look round the works and see other departments not quite so familiar as their own.

Invitation cards and badges were distributed to 4,000 employees and their relatives. The foremen and chargehands made up displays of their products, tools and raw materials and employees volunteered to demonstrate at their machines and benches. Two people built up a model organ with polished steel shafts to represent the pipes and other items used in motor manufacture to form the console. A



Relatives of employees during a tour of the works of Brook Motors, Ltd.

display of photographs showed the development of the company and the use of its products throughout the world. A feature was the first Brook motor wound in 1904 by the founder and present chairman, **Mr. E. Brook.** This was compared with its modern counterpart.

The directors of Muirhead & Co., Ltd., entertained their employees at a Christmas whist drive and dance held at Kennards Restaurant, Croydon, on December 6th. **Mr. and Mrs. Muirhead, Mr. and Mrs. Foll** and **Mr. and Mrs. Gibbs** welcomed the guests and there was a cabaret.

Obituary

Lord Rayleigh, whose death on December 13th at the age of seventy-two is announced, was president of the British Association for 1938 and from 1932 to 1939 was chairman of the executive committee of the National Physical Laboratory.

Mrs. H. C. Lamb.—We are very sorry to learn of the death on Saturday of Mrs. Ethel Lamb, wife of Mr. H. C. Lamb, who until his retirement in 1944, was chief electrical engineer and manager of the Manchester Corporation Electricity Department.

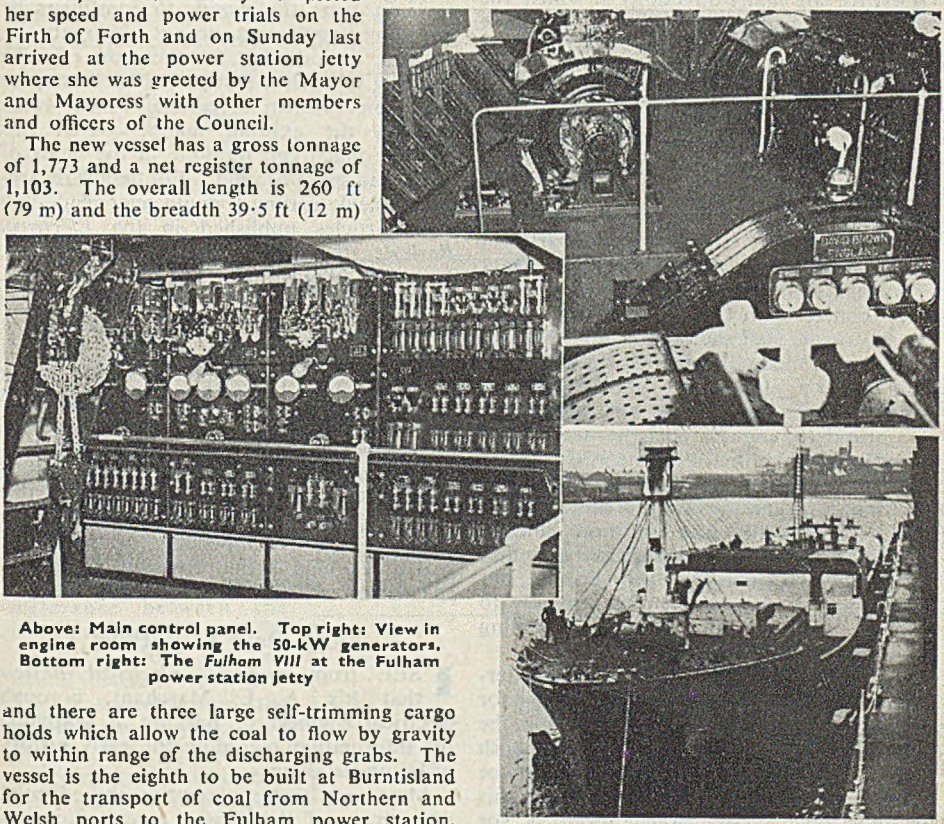
Mr. T. A. Nunwick, who for nearly twenty years represented the Midland Electric Manufacturing Co., Ltd., in the Yorkshire and Lancashire districts, died at Ainsdale on December 9th. Mr. Nunwick was eighty years of age, and had been living in retirement for many years.

New Fulham Collier

Addition to Power Station Fleet

THE motor collier, *Fulham VIII*, built by the Burntisland Shipbuilding Co. to the order of the Fulham Metropolitan Borough Council, has successfully completed her speed and power trials on the Firth of Forth and on Sunday last arrived at the power station jetty where she was greeted by the Mayor and Mayoress with other members and officers of the Council.

The new vessel has a gross tonnage of 1,773 and a net register tonnage of 1,103. The overall length is 260 ft (79 m) and the breadth 39·5 ft (12 m) and there are three large self-trimming cargo holds which allow the coal to flow by gravity to within range of the discharging grabs. The vessel is the eighth to be built at Burntisland for the transport of coal from Northern and Welsh ports to the Fulham power station. Many new features are embodied which are expected to increase efficiency and reduce cost of transport. There are also modern aids to navigation, including Metrovick radar equipment and a Decca Navigator.



Above: Main control panel. Top right: View in engine room showing the 50-kW generators. Bottom right: The *Fulham VIII* at the Fulham power station jetty

Propulsion is by twin vee-type Mirrlees, Bickerton & Day diesels giving 1,480 b.h.p. All the deck machinery is electrically driven and consists of windlass forward, warping winch aft, and a hauling winch for operating the hatch covers. An electrically driven steering gear is fitted over the rudder head and is operated by telemotor from the bridge. The auxiliary machinery comprises two marine type diesel engines developing 75 b.h.p. each driving a 50-kW generator. A third auxiliary diesel engine of 30 b.h.p. drives an 18-kW generator, air compressor and general service pump. The design of the vessel has been specially developed by the builders in collaboration with Mr. W. C. Parker, Fulham borough electrical engineer.

On the speed trials, which were run in the fully loaded condition, a mean speed of 11¼ knots was attained.

Canadian Electrical Trade

DURING the nine months to September, 1947, Canadian exports of electrical apparatus totalled in value $14,446,000, as compared with $16,947,000 during the corresponding period of 1946 and only $3,194,000 during the first nine months of 1938.

During the first half of 1947 Canada imported electrical apparatus from the United States valued at $32·5 million, compared with $24·4 million in the second half of 1946 and $21·2 million in the first half. The total for the whole of 1939 was only $12 million.

CORRESPONDENCE

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

Service to Consumers

THERE are many directions in which the electricity supply industry can improve its relations with consumers. The first contact with the industry is often made through the showroom assistant or representative, and as the job of these people is not just solely clerical it is essential that they should have a technical background in order to give reliable advice to consumers regarding the use of electrical appliances. The rest of the Consumers' Department staff (maintenance men, wiremen, meter fixers, meter readers, etc.), who also make direct contact with the consumers as well as the showroom staff should be enthusiasts.

The usual method of taking complaints by call, post, or 'phone, and sending out vans from a central depot works very well, but is it up-to-date enough for the most progressive industry in the country? Readers may have seen the news film dealing with the Cambridge car hire firm that has equipped its hire fleet with radio for more efficient working. Why do not electricity undertakings do the same? If they do not, our competitors the gas industry will probably do so first, and then lose no time in telling everybody how up-to-date they are.

The E.D.A. specification for the interchangeability of replacement parts for electric cookers, and B.S.S. 1195 for the dimensions of kitchen equipment are both very good moves toward improving service to the consumer, but more is needed in this direction. The most urgent need is for standardization of replacements for electric fires. I suggest that refractory fire bars should be made in one size and shape of bar only, but with choice of 1,000-W or 750-W element. Rod type elements for reflector fires should be made in two sizes only, with three loadings for each size:—(1) 10 in. long (diameter to be agreed) 500 W, 750 W and 1,000 W; (2) 14 in. long (diameter to be agreed) 750 W, 1,000 W and 1,250 W. By putting a threaded hole in the centre of each end cap and using detachable bolts with knurled heads for finger tightening it should be possible to use one type of element for either the clip-in type of fixing (without bolts) or for the thumbscrew type.

While the industry is suffering from the present plant shortage there is great scope for improving the service to consumers by installing appliances using electricity at off-peak periods, but for the most effective working of such a system it is necessary to have some system of control which works through the existing mains. Given this control, much can be done in the fields of water and space heating. For details regarding off-peak heating I would refer readers to three articles published in the *Electrical Review*: November 22nd, 1945 (p. 724), June 6th, 1939 (p. 872) and December 15th, 1939 (p. 757). In the last mentioned article Mr. W. L. Shand, M.I.E.E., mentioned a new type of thermal storage space heater of 2 kW and 3 kW size which was then being developed, and which, if successful could have been immediately put into production on a commercial scale. I presume that it was the war and not the failure of the experiments that prevented the appearance of this heater. Such a heater would now be very useful. The re-importing of soapstone would also help in the provision of off-peak space heaters. ICH DIEN.

Early Days at Barking

I SEE from to-day's *Electrical Review* that Mr. A. E. Marchant, borough electrical engineer of Barking, is searching for information regarding the early history of his undertaking.

May I say that representing the editorial department of the *Review* I went down to Barking one afternoon to prepare an illustrated article on the erection of the very small sets with which the system was started. After a tour of the salubrious neighbourhood I went to the little power station, then being laid out, in search of the young electrical engineer who had been appointed by the Council. I found him watching the operations of the plant erectors, and can see him as I write, in his holiday plus fours. It was none other than E. E. Hoadley at the beginning of his career. No doubt he could tell Mr. Marchant many things. Others are in the article that I published in the *Review*, early in the 1900's I think.

*Winchmore Hill, N.*21. ALBERT H. BRIDGE.

A.C. Network Analysis—I

Use of the Graphical Steady-State Method

By *Dr. L. Tasny-Tschiassny*
University of Sydney (Australia)

THE idea of finding by graphical methods the steady state voltage and current distribution in a network carrying a.c. of a given frequency is very tempting for two reasons, viz., graphical operations on vectors are more easily carried out and allow the problem to be visualized and the "potential diagram" of a network can be obtained by plotting in a diagram the endpoints of the vectors representing the difference in potential between the nodes of the network and an arbitrary point. If the endpoints of the vectors are marked by symbols referring to the nodes of the network, any line connecting two marked points represents the potential difference between the corresponding nodes of the network. Once the potential diagram of a network has been found, the current in any passive branch of the network can be computed immediately by dividing the potential difference between the ends of the branch by its impedance.

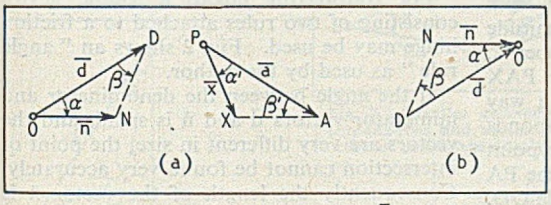


Fig. 1.—Construction of $\bar{x} = \frac{\bar{n}}{\bar{d}} \cdot \bar{a}$

Graphical methods are less accurate than numerical ones, but are quite sufficient for network analyses where, owing to component tolerances, only approximate results are required in general. Recent publications (a bibliography will will be included with Part II) have revealed the increasing interest shown by engineers in the graphical treatment of circuits, but so far only a few special cases have been dealt with, and the methods given are not always the simplest.

The author introduces the "angle rule" as a drawing implement and derives all constructions from two fundamental ones, viz., finding the sum of two vectors and finding the fourth proportional of three given vectors. The use of the "conjugate admittance" further simplifies matters.

As to symbols, the vectors representing impedances or admittances will be denoted by $\bar{Z}$ or $\bar{Y}'$ respectively and the vectors representing the conjugate complex values of admittances—which it is proposed to call "conjugate admittances"—will be represented by $\bar{Y}$.

The symbols Z, Y', and Y will be used for the magnitudes of these quantities. The vector representing the difference in potential between the points 2 and 1, i.e., the difference found by subtracting the value of the potential of the point 1 from the value of the potential of the point 2, will be denoted by $\bar{V}_{12}$ and its magnitude by V_{12}.

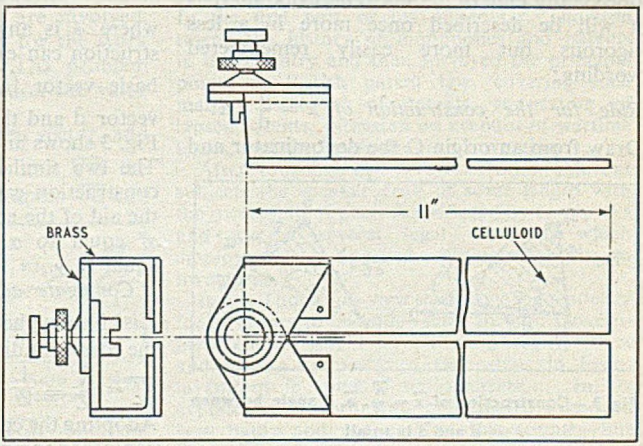


Fig. 2.—Angle rule

Fourth proportional of three given complex numbers.—Let $\bar{a}$, $\bar{d}$, and $\bar{n}$ be three given complex numbers. A fourth complex number is to be found which satisfies the equation

$$\bar{x} = \frac{\bar{n}}{\bar{d}} \cdot \bar{a} \quad \ldots\ldots (1)$$

or in other words the " basic " number $\bar{a}$ is to be changed in the ratio $\frac{\bar{n}}{\bar{d}}$.

The geometrical construction used in solving this problem is the following:— Assume an origin O (Fig. 1a) and draw from it the vectors ON and OD representing in magnitude and direction the complex numerator $\bar{n}$ and the complex denominator $\bar{d}$. Assume another point P and draw from it the vector PA representing in magnitude and direction the basic complex number $\bar{a}$. Construct on PA as base a triangle PAX similar to the triangle ODN in such a way that the denominator side OD corresponds to the basic number side PA and the point X is on the same side of the straight line PA as the point N is with respect to the side OD. Then the vector PX represents in magnitude and direction the complex number $\bar{x}$ given by equation (1).

In carrying out this construction the graphical operations remain the same, if instead of the tails of the vectors $\bar{n}$ and $\bar{d}$ their arrow heads are attached to the point O, as shown in Fig. 1b. The directions of the vectors $\bar{a}$ and $\bar{x}$ in the triangle PAX remain unchanged, because the vector $\bar{a}$ is multiplied by the ratio $\frac{-\bar{n}}{-\bar{d}}$.

Since the given construction is the foundation of any kind of graphical network analysis it will be described once more in a less rigorous but more easily remembered wording:

Rule for the construction of $\bar{x} = \frac{\bar{n}}{\bar{d}} \cdot \bar{a}$:—

Draw from an origin O the denominator and

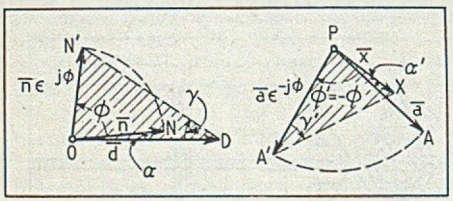


Fig. 3.—Construction of $\bar{x} = \frac{\bar{n}}{\bar{d}} \cdot \bar{a}$, if angle between $\bar{n}$ and $\bar{d}$ is small

numerator vectors $\bar{d}$ and $\bar{n}$, attaching to it either the two points or the two tails of the vectors; shift, turn, and reduce or enlarge the triangle formed by the two vectors $\bar{d}$ and $\bar{n}$, until the origin O coincides with the tail P of the basic vector $\bar{a}$ and the side corresponding to the denominator vector $\bar{d}$ coincides with the side corresponding to the basic vector $\bar{a}$; then the resultant vector $\bar{x}$ coincides with the shifted, turned, and reduced or enlarged numerator vector $\bar{n}$ and its tail is at P.

The easiest way of carrying out the construction is to transfer the angles, viz., to make $\alpha' = \alpha$ and $\beta' = \beta$. The point of intersection of the lines PX and AX then determines the end point of the resultant vector $\bar{x}$.

For transferring angles a simple device consisting of two rules attached to a friction hinge may be used. Fig. 2 shows an " angle rule " as used by the author.

If the angle between the denominator and numerator vectors $\bar{d}$ and $\bar{n}$ is small, and the vectors are very different in size, the point of intersection cannot be found very accurately. Consequently the length of the vector $\bar{x}$ is not determined accurately, though its direction is. In this case its length is either determined by the slide rule from the relation

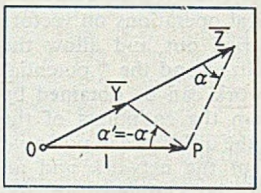


Fig. 4.—Conjugate admittance

$$x = \frac{n}{d} \cdot a \quad \ldots\ldots (2)$$

or the following is applied. If we write equation (1) in the form

$$\bar{x} = \frac{(\bar{n} \cdot \epsilon^{j\phi})}{\bar{d}} \cdot (\bar{a} \cdot \epsilon^{-j\phi}) \quad \ldots\ldots (3)$$

where ϕ is any convenient angle, the construction can easily be carried out with the basic vector $(\bar{a} \cdot \epsilon^{-j\phi})$, the denominator vector $\bar{d}$ and the numerator vector $(\bar{n} \cdot \epsilon^{j\phi})$. Fig. 3 shows an example of this construction. The two similar triangles are shaded. The construction can be carried out quickly with the aid of the angle rule by making the angles α' equal to α, ϕ' equal to $(-\phi)$, and γ' equal to γ.

Conjugate admittances.—If an impedance $\bar{Z}$ is given by the complex number $\bar{Z} = Z \cdot \epsilon^{j\theta}$, the corresponding admittance $\bar{Y}'$ has the value

$$\bar{Y}' = \frac{1}{\bar{Z}} = \frac{1}{Z} \cdot \epsilon^{-j\theta} \quad \ldots\ldots (4)$$

Adopting the convention of operating with the conjugate complex value $\bar{Y}$ of the admittance, defined as

$$\bar{Y} = \frac{1}{Z} \cdot \epsilon^{j\theta} \quad \ldots\ldots (5)$$

instead of using the actual admittance $\bar{Y}'$, $\bar{Y}$ will be called the conjugate admittance. By this procedure we gain the advantage that only the magnitude of a vector and

not its direction will be changed, if we change over from work with impedances to work with admittances. The magnitude of the conjugate admittance can be found either on the slide rule or by the construction shown in Fig. 4, i.e., by making the angle α' equal to $(-\alpha)$. All rules holding for work with admittances only, such as the rules for parallel connection, series connection, star-delta, or delta-star transformation, hold also for conjugate admittances. But if voltages (or currents) and admittances are involved, some modification is necessary for the work with conjugate admittances. The problem reduces to finding by construction the value $\overline{X} = \frac{\overline{Y'n}}{\overline{Y'd}} \cdot \overline{T}$, where $\overline{T}$ is a given vector, and instead of the admittances $\overline{Y'n}$ and $\overline{Y'd}$ the corresponding conjugate admittances $\overline{Yn}$ and $\overline{Yd}$ are given. In special cases either $\overline{Y'n}$ and $\overline{Yn}$ or $\overline{Y'd}$ and $\overline{Yd}$ may be real and equal to unity. Fig. 5 shows the relevant construction. There is no need to draw the actual admittance vectors $\overline{Y'n}$ and $\overline{Y'd}$, but the construction described under the heading of the fourth proportional of three given complex numbers (above) can be applied, with the modification that the angles α' and β' are plotted on the side of the vector $\overline{T}$ opposite to that on which they are plotted when working with actual admittances.

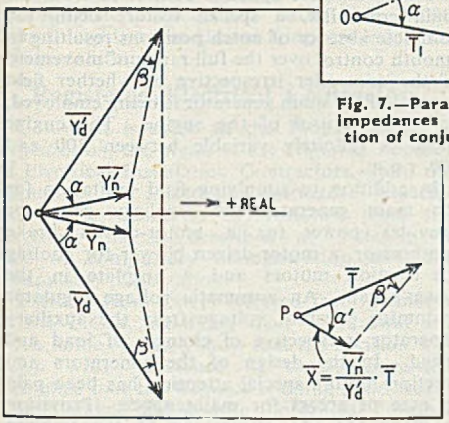


Fig. 5.—Finding $\overline{X} = \frac{\overline{Y'n}}{\overline{Y'd}} \cdot \overline{T}$, if $\overline{Yn}$ and $\overline{Yd}$ are given

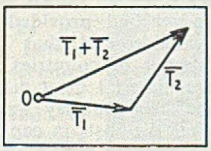


Fig. 6.—Sum of two vectors

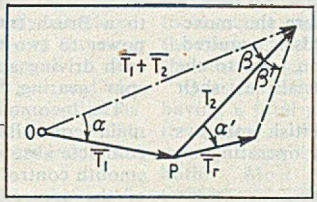


Fig. 7.—Parallel connection of impedances and series connection of conjugate admittances

Series connection of impedances and parallel connection of conjugate admittances.—Simple vector addition is applied as shown in Fig. 6. The symbol $\overline{T}$ stands for either $\overline{Z}$ or $\overline{Y}$.

Parallel connection of impedances and series connection of conjugate admittances.—The resultant value $\overline{T_r}$ is given by the formula :

$$\overline{T_r} = \frac{\overline{T_1}}{\overline{T_1} + \overline{T_2}} \cdot \overline{T_2} \quad \ldots\ldots\ldots \quad (6)$$

The relevant construction is shown in Fig. 7. First the vector $(\overline{T_1} + \overline{T_2})$ is found and then the angles α' and α and β' and β are made equal. If the directions of $\overline{T_1}$ and $\overline{T_2}$ nearly coincide, the rules for the construction of $\bar{x} = \frac{\bar{n}}{\bar{d}} \cdot \bar{a}$ can be applied. If more than two values of $\overline{T}$ come into consideration the construction of Fig. 7 is carried out several times. It is also possible to convert all impedances into conjugate admittances or *vice versa*, and to apply the simple vector addition construction of Fig. 6.

Patent Law

AT a meeting in London of the Association of Supervising Electrical Engineers on Tuesday last DR. A. P. THURSTON, M.B.E., read a paper on "British Patent Law and the Importance of Inventions to National Progress." In the first part of his paper Dr. Thurston traced the history of monopolies and patents in this country and then surveyed the principal points in British patent law, covering such matters as terms of patents, restoration of lapsed patents, extension on account of wartime losses, and the International Convention.

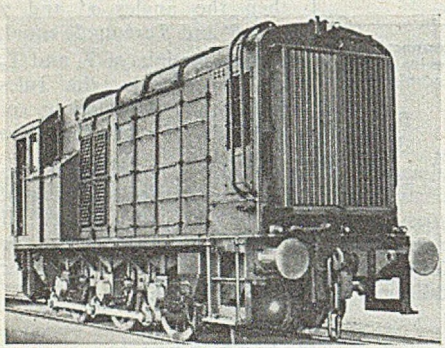
After touching upon various other relevant subjects the speaker dealt at some length with the ownership of patents produced by employees and quoted several legal cases in which employers had disputed employees' rights to inventions.

In Dr. Thurston's view the increasing tendency for inventors to be under some form of Government control might have a discouraging effect and it was necessary to take steps to foster inventions in spite of nationalization. In his experience, Governments had treated inventors very badly and not only in this country but throughout the world much inventive talent had been suppressed, lost or stolen. He thought that the time was ripe for the appointment of a commission on patent law and awards to inventors representative of men having the inventive faculty and in sympathy with the development of invention rather than representative of Government Departments.

Diesel-Electric Shunting Locomotive

THE Brush Electrical Engineering Co., Ltd., has produced its first prototype diesel-electric shunting locomotive. It is designed for shunting operations in large marshalling yards and is equally suitable for use in the yards of large industrial undertakings where the movement of heavy loads at low speeds is required. This locomotive is, at present, on loan to the L.N.E.R. and is undergoing trials at their Stratford yards.

It is the first shunter for British railways which incorporates an oil engine operating on the two-stroke principle and it is equipped with compressed air starting in place of the more usual electric starting. The locomotive is of the three-axle type and weighs 51 tons. It is capable of a starting tractive effort of 32,000 lb, which can be maintained up to a speed of 2 m.p.h. The power unit comprises a standard Petter " SS4T " Superscavenge oil engine rated to give 400 b.h.p. at 600 r.p.m. direct coupled to a Brush traction generator, which supplies power to two nose-suspended traction motors, each driving an outer axle by double reduction spur gearing.



Brush diesel-electric shunting locomotive

The locomotive speed is controlled from the main controller, a special feature being the complete absence of notch positions resulting in smooth control over the full range of movement of the controller irrespective of whether field control of the main generator is being employed, or speed control of the engine. The engine speed is infinitely variable between 300 and 600 r.p.m.

In addition to supplying field excitation for the main generator the auxiliary generator provides power for a motor-driven brake compressor, a motor-driven blower for cooling the traction motors and a hotplate in the driver's cab. An automatic voltage regulator maintains constant voltage from the auxiliary generator irrespective of changes of load and speed. In the design of the generators and traction motors special attention has been paid to ease of access for maintenance. Provision is made for the de-meshing of the traction motor gears in the event of its being required to haul the locomotive from one place to another at speeds above 20 m.p.h. A 12-cell lead-acid battery is employed for lighting and is charged by a small dynamo driven from the main engine.

Engineering Exports

MR. G. R. STRAUSS, Minister of Supply, was the principal speaker at a luncheon arranged by the British Engineers' Association on December 11th. LT. COL. H. RIGGALL, president of the B.E.A., in proposing the toast of the Ministry of Supply, expressed manufacturing engineers' concern at the nature of some of the capital cuts. Referring to export trade he said that if certain vital intermediate products were quickly made available the factories would be cleared of equipment for overseas and more dollars brought to this country. He thought that the distribution of steel could be facilitated by allocations to individual firms based on forecasts of the requirements from that section of the industry. Particular care should be taken not to sever our commercial ties with Empire markets.

MR. STRAUSS, in replying, made mention of the leading part played by the engineering industries in British export trade and quoted figures to show that they had a fine record. In 1938 the value of exports from the machinery, electrical goods and vehicle industries was £9·4 million a month ; in October this year it was £39 million which, allowing for the rise in prices was equivalent in volume to 194 per cent of the 1938 figure.

Discussions with the various sections of the industry had shown that the 1948 targets would be reached provided the raw materials were available and that import restrictions in a number of countries were relaxed. Steel was the material most difficult to supply, although the steel industry was doing very well. Even after the costs in capital construction had been made there would still be insufficient steel to meet all export programmes in full. It was therefore all the more important that as much as possible should be sent to markets from which there would be an immediate return in food and raw materials, especially the United States, Canada, Argentina and South Africa.

The Government would do all it could by negotiations with foreign countries and by wise husbanding of home resources to help the engineering industry to surmount its difficulties and lay the foundations of a prosperous future.

COMMERCE and INDUSTRY

Next Year's B.I.F. Traction Equipment for Brazil.

THE *Board of Trade Journal* says that allocation of space in the 1948 British Industries Fair (May 3rd-14th) is now practically completed and exhibitors will be notified during the next week or so. The demand for space in the London sections exceeded by 35 per cent the total area available and similar conditions prevailed in Birmingham. More than 3,000 firms in eighty-seven United Kingdom industries will be exhibiting.

Registered Electrical Contractors

Comment is made in the January issue of *Registration*, the organ of the National Register of Electrical Installation Contractors, upon the request of the Electrical Contractors' Association to its members to withdraw from the Register; this is described as "clearly a case of compulsory de-registration and not compulsory registration."

Extracts from letters received from members of the E.C.A. signifying their withdrawal are given, some of which show that the decision was taken with reluctance as those concerned recognize that the Register is doing good work.

It is stated that despite the critical national position at the moment there is no cessation of applications for registration although, naturally, the rate has slowed down in step with all business of a non-export character. At December 1st there were 1,045 contractors on the Register, only 112 fewer than a year earlier despite withdrawals of E.C.A. members. Fifty-two applications for registration were at present under consideration.

L.E.P.'s Soil Sterilizing Demonstration

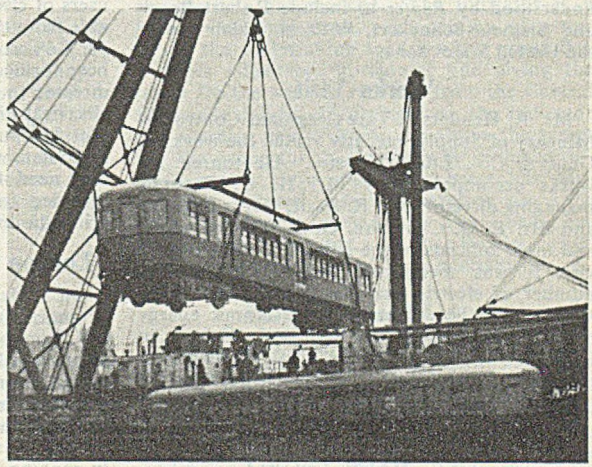
An electrode soil sterilizer of 4-cwt capacity developed by the Testing Department of the Lancashire Electric Power Co. was demonstrated at the company's Ormskirk premises on November 26th and 27th to representative market gardeners drawn from various parts of its area.

In developing the new model the company had in view the commercial grower's need for an electrode type soil sterilizer of larger capacity than those generally procurable at present. The demonstration was staged not with a view to putting a finished product before market gardeners (owing to the variable factors as between different classes of soil it is difficult to obtain consistent results with the electrode method) but to obtain their views on the equipment at its present stage of development, and to associate more closely the requirements of the commercial grower as distinct from those of the amateur gardener.

Questionnaires were completed by growers having a total glass area of 269,000 sq ft. All the growers, with one exception, used some means of sterilizing, either steam or chemical or both. Most considered that the maximum temperature should not exceed 210 to 212 deg F, as otherwise the soil would be likely to become sterile. The general view was that after sterilizing in the manner demonstrated soil would be suitable for use in from one to three days' time. If satisfactory sterilization could be accomplished at an approximate price of 1d. per cwt it would be a commercial proposition. The company is continuing the investigation in the light of this and other experience, and would be pleased to exchange information with other undertakings or manufacturers who are interested in this field of inquiry.

Exporting Electric Trains

At Birkenhead Docks on December 8th an electric train unit, the first of a contract for thirty which is being carried out by the Metropolitan-Vickers Electrical Co., Ltd., was taken aboard en route for Brazil, where it will run on the Central Railway's Rio de Janeiro suburban services. The electrical equipment is being manufactured by this company mainly at its Sheffield works, the coaches being built by the Metropolitan-Cammell Carriage Co. as



One of thirty Metrovick electric train units for Brazil being taken aboard at Birkenhead Docks

sub-contractor. This is a repeat order, sixty train units of this kind having been supplied for the original electrification scheme which was carried out by the same British manufacturers and completed in 1936. Each train unit consists of one motor coach and two trailer coaches.

Increased Copper Consumption

In the course of his speech at the annual meeting of the Copper Development Association last week, the chairman (Lt. Col. the Hon. R. Preston, D.S.O.), said that the upward trend in the consumption of copper continued; this year imports of primary copper into this country had been at the rate of 350,000 tons annually, notwithstanding many restrictions in the use of the metal. As one instance of such restrictions, he mentioned the limitation in the installation and use of domestic and semi-domestic electrical equipment caused by the inability of the electricity supply authorities to accept increased loads. These causes it might be hoped would ultimately be removed and a marked and continuing increase in the use of such appliances might then be expected.

Liquidation of German Trusts

The first orders to Germany's great steel and electrical trusts to sell their surplus assets under the decartelization laws promulgated last February will be announced in the next few days by British and American Military Government. The cartels immediately concerned are understood by *Reuter* to include Robert Bosch and Siemens-Schuckert, both of which are in the United States zone.

Works Visit

Mr. R. Henderson-Tate (Regional Controller, Ministry of Supply) recently visited the works of Gent & Co., Ltd., Leicester. He toured the works accompanied by Mr. H. K. Parsons, managing director, Mr. R. Swift, works director, and Mr. E. O. Chapman, clock sales manager, and other officials of the company. During his visit it was mentioned that a considerable number of electric impulse clocks were being supplied by the company to the atomic energy research stations at Harwell and Risley. In addition to those for normal timekeeping purposes, other clocks, for incorporating in parts of equipment, and a number of process timers were also being supplied.

New Welsh Factory

The Deputy Lord Mayor of Cardiff (Councillor Dr. J. Walker), representing the Lord Mayor and accompanied by Mrs. Walker, was the guest of honour at a reception and dinner given by the chairman and directors of the Hopkinson Electric Co., Ltd., at the Angel Hotel, Cardiff, on December 6th, to inaugurate the company's new factory on the outskirts of the city. Proposing the toast of "The New Industries of Wales," Mr. Marquand, Paymaster General and M.P. for Cardiff East, said that the company was to be commended for transferring from London an industry of the greatest importance. The chairman, Mr. L. D. Bennett, stated that the company's resettlement scheme was the largest of those in the South Wales area and would, when completed, give employment to over two thousand people. Other speeches were made by the Deputy Lord Mayor, Sir Frederick J. Alban, Brigadier-General R. F. Legge, Mr. B. M. Smith (Regional Controller, Ministry of Supply) and Councillor G. Williams. The toast of the chairman was proposed by Mr. N. G. Lancaster. On the previous evening a staff dance had been held at the Drill Hall. The chairman and most of the directors were present and over 540 of the staff and their friends attended.

Canadian Import Duties

A list of tariff amendments made by the Canadian Government under the Geneva Tariff Agreement appears in the *Board of Trade Journal* of December 13th. It is seen from this that several classes of electrical goods are affected, but while generally the British preferential duty remains as before, in all cases the most-favoured-ration rate is reduced, thus narrowing the preferential margin.

Cookery Book

A book of recipes with hints and advice for users of electric cookers, price 3s. 6d., is obtainable from the Landwood Distributing Co., Ltd., 18, Cowcross Street, London, E.C.1, which has been formed with Miss Ester Purnis as managing director to market the book for sale within the electrical industry. This edition supersedes that first published in 1931; it has been brought up to date with regard to present food shortages and need for fuel economy, directions being included for 18 meals cooked entirely on the griller-boiler.

London School of Domestic Science

On Friday last week diplomas were presented to successful students in the examinations of the London School of Electrical Domestic Science, at Imperial Court, Basil Street, Knightsbridge, London, S.W.3. The certificates were presented by Mr. V. W. Dale, general manager and secretary of E.D.A., who was introduced by Mr. S. C. Hurry, a director of the School. In making the presentations Mr. Dale referred to the difficulties which the students had encountered in the past year owing to economies in the use of electricity. He told them not to be depressed by the abnormal conditions. The electricity supply industry had been in reverse for eight years, and economies would have to continue for another year or two, but the time would come when there would be an abundant supply once again and the industry would be

able to meet the domestic needs of the country. When that time came the students would have plenty of scope for their activities.

During the spring term there will be evening classes at the school in cookery (household and advanced), laundrywork and housewifery, electricity theory and demonstrating. Particulars can be obtained from Mrs. M. H. Bain, the principal.

London Company to Mine Queensland Coal

Reuter reports from Brisbane that Mr. E. M. Hanlon, Prime Minister of Queensland, signed an agreement on December 11th with Mr. T. J. Hirst, representing the Electric Supply Corporation (Overseas), for the development of the Blair Athol open cut coalfield in Central Queensland. The agreement, estimated as worth £18,000,000, represented about £12,000,000 to work the coalfield—said to be capable of producing the cheapest coal in the world—and £6,000,000 to build a railway to the coast for the export of the coal. The Queensland Parliament recently passed a Bill authorizing the scheme. The coal is only a few feet below the surface, and the company aims at producing at least 2,000,000 tons a year for export.

The company was recently formed by the Electric Supply Corporation, Ltd., and the directors include Mr. A. J. Fippard and Sir John Dalton.

Belfast Engineer's Salary

The General Purposes Committee of the Belfast Corporation now recommends that the salary of the electrical engineer and manager, Mr. W. J. McC. Girvan, shall be fixed in accordance with the 1941 agreement of the National Joint Committee of Local Authorities and Chief Engineers. The Committee had previously recommended an increase of 7½ per cent (£150). The new decision will mean an increase of approximately £500 on the present salary of £2,000.

Coal Price Increase

A further increase in the price of coal, by 2s. 6d. per ton, was announced this week by the National Coal Board. It is said to be necessitated by the extra cost of wages following the extension of working hours at overtime rates and by the raising of the wages of lower-paid mineworkers.

E.D.A. Scottish Exhibition

An exhibition organized by the Scottish Area Committee of the British Electrical Development Association was opened at Glasgow on December 10th by Mrs. A. E. MacColl, wife of the deputy chairman of the North of Scotland Hydro-Electric Board. This exhibition will be a permanent part of the Scottish Building Centre at 425, Sauchiehall Street. Among the speakers was Mr. V. W. Dale, general manager and secretary of E.D.A., who welcomed the idea of such exhibitions as a means of bringing together the architect and the electrical engineer. He said if the Government did not foolishly curtail the development programme which the electrical industry had in hand, the industry would be on top of the hill again in 1951 and would be able to meet all demands. The £450 million programme now in hand would provide an additional 11,000,000 kW. Coal was now in better supply, and the industry had been assured that there would be no coal crisis this winter.

Fuel economy is the keynote of the display, which includes an electric kitchen unit, including a refrigerator, cooker, combined dish and clothes washing machine, drying cupboard, air-conditioning plant, and radio loudspeaker unit.

Load-Spreading Indicator

Ipswich has been divided into five districts, each representing 20 per cent of the maximum demand, for load-spreading purposes. Each district in turn minimizes its electrical demand on one day from Monday to Friday, advancing one day every week. If the undertaking's load exceeds the allotted target, the supply to the appropriate district will if necessary be cut off. Consumers are kept informed of the success of their group's efforts by daily reports in the local Press and by an indicator exhibited at the town hall together with a map on which the districts are marked. The indicator is a five-column barograph, each column of which shows the undertaking load for the group-day with an adjustable horizontal line giving the target for the week as received from the Central Electricity Board. Prominent on the indicator is a warning that if loads are above the target line the group for the day may be switched off. Load curves show that the scheme has considerably reduced demand, although the kWh have been almost unchanged. The scheme has been devised by Mr. G. A. Vowles, chief engineer and manager of the undertaking.

Edison Swan Merger

The board of Associated Electrical Industries, Ltd., announced last week that with effect from January 1st next, the Edison Swan Electric Co., Ltd., will absorb two other subsidiaries, Edison Swan Cables, Ltd., and Cosmos Manufacturing Co., Ltd. The name of the Edison Swan Electric Co., Ltd., will be unchanged.

Bathroom Fatalities

Recording a "Death by misadventure" verdict at Chorley on December 9th on Mrs. Elsie Cherry (32), who died from touching an electric fire in the bathroom, the Coroner said that there were two lessons to be learned

from the mishap: the danger of using two-pin plugs and the inadvisability of having a radiator in a bathroom. The radiator was connected by an adaptor to a wall light. Mr. H. Tasker, of the Lancashire Electric Power Co., said that the metal back of the radiator had severed the rubber insulation of a wire, causing a short circuit. This made the radiator alive and Mrs. Cherry had touched some part of it. The fire should have been earthed.

An electric heater which had fallen into the bath water caused the death of Mr. W. E. Huggett, headmaster of Rudgwick School, Sussex. It was suggested at the inquest that he stood up in the bath to place the heater on the window ledge and then touched the flex, bringing the heater down into the water. A verdict of " Accidental death " was recorded.

Dissolutions of Partnership

Messrs. A. T. Izzard and A. E. Martin, carrying on business as contractors to radio and electrical industries at Park Lane Corner, High Road, Broxbourne, Herts, as Broxlea Products, have dissolved partnership by mutual consent. Mr. Izzard will attend to debts and carry on the business under the present title.

Messrs. H. Norris and F. J. Hyde, carrying on business at 78, High Street, Leagrave, Luton, Beds, as Leagrave Radio and Electrical Stores, have dissolved partnership by mutual consent. Mr. Norris will attend to debts and carry on the business.

Trade Publications

Fractional H.P. Motors, Ltd., Rookery Way, Hendon, London, N.W.9.—Priced folder illustrating the moulded " Sylentflo " hair dryer.

Silvercrown, Ltd., 178, Goswell Road, London, E.C.1.—Technical brochure on types and sizes of rectifiers for electro-plating shops.

Newbold & Bulford, Ltd., 36, Clerkenwell Road, London, E.C.1.—Priced leaflet on the " Lenslite Hawk " illuminated magnifier for reading maps, plans, etc.

Wembley Electrical Appliances, Ltd., Exhibition Grounds, Wembley Park, Middlesex.—Catalogue with separate price sheets of " W.E.A. " fluorescent lighting fittings.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—Stock list of starters and accessories.

DS Plugs, Ltd., Ordsal Electrical Works, Manchester, has issued a gaily coloured booklet parodying well-known nursery rhymes with some amusing illustrations.

Calendars and Diaries

" Still Waters " is the title of a view of a placid lake adorning the calendar of the D.P. Battery Co., Ltd.

The pocket diary received from Thomas Bolton & Sons, Ltd., has a neat dark-red leather binding. There is a section, separately bound, containing useful data including tables of copper, bronze and cadmium-copper wire, and copper and brass sheets and tubes. Reference to the various tables is facilitated by an index.

The useful wall calendar of Metway Electrical Industries, Ltd., has large monthly sheets attached to a card illustrating some of the company's products.

The calendar of Wholesale Electrical Components, Ltd., has monthly slips mounted on a strong card.

An electrical pocket diary, a page-a-week desk diary and an illustrated wall calendar have been received from Rich & Pattison (Birmingham), Ltd.

Trade Announcements

The Overseas Engineering Co., Ltd., has transferred its European and South American Departments to 27, Watling Street, E.C.4. (telephone: City 2461/2). All communications, however, should still be addressed to the head office, 200, Bishopsgate, E.C.2, as before (telephone: Bishopsgate 9878).

Motor Installation Booklet

An illustrated booklet of vest pocket size and 104 pages has been published at 1s. by Higgs Motors, Ltd., Witton, Birmingham, 6. Its main contents are practical hints on installation of motors and advice about maintenance; also technical data, relevant I.E.E. regulations and starter connection diagrams for different types of machines.

New Year Holidays

The works of Bruce Peebles & Co., Ltd., will close on December 31st and re-open on January 6th.

Price Alterations

Belling & Lee, Ltd., ask us to state that since their advertisement on page 46 of our December 12th issue was passed for press some of the prices given have been increased. The items are L 1005, L 1001/1W and L 1004/11.

INFORMATION DEPARTMENT

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

" Elmco " electric fires.

" Komet " imitation-coal fire.

" Even-Glow " lamps.

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

Equipment in India

How Tropical Climate Affects Materials and Machines

SCHEMES are in hand for the employment of electric power on a "vast scale" in India. The great rivers are being harnessed for the two-fold purpose of irrigation and power generation; a large proportion of the electricity to be so produced will be employed to drive irrigation pumps many hundreds of miles away from the rivers.

MR. R. ALLAN (G.E.C. (India), Ltd.), believes that immediately in the wake of this "great surge" of electrical development there is likely to follow widespread breakdown of equipment; the reasons are stated in the paper which he prepared for the Institution of Electrical Engineers and was presented for him by MR. R. O. ACKERLEY at a meeting in London last week. It cites numerous typical examples of failure of machines and materials due to climatic effects. Remedies are suggested in most cases, some definite recommendations are made and certain types of plant and methods of installation which are quite unsuited to India are indicated.

"Incredulous" Designers

Designers tend to be conservative and, what is worse, incredulous, so the object of the paper is to awaken manufacturers to the fact that a tropical climate is a formidable factor in the planning of really reliable goods for export.

The chief factors to be contended with are the lack of skilled labour for proper maintenance and the repair of machines. The educated cannot do practical work because of their religious or social status, while the uneducated understand very little of their work.

Temperatures are excessive, variations extreme and the strength of the sunlight makes exposed structures and tools too hot to be handled between 11 a.m. and 4 p.m. Many kinds of insulating materials lose their "nature" and tend to disintegrate. In some cases small motors need to be of 50 per cent greater rating than for equivalent purposes elsewhere.

There is 2·6 times as much moisture in the air in India as in Britain. In this connection the author suggests two theories in explanation of insulating material faults and flash-over which seem to occur for no apparent reason.

Special problems are created by the prevalence of salt-laden atmosphere. The necessity for ventilating plant to prevent its overheating makes it almost impossible to avoid the dust nuisance. It would be advisable to air-condition certain sections of large installations. Rodents are a menace to rotating machines and insects destroy insulation.

The paper concludes with brief comments on different systems of wiring. The author's experience of weatherproof v.r. cable causes him to recommend its use exclusively in place of ordinary cable in all conduit systems. He is of the opinion that steel conduit might be replaced to advantage, in India, with tubes drawn from one of the synthetic resins or bakelized materials.

DISCUSSION

In opening the discussion MR. J. F. SHIPLEY (Mackness & Shipley) said that conditions in the hold of a ship for part of the voyage to the tropics were very often similar to those on the site. Manufacturers, speaking generally, could not afford to make two different types of product, one for home use and one for export, so that many first-class manufacturers were producing equipment suitable for world-wide use.

In the tropics, condensation took place at much smaller differences of temperature than in this country. On the other hand, intense dryness caused troubles; insulation shrank and tended to disintegrate when the moisture returned. It was very difficult to find materials which would stand up to cycles of contraction and drying followed by expansion and swelling. All forms of life could give trouble, from fungus which grew on metal in the presence of moisture and the termites which would eat through the lead sheathing on cable to the European who went abroad and did not know how to handle his men properly.

A plentiful supply of high-pressure air would distribute heat, absorb a good deal of moisture, re-evaporate any moisture which condensed on the apparatus, and disturb all insect life. One of his clients in West Africa had an automatic hydro-electric station with standard equipment which had been kept in operation by this means since 1939 without cessation or breakdown due to insulation failure.

Training Labour

LT. COL. C. H. BRAZEL (I.E.E. representative, Ceylon), suggested that if the general standard of skill of labour in the tropics was low, it was largely due to the absence of proper apprenticeship schemes; where such schemes were provided it was possible to train useful workmen. He emphasized the need for more liberal clearances in electrical equipment for service under humid conditions. The tendency to cram as much equipment as possible into the smallest possible space added to maintenance difficulties. Many troubles could be avoided by the water-repellent properties of silicone-treated materials.

MR. A. H. YOUNG (Edmundson's Electricity Corporation), referred to violent contraction and expansion on overhead line insulators, to lightning, to corrosion problems with magnets

and relays and to difficulties of lubrication, which was an entirely different problem in the tropics, requiring different viscosities from those used at home.

The Institution could serve a useful function by circulating to members overseas copies of the new codes of practice, so that modifications could be suggested to cover their application to tropical countries.

MR. H. D. MCLAREN (Admiralty), considered that manufacturers should provide explicit erection and running instructions, and prove at their works the ability of equipment to meet specified requirements. If rapid deterioration of Class A insulation was to be avoided, material incorporating it should be carefully designed to avoid any hot spots. When specifying electrical equipment for the Singapore Naval Base the temperature rise was restricted to 35 deg C and experience proved the wisdom of that safeguard.

The lead casing of cables was not proof against white ants; those at Singapore had over the lead a thin layer of brass tape, which seemed to have been successful.

Sunshades for Outdoor Plant

MR. J. M. GOODALL (B.T.H.), who has just spent a year in India, mainly in connection with hydro-electric installations, advocated sunshades, consisting of an asbestos cover on a steel frame, for self-cooled transformers placed out of doors. Bakelized paper insulation in transformers and switchgear was troublesome in India and could with advantage be cleaned, dried out and revarnished every twelve months. Heaters in the air space above the oil in outdoor oil circuit-breakers, not in the oil itself, kept the air space 10 deg above the surrounding air to reduce the chance of condensation.

The Indian Government engineers were considering asking the porcelain makers to make a combined thermal, mechanical and electrical test on overhead line insulators.

MR. T. JACKSON (Preece, Cardew & Rider) said that some of the blame for unsuitability of apparatus must fall on the B.S. Specifications, which were not nearly severe enough. A great deal of trouble in erection was caused by manufacturers who did not send out sufficient instructions to enable even their own people to connect up special instruments which, perhaps, had been bought from outside. The use of linseed oil should have been stopped years ago and the use of laminated bakelite, cut from blocks or strips, should be avoided for high voltage; it must be moulded and, in any case, a great deal more must be done with bakelite before anything really satisfactory became available.

He concluded with a compliment to British manufacturers, particularly of heavy plant. He had visited Hong Kong and Malaya two years ago and the way in which the plant there had stood up to the treatment it had received from the Japanese and without any maintenance was a cause for pride.

MR. C. F. MAYSON suggested that it would be in 10 to 15 years' time, when all the new hydro-electric and other schemes were in full working order, that the problem of skilled labour might have to be faced in India and elsewhere. There was a lack of technicians. The Anglo-Indians, whom he had found to be good practical, technical men, might fill the gap to some extent.

MR. H. D. SYMONS (H. D. Symons & Co.), suggested that a simple way of testing materials for their resistance to climatic conditions was to take, say, 5 cm^3 of the material, put it in a glass tube 6 in. (15 cm) in length with 5 cm^3 of water and subject it to a temperature of 100-105 deg C for 100 hours. If at the end of that time nothing much had happened to it, it could be regarded as a safe material for use in the tropics.

Specifications might have to be reconsidered by the B.S.I. and the E.R.A. should evolve tests which would enable British manufacturers properly to "tropicalize" their plant and apparatus.

MR. E. L. HOYLE (G.E.C.), replying to the discussion, said that more trouble could occur through bad packaging of insulating materials in transit than through conditions on arrival. The standardization of equipment for world-wide markets was a complex problem and economics must not be left out of account. There was need for the development of a protective grease for contacts, containing a fungicide. While a certificate that gear had passed certain tests was no guarantee that it would stand up to the conditions of a particular site, the provision of such a certificate would be a step in the right direction.

E.D.A. Activities

ON December 8th the South-East and East Area of E.D.A. gave a display of educational films for directors of education and chief education officers from the area at the Connaught Rooms.

About fifty officers saw the Association's four new educational films, "Generation of Electricity," "Transmission of Electricity," "Simple Household Electrical Repairs," "The Electric Iron," and the film "Can We Be Rich?" Members of the Joint Area Co-operation Committee, representing the Eastern, the Greater London and the Southern Committee, were present, Mr. J. R. Jones, the Greater London Committee chairman, presiding. He was supported by Messrs. S. J. C. Ellis (Southern chairman) and G. P. Dixon (Eastern chairman). Mr. V. W. Dale, general manager and secretary of E.D.A., spoke on the films which were well received and were followed by a lively discussion.

On December 15th-17th the South-East and East England Area is holding a short course on refrigerator maintenance for members of the maintenance staffs of electricity undertakings in the area, at the Kingsway Hall, W.C.2.

ELECTRICITY SUPPLY

Reducing Dust Emission at Kirkstall. Access to Keadby Site.

Accrington.—HUNCOAT POWER STATION.—Early in February work is due to start on preparing the site for the new Huncoat power station at Accrington. The Corporation is seeking sanction to divert Altham Lane, a main road, and three other paths on the site.

Barrow-in-Furness.—POWER STATION CONSULTANTS.—Merz & McLellan are to act as consultants for the proposed new power station.

Brierfield. — STREET LIGHTING. — Improved electric lighting of several main roads will cost £2,140.

Brighouse.—PROPOSED REBATE.—At the December Council meeting Councillor F. L. Kilby said that the refund due to Brighouse under the settlement with the Yorkshire Electric Power Co. was £7,336. It was proposed to grant a rebate to consumers equal to one-sixth of their total charges for the four quarters to September 30th last. That was the concluding stage of a matter which had been going on for ten or twelve years.

Bristol.—STREET LIGHTING SWITCHES.—A report submitted by the Public Works Maintenance Committee recommends the use of time switches for electric street lamps. There are 10,639 electric lamps manually controlled costing £27,600 yearly in wages. The cost of installing automatic control is given as approximately £47,000 and the annual cost of repayment and maintenance is estimated at £16,000.

Chesterfield.—NEW SUBSTATION.—The Corporation Electricity Committee is to provide a substation at Brampton, together with a new h.v. feeder from Bobbin Mill Lane substation at a cost of £10,721.

SUPPLY TO BUNGALOWS.—A scheme for supplying electricity to 63 aluminium bungalows in Grangewood Road will cost £10,726.

Coventry.—DEARER ELECTRICITY LIKELY.—Electricity consumers in Coventry will probably have to pay an average of 20 per cent more for their supply from next March. The accumulated deficiency by the end of the financial year is expected to reach £274,000.

Douglas (I.O.M.).—ADDITIONAL PLANT AND CHANGE-OVER.—The Town Council has approved a scheme for the installation of a 5,000-kW turbo-generator and two boilers at the Pulrose power station as recommended in a special report submitted by the borough electrical engineer (Mr. C. Anderson). The consulting engineers, Messrs. Kennedy & Donkin, estimate that the cost would be of the order of £250,000 to £300,000. A second part of the report deals with a scheme for a progressive change-over from d.c. to a.c. over a period of ten years at an approximate cost of £388,900.

Grimsby.—SURCHARGE TO REMAIN.—A further attempt made at a meeting of the Electricity Committee to secure the abolition of the 15 per cent surcharge on electricity accounts was defeated by 9 votes to 3. The chairman, who opposed the removal of the surcharge, said that if it were abolished the undertaking would lose £2,500 in the current year and the new Electricity Board's decision regarding tariffs in the area might be adversely influenced by "such an imprudent business move."

Holborn.—FLUORESCENT LIGHTING FOR KINGSWAY. — An experimental system of fluorescent lighting is now being tried out by Holborn Council in Kingsway. The General Electric Co., Ltd., and the British Thomson-Houston Co., Ltd., are each erecting six 25-ft columns between Sardinia Street and the Stoll Theatre, with four columns on each side of the roadway and four down the centre. These columns will carry the horizontal fittings containing 80-W tubes.

Hoylake.—SWITCHGEAR.—The U.D.C. is to seek permission to borrow £43,000 to install new switchgear in the electricity works.

Kettering.—SUPPLY TO ESTATE.—The Electricity Committee proposes to provide new feeders, substation, etc., for supplying electricity to a new housing site off Rockingham Road, Corby, at an estimated cost of £26,810.

Leeds.—REDUCING DUST EMISSION.—It was reported at the monthly meeting of the City Council that the city electrical engineer (Mr. F. Nicholls) had submitted proposals for minimizing dust emission from Kirkstall power station. Steps have been taken to decrease the steaming hours of No. 1 boiler house (rendered possible by the introduction of load spreading), and dust emission will be reduced still further when plant extensions, which are being expedited as much as possible, are completed in the New Year. The proposals were referred to a small deputation for consideration and report, with authority to visit undertakings in other towns where grit arresting plant is installed.

Lincolnshire.—ACCESS TO POWER STATION SITE.—Reference is made in a report of the Highways Committee of the Lindsey County Council to conferences with the Central Electricity Board regarding access to the proposed generating station at Keadby. An original proposal involved the replacement of the bridge over the canal in Keadby village and other works at a total cost of about £25,000. Subsequently the C.E.B. stated that it was considering approaching the site from Crowle. The County Council has informed the Board that it would regret embarking upon such a large expenditure as this would involve, preferring a

scheme for a road from a point in Keadby village along the north side of the canal, but would raise no objection provided satisfactory arrangements were made as to construction and cost.

Liverpool.—INCREASED SUPPLY.—The Electric Power and Lighting Committee is to provide an increased supply of electricity in the Walton and Fazakerley area, at an estimated cost of £19,030.

Tunbridge Wells. — NO ALTERATION IN CHARGES.—Estimates for the current year reveal a net deficiency on appropriation account of £27,533. At the last meeting of the Town Council the chairman of the Electricity Committee (Alderman R. S. R. Berry) said that in view of the forthcoming nationalization it did not seem worth while for the town to make any alteration in the charges. There was a reserve out of which they could meet the loss.

Walsall.—RETAILERS' FUEL SAVING.—Members of the Retail Section of the Walsall Chamber of Commerce have volunteered to make a fuel saving of 20 per cent on their consumption for 1945, and are urging all other retailers in the town to make a similar economy.

Wolverhampton.—STREET LIGHTING.—The Council has accepted a recommendation from the Accident Prevention Committee requesting the Electricity Committee to improve the standard of street lighting.

TRANSPORT

Darlington.—TROLLEY-BUSES.—The Corporation is applying for a provisional order authorizing the running of trolley-buses in Tubwell Row.

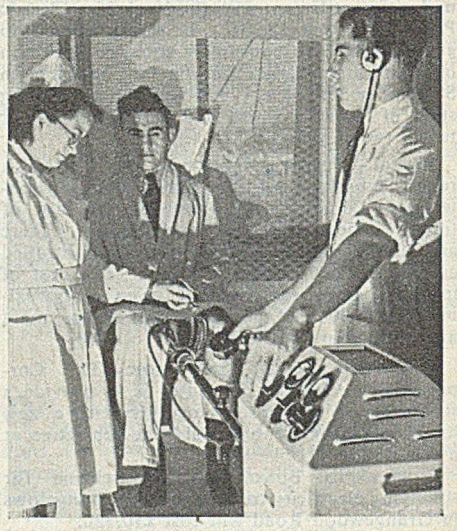
London.—CENTRAL LINE EXTENSIONS.—On Friday last week, Mr. Alfred Barnes, Minister of Transport, opened the extensions of the Underground Central Line from Leytonstone to Newbury Park and Woodford, which have just been completed after a wartime suspension. The work involved the construction of four miles of tunnel and four stations for the Newbury Park branch and three stations on the electrified track of the L.N.E.R. to Woodford. The service was opened to the public on Sunday last. The extensions have cost about £3,000,000. With Mr. Barnes were Lord Latham (L.P.T.B.), Sir Ronald Matthews (chairman of the L.N.E.R.) and other distinguished people.

Manchester.—TROLLEY-BUS ROUTE EXTENSION.—The Transport Committee proposes to extend the Greenheys and Rochdale Road trolley-bus service from Swan Street, along Miller Street into Corporation Street returning via Mayes Street and Dantzic Street, subject to the necessary consents being granted.

South Lancashire.—TROLLEY-BUS SERVICES.—A Bill which the South Lancashire Transport Co. proposes to introduce in the present session of Parliament seeks powers, *inter alia*, to operate additional trolley-bus routes.

Training the Blind

THERE are a number of points of electrical interest in the 1946-47 report of the National Institute for the Blind, 224, Great Portland Street, London, W.1. One of the most important branches of the Institute's work is helping blind people to achieve economic independence by training them for many kinds of industrial work. During the year jobs were found for 178 persons. Two schools have been set up, one for telephony and the other for physiotherapy. The accompanying picture shows a blind student at the School of Physiotherapy administering ultra-short-wave therapy under the supervision of the Electrical Studies Sister. Tuning is done with the aid of a special detector (seen in the student's right hand) and earphones. This and special Braille milliammeters are the only special instruments employed and, although for training purposes apparatus



A blind student electro-therapist

is marked in Braille, students are soon capable of operating standard equipment. Altogether nearly 400 men and women of from 18 to 40 years of age from all over the world have been trained at the school and last year nearly 10,000 treatments were given in the adjoining Eichholz Memorial Clinic which is staffed by qualified blind physiotherapists. All kinds of electrica treatment are given except ultra-violet-ray and no doubt in time prejudice against their ability to undertake this will be broken down also. The report is accompanied by an appeal for funds.

Institution of Heating and Ventilating Engineers. — The Institution has moved to 75, Eaton Place, London, S.W.1

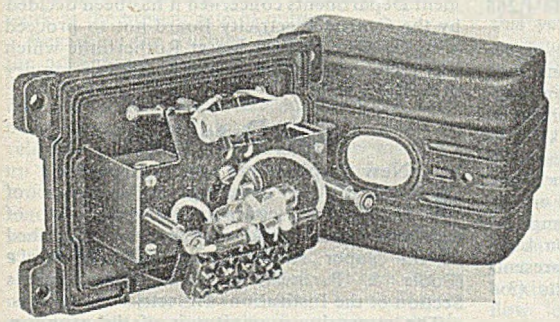
RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Mercury Switch Relay

A MODERN appearance has been combined with mechanical strength and simplicity of operation in the design of a mercury switch relay produced by ENGEL & GIBBS, LTD., 983–5, Finchley Road, Golders Green, London, N.W.11.

Making use of the peculiar properties of coned armatures, the mechanism embodies two balanced solenoids acting on a rotor consisting of a rectangular piece to which are attached conical curved arms. The mercury switches, being simply clipped into position, are easily replaceable, and the total enclosure of the contacts ensures freedom from corrosion and contamination.



The E.G. mercury switch relay

Single- or double-pole models are available, taking up to 15A, and the fitting of a time-lag switch gives a delay up to 45 seconds. All relays are guaranteed to operate down to 80 per cent of the rated working voltage, and so sensitive is the movement that only 1·5 VA a.c. or 0·5 W d.c. is required to operate a standard single-pole unit. The units are therefore eminently suited for use in sensitive thermostatic and pilot contact work. Provision is made within the relay for the inclusion of a non-inductive resistance for connection across the pilot contacts. A window in the front of the cover facilitates fault tracing and a conduit entry box can be incorporated as an integral part of the relay if desired. There is complete freedom from hum and chatter.

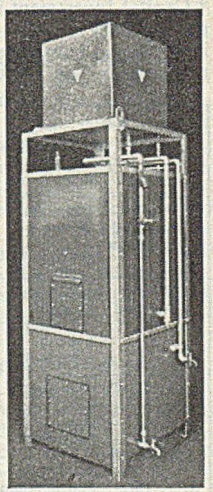
Watertight Lighting Fitting

The substantially made watertight lighting fitting produced by LOBLITE, LTD., Team Valley Trading Estate, Gateshead-on-Tyne, 11, has a moulded plastic body with two lugs for fixing to the ceiling or wall. The screw-necked well glass is made tight by means of a rubber gasket. The bayonet-cap 60-W lampholder is skirted and attached to a ceramic base inside a sealed connecting chamber. Two spouts moulded to the body can be pierced as needed for accommodating up to four cores of cable, round or oval up to and including 3/·036, t.r.s. or p.v.c., through or end termination. The gland packing consists of a rubber ring between two galvanized washers pressed tightly round the cable when the hexagon nut is screwed into the entry spout.

New Steam-raiser

A combination water heater and quick steam-raiser for washing and sterilizing dairy utensils, which has been named "Electrobloc," is a development of the "Whizzer" sterilizer for milking machine components. Both are products of J. W. WOOLLEY & CO., LTD., Two Gates, Tamworth, Staffs, and operate on the same heat-storage principle. They are thus off-peak appliances of small maximum demand, low loading, good load factor and need not be affected by electricity "cuts," since they can be arranged for heat replenishment at night. The steam-raiser is 8 ft. 6 in. high by 2 ft 8 in. in both width and depth. On top is a cold water tank with float valve feed. The centre section is a heavily lagged 50-gallon tank for the storage of hot water, containing a 2-kW immersion heater which is thermostatically controlled.

The base section is the steaming "Electrobloc," so named because it consists of a heat-insulated metal block containing a heating element which is controlled by a time switch.



Thermal-storage steam-raiser

Steam is generated, when it is required, merely by admitting hot water from the central storage tank to the hot block situated below it.

The "Whizzer" sterilizer is similarly contrived, except that a steam-jet chest replaces the hot water storage tank; the 1-kW block element is time-switch controlled. All the wiring is brought out to a single-phase junction box on the side of the casing and an earthing lug is provided.

Generation in November

Small Increase Recorded

RETURNS rendered to the Electricity Commissioners show that 3,983 million kWh was generated by authorized undertakers in Great Britain during November, as compared with the revised figure of 3,948 million kWh in the corresponding month of 1946, representing an increase of 35 million kWh (0·9 per cent).

During the first eleven months of 1947 authorized undertakers generated 38,147 million kWh as compared with the revised figure of 36,882 million kWh for the corresponding period of 1946, representing an increase of 1,265 million kWh (3·4 per cent).

The total kWh sent out during November (i.e., kWh generated less the amount consumed in the stations by auxiliary plant and for lighting, etc.), was 3,761 million kWh, as compared with the revised figure of 3,732 million kWh in the corresponding month of 1946, representing an increase of 29 million kWh (0·8 per cent). During the past eleven months the total energy sent out was 35,983 million kWh as compared with the revised figure of 34,794 million kWh for the corresponding period of 1946, representing an increase of 1,189 million units (3·4 per cent).

Power Plant Cuts

Central Board's Revised Programme

IN consequence of the Government's decision, outlined in the White Paper on "Capital Investment in 1948," to limit the output capacity of new plant coming into service in 1950 and subsequent years to 1,500,000 kW per annum, the Central Electricity Board has reviewed its programmes of generating plant extensions.

As originally drafted, the Board's programmes provided for the installation of about 6,000,000 kW of plant, including seventeen new generating stations, by the winter of 1950 and a further 3,923,500 kW including fourteen further new stations, by the winter of 1952, the aggregate estimated cost being about £450 million. The programmes for 1951 and 1952 have now been reduced to levels complying with the Government's limitation and they now provide for a total of 2,287,000 kW which represents a reduction of 1,636,500 kW on the original figure. The accompanying table shows which of the projects then enumerated have now been postponed.

As the result of discussions with the Government Departments concerned it has been decided by the Central Electricity Board not to proceed with the proposed station at Rotherhithe which was mentioned at the Bankside station inquiry earlier this year.

Scheme Area	Station	Owners	Generating Sets (kW)	Boilers (lb/hr)
Scotland	Portobello	Edinburgh	1—60,000	1—540,000
N.W. England and N. Wales	Carrington	Manchester	1—60,000	2—360,000
	Bolton	Bolton	1—30,000	2—180,000
			1—1,250*	
	Whitebirk	Blackburn	1—40,000	3—150,000
Mid-East England	Sculcoates	Hull	1—30,000	2—190,000
	Skelton Grange	Leeds	1—60,000	1—550,000
	Lincoln	Lincoln	2—20,000	4—120,000
	Thornhill	Yorks. E.P. Co.	1—45,000	4—180,000
Cent. England	Meaford	N.W. Midlands J.E.A.	1—60,000	2—360,000†
S.E. and E. England	Battersea	Battersea	1—30,000	2—190,000
S.W. England & S. Wales	Carmarthen Bay	Llanelly E.S. Co.	2—60,000	4—360,000

* Auxiliary set. † One-half of original proposal.

Gas Detection

New Aspirator-Type Equipment

AN outfit for detecting the presence of combustible concentrations in air of explosive gases and vapours is described in the paper submitted by MR. R. POOLE (Poole & Partners) to the Measurements Section of the Institution of Electrical Engineers.

The measuring apparatus is of the aspirator type with electrically heated dual-filament cell within a gas-sampling chamber forming part of a Wheatstone bridge circuit. It is energized by an 8-Ah accumulator; a combined filter and trap in the inlet tube enables the meter to be used in dusty and moist atmospheres. Flash-back arrestors in both inlet and outlet tubes are a precaution against the propagation of flame.

Use of the instrument does not involve special knowledge or skill. Both laboratory and portable models have been developed by the author and his associates.

The paper summarizes investigational development and describes the design, testing and calibration of the instrument. The author comments on the permissible inaccuracy of detectors of this kind; draws attention to the need for official standardization of methods of testing and calibrating gas detectors and also records some factors that may require special consideration when regulations are being framed.

Present statutes do little more than call for proper ventilation wherever explosive gases and/or toxic vapours are likely to occur. They merely throw back upon the industrialist the responsibility of proving that working conditions are in accordance with the regulations in spite of the lack of officially approved methods of measurement.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Brush Electrical Engineering Co., Ltd.—The reasons for the decline in turnover during 1946 having been dealt with in the directors' report, the statement of the chairman (Sir Ronald Matthews), which has been circulated, is confined to prospects. He says that the company's total order book is in the neighbourhood of £7,500,000, providing some eighteen months' work at the present rate of output.

Regarding the Turbine Division, he refers to the advantages of quick starting and compact design of the Brush-Ljungström machine. Besides the 30,000-kW size on which the company proposes to concentrate it is also developing a range of smaller axial-flow machines up to 5,000 kW for use in particular where process steam is required ; the first set of this kind should be running by the middle of next year. To overcome the difficulties experienced with existing designs of turbines, new and more robust blading is being fitted, with a lesser number of stages, and in addition an alternative method of blade-root fixing for the outer blade rings has been adopted.

The output of the Electrical Division in 1947 will be of the order of £1,500,000 and the programme for next year envisages an output in excess of £2,500,000. Work in progress for extending and improving production and testing facilities will enable the company to manufacture the largest sizes of transformers. Designs have been completed for a range of flameproof motors. Careful standardization and concentration on a few types have enabled the output of low- and medium-speed engine-driven alternators to be increased. On a programme for the production of 55-kW units first authorized in March, 1947, an aggregate of nearly 75,000 kW will have been supplied by March next, and by no other method could such a substantial amount of generating plant have been provided in that time. The chairman also refers to progress in the fields of diesel electric traction and switchgear. In connection with the Engine Division, he mentions that negotiations are proceeding for the acquisition by the company on a share exchange basis of the shares of Mirrlees, Bickerton & Day, Ltd., and J. & H. McLaren, Ltd. (These two companies are at present wholly-owned subsidiaries of Associated British Engineering, Ltd.).

Morphy-Richards, Ltd.—Some experiences in the effort to increase exports were recorded by the chairman (Mr. George Wansbrough) in his speech at the annual meeting last week. He said that to most markets each batch of goods exported represented the outcome of what seemed like a separate battle. Recently Mr. Morphy visited Canada and reported favourably on the prospects of selling large quantities of their electric irons, but no sooner had the negotiations got under way than the import of such apparatus from this country into Canada was entirely prohibited. On the other hand they were now able to send reasonable quantities of complete irons to New Zealand instead of only parts; in Australia their subsidiary company had made an excellent start; and in Argentina some 50,000 irons had been sold this year. In view of the Government's programme they could not count on the factory at Blyth for any certain date next year, and they were considering concentrating the manufacture of various new products in establishments within working distance of their extended premises at St. Mary Cray.

Marco Refrigerators, Ltd.—The annual meeting was to be held on Wednesday last. In a statement issued with the report and accounts, Mr. R. A. Fulford (chairman) said that the erratic availability of basic materials continued to make a sustained and regular flow of production an almost impossible achievement and reduced organized output to a series of sprints and halts. During the year much progress had been made in the development of new and improved models. The production programme for 1947-48 included a substantial volume of direct Government and semi-direct Government work, much of which was already in hand.

The Engineering & Lighting Equipment Co., Ltd., reports a trading loss for the year to March 31st last of £40,636, as compared with a profit of £19,615 for the previous year. After meeting various charges and adding estimated E.P.T. recovery to December 31st, 1946, there is a net loss of £10,014 (against a profit of £13,309). The preference dividend for the half year to June 30th, 1946, requires £2,270, and after crediting £2,594 from the sale of the Acme works and £823 canteen funds, the debit carried forward is £6,295 (against a credit of £2,571 brought in). No ordinary dividend is paid (against 8 per cent).

British Insulated Callender's Cables, Ltd., have declared an interim ordinary dividend of 2 per cent, less tax. The previous accounting period covered eighteen months when an interim dividend of 4 per cent was followed by a final dividend of 6 per cent, making 10 per cent, less tax, for the eighteen months.

The London Electrical & General Trust, Ltd., has declared an unchanged interim dividend of 2 per cent.

Holophane, Ltd., report a net profit for the year ended June 30th last of £34,003, as compared with £24,177 for the preceding year, and after providing for taxation, there is a balance

of £11,326 (against £9,503), to which is added £20,993 brought in, making £32,319. It is proposed to pay a final dividend of 7½ per cent, making 15 per cent for the year and to carry forward £23,498.

Crompton Parkinson, Ltd., have decided this year to submit to stockholders consolidated accounts in addition to the usual accounts of the company, and this will make it impossible to transact the business of the annual meeting at the meeting being held to-day (Friday). It is therefore proposed to pass a resolution at to-day's meeting for adjournment until January 16th next. The dividends on the preference and ordinary stock will be declared at the adjourned meeting.

Scophony, Ltd.—After providing £3,000 (same) for depreciation there was a trading loss for the year ended March 31st last of £11,083 (compared with a profit of £10,512 for 1945-46). After making various provisions including £7,919 for research and development, £5,887 for expenses of anti-trust lawsuit in U.S.A. and negotiations for sale of American interests, and £12,074 for writing off advances to subsidiary company, a debit of £32,281 is carried forward (against a balance of £9,537 brought in). Regarding the balance-sheet items "Patents and trade marks and development expenditure, including goodwill," the directors state that the figure of £204,920 represents expenditure incurred since incorporation of the company. They are not prepared at this stage to express any opinion as to the value of these items.

Thorn Electrical Industries, Ltd., is seeking Treasury consent for an issue to the public, but with preferential consideration for existing shareholders, of 400,000 5 per cent second cumulative preference shares of £1 each. An extraordinary general meeting is to be held on January 5th.

Stockholders' Representatives

The following further appointments of stockholders' representatives under the Electricity Act, 1947, are announced:—

MR. H. D. BUCHART, Hascombe Grange, Godalming, Surrey—Mersey Power Co., Ltd., and Mid-Cheshire Electricity Supply Co., Ltd.

MR. G. L. C. TOUCHE, Basildon House, Moorgate, E.C.2.—The Northampton, Rushden, Wellingborough, Herne Bay, Northwood, Woodstock and Bungay Companies.

New Companies

Communication Systems, Ltd.—Registered December 6th. Capital, £500,000. To acquire from Automatic Telephone & Electric Co., Ltd., Strowger Works, Liverpool, 7, that part of its undertaking which consists of the sale of private automatic exchange equipment and apparatus, intercommunication telephone equipment and apparatus, public address systems, clocks and internal signalling systems and apparatus, etc. Subscribers are: T. Eades and W. A. Travers. Regd. office: Melbourne House, Aldwych, W.C.2.

Radio Equipment, Ltd.—Registered December 6th. Capital, £680,000. To acquire not less than 90 per cent of the issued share capital of the Mullard Wireless Service Co., Ltd., and to carry on the business of manufacturers of, and dealers in, radio valves and apparatus, electric lamps, tubes, etc. Directors: G. W. O. Howe (director of Mullard Radio Valve Co., Ltd.), S. R. Mullard and N. Gunn (directors of Mullard Wireless Service Co., Ltd.). Regd. office: Spencer House, South Place, E.C.2.

Sheen Instruments, Ltd.—Registered November 21st. Capital, £3,000. Mechanical and electrical engineers, vendors of scientific instruments, apparatus and motors, etc. Directors: E. E. Jelpke and G. A. Herbert. Regd. office: 12, Temple Sheen Road, S.W.14.

Millns Electrical Company, Ltd.—Registered December 8th. Capital, £10,000. Directors: P. M. Millns, C. M. Millns, J. J. Boos and G. Pipe. Secretary: A. L. Owen. Regd. office: 133-7, Fetter Lane, E.C.4.

Treforest Electrical Services, Ltd.—Registered December 8th. Capital, £1,000. Directors: A. J. Nicholas and J. G. Gilliver. Regd. office: The Trading Estate, Treforest, Glam.

Increases of Capital

General Radiological, Ltd.—Capital increased by £50,000 beyond the registered capital of £25,000.

Yorkshire Switchgear & Engineering Co., Ltd.—Capital increased by £20,000 beyond the registered capital of £10,000.

Nevelin Electric Co., Ltd.—Capital increased by £70,000, in £1 ordinary shares, beyond the registered capital of £30,000.

Multi-Broadcast (Kidderminster), Ltd.—Capital increased by £4,000 beyond the registered capital of £6,000.

Parmeko, Ltd.—Capital increased by £25,000 beyond the registered capital of £15,000.

Bankruptcies

A. Lawson, formerly Abraham Lotterman, 261, Park West, Edgware Road, London, W.1, electrical engineer.—Order made on October 28th granting bankrupt's discharge as from November 28th, 1947.

A. Hitchcock, Castle View, Holme Bank, Dobcross, near Oldham, Lancs., radio and electrical engineer.—Receiving order made on December 8th on a creditor's petition.

R. T. Morrison, carrying on business at 82, Lumb Lane, Bradford, electrical engineering contractor.—Last day for receiving proofs for dividend December 31st. Trustee, Mr. G. F. Morris, Hallfield Chambers, 71, Manningham Lane, Bradford, Official Receiver.

STOCKS AND SHARES

STOCK Exchange markets are unusually active for this time of the year. The main reason is the coming transition of home railway stocks into the new Transport Stock. This has produced a substantial amount of trade, for many holders of Home Railway stocks, faced with the assurance of a lowered income, are selling these securities and putting the money into home industrial shares from which a higher yield is obtainable. The result is seen in a fairly general rise in the prices of industrial stocks and shares, in which electrical manufacturing and equipment are included. Home electricity shares are better than they appear from the officially-quoted prices, the market in these having followed the trend set by Home Rails.

British Transport Stock

Home Railway stocks will cease to exist on the night of December 31st, after which they become transformed automatically into British Transport Stock. Terms of the new security will not be announced until after business hours on New Year's Day.

After dividend and transfer-stamp adjustments, prices of Home Railway stocks stand at a discount of about 4 per cent on the compensation figures fixed as the basis for the exchange. In other words, a buyer is paying about £96½ for £100 British Transport Stock. The gap measures the element of doubt as to whether the new security will, in market dealings, be worth the price at which it is issued. Anxiety on this score has been noticeably reduced by the fall in gilt-edged prices to a level at which 3 per cent is indicated as the fair rate of interest on a long-dated issue. Holders of electricity supply shares are highly interested spectators.

The Week's Changes

Electrical equipment issues have had their fair share of the investment demand which has enlivened the industrial markets this week. G.E.C. led the way with a 3s. rise to 91s. 3d. Prices have been raised for A.E.I., now 82s. 6d., Cromptons, 31s., Reyrolles, 68s., Johnson & Phillips, 76s. 3d., and several of the other leaders. Telephone shares are particularly firm, with Automatics up to 67s., Ericssons to 42s. 6d., H.T.A. to 16s. 3d. The industry's position under the latest Government proposals on capital expenditure was read as favourable. Deccas have been in demand since publication of the dividend and preliminary figures. At 41s. 3d., they have gained as much as 7s. 6d. on the week; optimistic conclusions have been drawn from the distribution of 20 per cent as a first interim for this year. A single interim of 33⅓ per cent was paid previously. Cossors, at 17s., and Radio Television, at 6s. 3d., are both better. British Insulated Callenders went back from 40s. to 37s. 6d. on disappointment with the interim dividend of 2 per cent.

Coming Events

General Cables are among the companies which make up their accounts to September and generally declare the dividend before the end of the year. The 5s. shares have risen 10s. to 47s. 6d. over the past month. Last year's distributions totalled 20 per cent, but the interim in June was raised from 8 to 20 per cent. Westinghouse Brake and E.K. Cole also publish their results near the turn of the year. On the former's £1 shares, quoted at 70s., the modest 4 per cent yield testifies to the investor's confidence in this year's results. "Ekco" 5s. shares return 5½ per cent on the basis of last year's distribution; relatively higher yields are common at present to most of the shares in this field.

Cable & Wireless preference is up 4 to 120½ and the ordinary 2, to 173½, on pressing investment demand. Tube Investments at 7⅛ are 3s. 9d. up. Brush at 6s. 3d. have regained 9d. of last week's fall, and a number of small improvements have occurred throughout the lists.

Earnings and the Profits Tax

Since the doubling of the taxes on company profits, the investment experts have spent time and ingenuity in calculating probable effects on the distributable earnings of individual concerns. They have, necessarily, to beg a number of questions. Basis of the tax assessment, allowance for the elimination of E.P.T., and the current level of profits, are three of the largely unknown quantities. On the top of these is the extent to which boards of directors may be influenced, in their dividend policies, by the consideration that profits distributed attract tax at 25 per cent, while on those ploughed back, the impost is halved. Undeterred, a firm of dealers in electric cable and telephone shares has published tentative estimates.

Dividend Cover

These estimates are calculated on profits disclosed in the last-published accounts, after elimination of estimated E.P.T., and substitution of a 25 per cent tax on the whole of the earnings available for preference and ordinary dividends. Results of some of these calculations are as follows; they must be read with all the reservations noted in the previous paragraph:—

Ordinary Shares	Est. Earnings	Div. Per Cent	Price	Yield
Auto. Telephone ..	12½	12½	65/9	3·8
B.I.C.	9	6½	37/6	3·6
Enfield	11	7½	38/9	3·8
Johnson & P. ..	21	15	76/3	3·9
Siemens	7	7½	32/–	4·7
Telephone Manufacturing ..	5½	9	9/6	4·7
Aerialite	350	150	15/6	9·7

The B.I.C. figures are taken as the twelve-months equivalent of the actual eighteen months figures.

Swiss Electrical Trade

Expansion of Exports in 1946

THE Swiss Government has recently issued detailed figures, by countries, of foreign trade in 1946. From these records the following statement of the export trade in the leading electrical goods in that year has been compiled. After declines in many groups between 1944 and 1945, nearly all sections made a big advance in 1946. There were good sales in the countries which were recovering from the war. (17 Swiss francs equal £1.)

Class of Equipment	1946 Fr.(000)	Inc. or dec. on 1945 Fr. (000)
Accumulators	686	+ 324
To Argentina	109	— 23
„ *Belgium*	56	+ 56
„ *Spain*	160	+ 11
„ *Portugal*	95	+ 67
Insulators	353	+ 252
To Czechoslovakia	74	+ 74
„ *Holland*	127	+ 125
„ *France*	19	— 44
„ *Italy*	21	+ 21
„ *Spain*	48	+ 41
„ *Portugal*	20	+ 11
Meters and measuring instruments	14,075	+ 3,486
To Belgium	2,160	+ 1,966
„ *Spain*	941	— 943
„ *Sweden*	1,605	+ 764
„ *Czechoslovakia*	1,113	+ 1,098
„ *Argentina*	1,995	— 350
„ *Holland*	1,587	+ 1,487
Glass rectifiers, with or without mercury	19	+ 19
To Bulgaria	18	+ 18
Telegraph and telephone apparatus	1,335	+ 1,127
To Italy	130	+ 130
„ *Spain*	201	+ 154
„ *Belgium*	128	+ 119
„ *Iran*	210	+ 210
Radio apparatus	7,009	+ 3,423
To Mexico	575	+ 447
„ *Belgium*	1,227	+ 1,195
„ *Sweden*	659	+ 501
„ *Czechoslovakia*	772	+ 772
„ *S. Africa*	1,022	+ 464
„ *Brazil*	623	+ 290
Dynamo-electric machines	43,188	+ 11,264
To France	3,962	+ 1,962
„ *Spain*	12,741	— 3,024
„ *Portugal*	3,109	— 18
„ *Denmark*	495	+ 100
„ *Czechoslovakia*	321	+ 138
„ *Argentina*	1,630	— 156
„ *Brazil*	2,679	— 461
„ *Turkey*	426	+ 375
„ *Belgium*	3,039	+ 2,271
„ *Holland*	5,219	+ 4,694
„ *Egypt*	1,147	+ 867
„ *China*	1,329	+ 1,323
Insulated wire and cable	870	+ 817
To Denmark	135	+ 116
„ *Sweden*	174	+ 169
„ *Belgium*	152	+ 152
„ *Czechoslovakia*	88	+ 88
Lighting and starting equipment for vehicles	7,358	+ 5,380
To Holland	642	+ 642
„ *Sweden*	1,488	+ 1,228
„ *Czechoslovakia*	906	+ 849
„ *Brazil*	494	+ 459
„ *Belgium*	1,501	+ 608

According to the August *Bulletin* of the Swiss Bank Corporation, although production, employment, consumption and profits have continued to increase, there are signs that a limit has been reached. Demand tends to become more normal and in various markets the buyer is beginning to get the upper hand of the seller. Meanwhile the lack of man-power continues serious and is preventing industry from making full use of its productive capacity.

Class of Equipment	1946 Fr.(000)	Inc. or dec. on 1945 Fr. (000)
Electric incandescent lamps	614	— 14
To Spain	78	+ 75
„ *United States*	230	+ 228
Unspecified electrical apparatus over 500 kg.	5,186	+ 1,278
To Holland	1,007	+ 925
„ *Spain*	768	— 1,945
„ *Portugal*	620	+ 407
„ *Turkey*	633	+ 633
„ *Brazil*	461	+ 365
Ditto, 50 to 500 kg.	5,211	+ 1,259
To Belgium	547	+ 531
„ *Holland*	513	+ 496
„ *Spain*	799	— 834
„ *Turkey*	471	+ 466
„ *Sweden*	598	+ 307
„ *Brazil*	615	+ 127
Unspecified electrical apparatus 3 to 50 kg.	6,292	+ 1,726
To France	802	+ 44
„ *Belgium*	723	+ 578
„ *Holland*	769	+ 735
„ *Spain*	579	— 893
„ *Rumania*	558	+ 558
Ditto under 3 kg.	7,215	+ 2,673
To France	1,024	+ 400
„ *Czechoslovakia*	219	+ 210
„ *Sweden*	1,208	+ 992
„ *Spain*	272	— 139
„ *Belgium*	1,028	+ 801
„ *Holland*	1,221	+ 1,219

Dutch Motorship

THE 23,000-ton motorship *Willem Ruys* has just been put in service by the Royal Rotterdam Lloyd Line. This vessel was built at Flushing, and the hull was in an advanced state of completion when Holland was occupied. The Dutch managed to avoid completion of the vessel for use by Germany, and were also able to save a considerable quantity of the equipment by hiding it in various ways. Laurence, Scott & Electromotors, Ltd., had already delivered a considerable quantity of electric motors, and these were put into the hull and covered with sand. Despite their long storage in adverse conditions, they were found to be little the worse when Holland was liberated and the work of completing the vessel was put in hand. The company supplied the majority of electric motors and starters used on the ship, the total being 132 motors and 128 starters.

NEW PATENTS

Electrical Specifications Recently Published

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

1942

GENERAL Electric Co., Ltd., and E. Gallizia.—" Metal-vapour electric discharge converters." 2049. February 16th, 1942. (595238.)

English Electric Co., Ltd., and R. J. Welsh.—" Power plant comprising a prime mover and an internal-combustion compressor supplying motive fluid thereto." 13740. September 30th, 1942. (594996.)

Metropolitan-Vickers Electrical Co., Ltd., and D. M. Smith.—" Internal-combustion turbine plant." 14042. October 6th, 1942. (595116.)

English Electric Co., Ltd., J. P. Chittenden and R. J. Welsh.—" Governing of a prime mover such as a turbine supplied by one or more gas generators." 14498. October 16th, 1942. (595117.)

1943

Pye, Ltd., and D. Jackson.—" Holders primarily for radio valves and the like." 10827. July 3rd, 1943. (Cognate applications 15845/43 and 6090/44.) (595178.)

C. A. Becker.—" Electric torches." 21536. December 23rd, 1943. (595121.)

1944

Pye, Ltd., and D. Jackson.—" Retaining clips for thermionic and like valves." 311. January 7th, 1944. (595182.) " Holders primarily for radio valves and the like." 8971 and 8973. September 27th, 1943. (Cognate applications 6091/44 and 6089/44.) (Divided out of 595178.) (595185 and 595187.) " Holders for radio valves and other electric discharge devices." 8972. September 27th, 1943. (Divided out of 595178.) (595186.)

R. Crittall & Co., Ltd., J. L. Musgrave, N. K. Mousley and E. R. W. Hinchley.—" Electromagnetic valves." 2697. February 14th, 1944. (595245.)

Western Electric Co., Inc.—" Object detection apparatus of the pulse reflection type." 3700. June 23rd, 1942. (594997.)

American Electro Metal Corporation.—" Electrical heating elements." 4152. March 3rd, 1943. (595060.)

Pye, Ltd., and L. W. Germany.—" Automatic starting arrangement for synchronous motors." 5864. March 30th, 1944. (595124.)

Marconi's Wireless Telegraph Co., Ltd.—" Radio systems and reflectors therefor." 7369. January 27th, 1943. (595062.) " Radio distance indicator." 9624. March 29th, 1943. (595063.) " Radio direction finders." 12767. July 30th, 1942. (595067.) " Electron discharge devices." 14230. March 31st, 1943. (595251.) " Radio-position determining systems." 20674. January 6th, 1943. (595002.) " Apparatus for producing electric oscillations." 20910. July 28th, 1943. (595073.) " Radio direction finding." 24947. August 28th, 1942. (595074.) " Direction finders." 26045. February 26th, 1942. (595075.)

L. F. Broadway and A. H. Atherton.—" Electron discharge devices employing hollow resonators." 9796. May 20th, 1944. (595247.)

Farnsworth Television & Radio Corporation.—" Television apparatus." 17539. June 5th, 1943. (595256.) " Television signal amplifier." 24445. April 26th, 1943. (595260.)

Standard Telephones & Cables, Ltd.—" Directive radio systems and the like." 18685. December 6th, 1943. (595072.) " Radio-goniometer construction." 23498. July 17th, 1942. (595004.) " Velocity modulation impulse generator." 25594. July 17th, 1941. (595006.)

Leland Electric Co.—" Carbon pile electric regulators." 18910. February 12th, 1944. (595133.)

General Electric Co., Ltd., D. C. Espley and D. O. Walter.—" Television systems." 21756. November 6th, 1944. (595138.)

R. Simpson.—" Means for illuminating indicating instruments." 22482. February 2nd, 1944. (595003.)

British United Shoe Machinery Co., Ltd. (United Shoe Machinery Corporation).—" Methods of shoe making involving the use of high-frequency electric fields or apparatus suitable for use therein." 23675. November 28th, 1944. (Cognate application 7325/45.) (595140.)

Electric Construction Co., Ltd., and J. C. Milne.—" Regulation of dynamo-electric machinery." 23743. November 28th, 1944. (595141.)

H. M. Powell.—" Electrical apparatus for producing a movement proportional to or a function of the value of the difference between two quantities." 25063. December 13th, 1944. (595263.)

1945

General Electric Co., Ltd., and J. Mitchell.—" Test equipment for high-voltage transmission lines." 1291. January 16th, 1945. (595144.)

Marconi's Wireless Telegraph Co., Ltd.—" Stabilized harmonic electronic oscillator." 1358. May 15th, 1943. (595200.) " Automatic gain control." 3368. January 28th, 1942. (595008.) " Apparatus for measuring standing waves on radio-frequency transmission lines."

8136. March 30th, 1944. (595207.) "Ultra-high-frequency communication systems." 12365. April 22nd, 1942. (595285.) "Variable reactance devices." 14935. June 13th, 1944. (595098.) "Voltage transformer." 31708. February 3rd, 1943. (Divided out of 594763.) (595173.)

Westinghouse Electric International Co.—"A.c. circuit breaker systems." 1567. June 12th, 1942. 595077.) "Dynamo-electric machines." 13325. May 27th, 1944. (595219.)

Westool, Ltd., G. R. Hook and R. W. Smith.—"Solenoids." 2270. February 28th, 1946. (595201.)

W. W. Triggs (Farnsworth Television & Radio Corporation).—"Television image translating devices." 2491. January 31st, 1945. (595268.)

Ritter Co., Inc.—"Time-controlled electric switches." 2720. February 3rd, 1944. (595146.)

E. I. du Pont de Nemours & Co., and R. A. Hoffman.—"Electrodeposition of lead." 3439. February 12th, 1945. (595148.)

M. Offner.—"High-frequency diathermy apparatus." 4476. March 6th, 1944. (595151.)

General Electric Co., Ltd., P. A. Hoare and E. H. Nelson.—"Electric discharge lamps." 5030. February 28th, 1945. (595274.)

United Insulator Co., Ltd., and N. G. Westcombe.—"Variable electrical condensers." 6188. March 12th, 1945. (595012.) "Electrical condensers." 17709. July 11th, 1945. (595042.)

Submarine Signal Co.—"Piezo-electric vibrators." 8250. April 3rd, 1941. (595154.)

Philco Radio & Television Corporation.—"Wide-band thermionic amplifiers." 8576. November 20th, 1944. (595210.)

Standard Telephones & Cables, Ltd.—"Aircraft radio guiding system." 10042. April 26th, 1944. (595022.)

C. W. Oatley, W. S. Elliott and H. Pursey.—"Cathode-ray tube display systems." 11192. May 2nd, 1945. (595094.)

Dewhurst & Partner, Ltd., and G. E. Minns.—"Electromagnetic switches and relays." 11354. May 4th, 1945. (595213.)

Standard Telephones & Cables, Ltd., and E. O. Willoughby.—"Radio navigational systems." 12372. May 16th, 1945. (595216.)

Westinghouse Electric International Co.—"Gas-blast electric circuit interrupters." 13012. May 24th, 1944. (595217.)

Soc. Rateau and R. Anxionnaz.—"Gas turbine motor of reduced dimensions." 13613. January 8th, 1942. (595286.)

Pye, Ltd., and D. Jackson.—"Contacts for sockets primarily for radio valves and the like." 13665. May 31st, 1945. (595220.)

Foster Transformers & Switchgear, Ltd., and T. Courtney.—"Electric transformers." 14219. June 6th, 1945. (595166.)

Standard Telephones & Cables, Ltd., and C. W. Earp.—"Frequency and phase modulation." 14800. June 11th, 1945. (595168.)

Hazeltine Corporation.—"Frequency conversion system." 15357. August 16th, 1944. (595224.)

E. R. Booth and S. Marks.—"Push-button switches." 16072. June 23rd, 1945. (Cognate application 27585/45.) (595226.)

Franco-British Electrical Co., Ltd., and A. H. Brackensey.—"Signs and their method of production." 17094. July 4th, 1945. (595109.)

English Electric Co., Ltd., P. L. Mardis, S. A. Smith and F. Wilson.—"Electrical switching apparatus." 17260. July 6th, 1945. (595112.)

Ashley Accessories, Ltd., and C. W. Pickering.—"Electric lamp and like holders." 20695. August 13th, 1945. (595233.)

Amended Specification Published

583362. R. A. R. Tricker and others.—"Electro-optical apparatus."

Trade Marks

THE following applications have been made for the registration of trade marks. Objections may be entered within a month from December 10th.

ZENITH (design). No. 653,876, Class 7. Laundry washing machines.—Marshall-Wells Co., Duluth, Minn., U.S.A. Address for service: c/o Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, W.C.2.

RAYTHEON. No. 648,858, Class 9. Battery eliminators, devices for controlling or modifying electrical currents; electric discharge tubes, vacuum tubes, current rectifying and transforming tubes, photo-electric cells, flashlight apparatus for photographic purposes, altimeters, electrical apparatus for calibrating altimeters, oscilloscopes, moisture-measuring instruments, radio antennæ, radio transmitting and receiving apparatus, radar apparatus, television transmitting and receiving apparatus and electromagnetically-operated machines for testing the resistance qualities of materials. No. 648,859, Class 11. All goods included in Class 11.—Raytheon Mfg. Co., Newton, Mass., U.S.A. Address for service: c/o Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, W.C.2.

MILVAC. No. 652,797, Class 9. Electric vacuum cleaners, and parts thereof included in Class 9.—Midland Industries, Ltd., Heath Town Works, Deans Road, Wolverhampton.

PATHFINDER. No. 652,883, Class 9. Electric flat irons.—Truvox Engineering Co., Ltd., Truvox House, Exhibition Grounds, Wembley.

SANTON. No. 653,047, Class 9. Electrical switches.—Santon, Ltd., Somerton Works, Newport, Mon.

MEDRESCO. No. 653,012, Class 9. Hearing aids for the deaf, and parts thereof included in Class 10.—Minister of Supply, Great Westminster House, London, S.W.1.

ABBEY PRODUCTS. No. B647,812, Class 11. Electric lighting fittings made of common metal.—Erdington Jig & Tool Co., Ltd., 2, High Street, Erdington, Birmingham, 23.

SILOPEX. No. 649,753, Class 17. Insulating materials.—Ioco, Ltd., Netherton Works, Netherton Road, Anniesland, Glasgow, W.3.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—January 21st. N.S.W. Railways 33-kV switchgear for White Bay power station (Spec. 1182).—*Tenders* (Melbourne).

Bethesda.—December 31st. Urban District Council. Substation switchgear, l.v. cable and overhead line. (See this issue.)

Blackpool.—January 12th. Town Council. Electrically driven automatic centrifugal pump, with accessories. Borough surveyor, Municipal Buildings.

Bury.—January 5th. Electricity Department. One 40-kV, d.c. testing equipment and one h.v. cable fault localizing bridge. (December 5th.)

Camberwell.—January 12th. Borough Council. Electric lamps for twelve months from April 1st. Borough engineer, Town Hall.

Dagenham.—January 10th. Town Council. Lamps and other electrical supplies for the year commencing April 1st, 1948. Borough engineer, Civic Centre.

Egypt.—Ministry of Public Works. Supply and erection of the main items of mechanical and electrical equipment for the Diesel generating station and water filtration and ice-making plants required for the Aswan Dam Hydro-Electric Scheme. Specifications and conditions of contract may be obtained from the consulting engineers to the Egyptian Government, Kennedy & Donkin. (December 5th.)

Keighley.—January 12th. Corporation. Fire extinguishing equipment. (December 12th.)

New Zealand.—Hydro-Electric Department. January 20th. E.h.v. control and relay boards (Con. 44-7). January 27th. Transformer banks, one 30,000 kVA, two 10,000 kVA and one 5,000 kVA (Con. 53-6). February 3rd. Grit arrestors (Con. 60). February 10th. Pilot wire transmission line protective relay equipment (Con. 57-9). February 17th. Outdoor switchgear (Con. 63-6). February 24th. Circuit breakers (Con. 67-8).—*Tenders.*

Stockport.—February 9th. Electricity Department. Supply and erection of storage battery at Millgate generating station. (See this issue.)

Warwickshire.—Firms wishing to have their names placed upon a list of approved contractors for heating, laundry and kitchen equipment, electric lighting and power installation and other services should apply to the county architect by February 23rd. (December 5th.)

Orders Placed

Barrow-in-Furness.—Electricity Committee. Recommended. Overhead lines (steel cored aluminium) from Lindale to Martin and from Plumpton to Mansriggs (£3,846).—Johnson & Phillips.

Hull.—Corporation. Accepted. Lead-covered cable (£1,034).—B.I. Callender's Cables.

Leeds.—City Council. Accepted, subject to the Finance and Parliamentary Committee authorizing the expenditure. 132-kV transformers (£200,860, including a provisional sum of £20,000).—Hackbridge & Hewittic Electric Co. Ash and dust handling and disposal plant (£124,360, including a provisional sum of £6,000).—Babcock & Wilcox.

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.

It must be borne in mind that many of the projects mentioned may be postponed as a result of the Government's suspension of building activities for the time being.

Accrington.—Additions to Cumberland Mills; Co-operative Wholesale Society, Ltd., 1, Balloon Street, Manchester.

Alcester.—Permanent houses (46), Salford Priors and Studley, for R.D.C.; F. B. Andrews & Son, architects, 95, Colmore Row, Birmingham.

Arnold.—Secondary school, Redhill, second section (£14,766); county architect, Shire Hall, Nottingham.

Aycliffe (Co. Durham).—Houses (200), southern section of proposed new town, for Aycliffe Development Corporation, Bishop Auckland.

Barnard Castle.—Houses at Staindrop (56) and Ingleton Land (22); R.D.C. surveyor.

Birmingham.—Factory, Chester Road; Marsh & Baxter, Ltd., Hall Street, Brierley Hill, Staffs.

Bournemouth.—Transport depot, Castle Lane; Jackson & Greenan, architects, Bournemouth.

Reinstatement and repair of Art Gallery and Museum; borough architect, Town Hall.

Bradford.—National Wool College (£250,000); borough surveyor.

Braunstone.—Infants' school, Ravenshurst Road (£43,000); county architect, County Offices, Greyfriars, Leicester.

Canning Town.—Reinstatement of Flour Mills of Joseph Rank, Ltd.; T. P. Bennett & Son, 43, Bloomsbury Square, W.C.1.

Cardiff.—Factory, Penarth Road, for Stone & Co., Ltd.; Yorke, Rosenberg & Mardall, 35, Welbeck Street, W.1.

Cockermouth.—The architects for the staff quarters at Dovenby Hall Colony referred to in our issue of December 5th are Sheppard & Partners, 38, Bedford Place, London, W.C.1.

Coventry.—Reinstatement of Hill Farm School; D. E. E. Gibson, borough architect, 1a, Warwick Row.

Cuckfield.—Houses (44); R.D.C. surveyor, Boltro Road, Haywards Heath, Sussex.

Dunfermline.—Houses (120), Burnside Street, Rosyth (£147,181); town clerk, City Chambers.

Eastry.—Houses (46), Aylesham, for R.D.C.; J. B. Rose & Co., builders, Folkestone.

Grimsby.—Factory, Newhaven Terrace; Torbinia, Ltd., Cosgrove Street, Cleethorpes.

Guildford.—Houses (66); R.D.C. surveyor, Millmead Lane.

Holborn.—Reinstatement and improvements at Central School of Arts and Crafts (£52,060), for L.C.C.; county architect, County Hall, Westminster Bridge, S.E.1.

Hornchurch.—Primary school, Cranham (£68,500) for Essex C.C.; Chancellor, Simpson & Bragg, architects, 19, Duke Street, Chelmsford.

Jarrow.—Factory, Bede estate, for the Jarrow Welding & Boiler Co., Ltd., 15, Ferry Street.

Keighley.—Houses (160), Western Avenue, Riddlesden; E. Slater, builder, Dunkirk Lane, Riddlesden.

Lambeth.—Houses (68), St. James' Crescent, Darrington Road and Angell Road, for Ecclesiastical Commission, Millbank, S.W.1.

Lincoln.—Primary school, Lincoln Gardens estate (£144,000); county architect, Newland, Lincoln.

London.—Reconstruction of Mount Pleasant Parcels Office, Rosebery Avenue, for the P.M.G.; Ministry of Works.

Otley.—School, Weston Lane, for West Riding E.C.; H. Bennett, county architect, Wakefield.

Oxford.—Extensions to Physics Laboratory, Park Road, for University Chest; Lanchester & Lodge, 10, Woburn Square, W.C.1.

Reading.—Houses (50), Westwood No. 2 site; borough surveyor.

Royston.—Factory for Siddall & Hilton, Ltd.; W. Hall, architect, 10, Commercial Street, Halifax.

Silverdale.—Extensions to foundry, Cemetery Lane, Newcast Foundries, Ltd.; Hollins & Jones, architects, Lloyds Bank Buildings, Newcastle (Staffs).

Smethwick.—Extensions to Chance Technical College (£42,500); Holbrow & Partners, architects, 104, Colmore Row, Birmingham.

Southfields.—Extensions to works for Philips Transmission, Ltd., Brathway Road.

Southwark.—Clothing factory, King's Place, Newington Causeway; J. Crosby & Co., 232, Bishopsgate, E.C.2.

Staveley.—Houses (38), Inkersall Green estate, for U.D.C.; H. W. Gilman, surveyor.

Stockport.—Factory at Broadstone Hall Road, Reddish, for Pickering & Co. (Cereals), Ltd., Egerton Street, Denton.

Walsall.—Factory at Bescot Crescent for Marshall & Hamlett, Ltd., 7, Littleton Street.

West Hartlepool.—Houses (36) for T.C.; borough engineer, Town Hall.

West Sussex.—Schools, Horsham and Chichester; county architect, Chichester.

Yeovil.—School, Westfield; R. O. Harris, county architect, Park Street, Taunton.

"Photo-Finish" Equipment

EQUIPMENT for photographically recording the winners of horse races which is distributed by the Race Finish Recording Co., Ltd., established by the Jockey Club, consists of a special camera with a spinner and a light flasher, the last item being designed and made by the General Electric Co., Ltd.

The camera lens projects on to the film an image of each horse as it crosses the winning line and, the film being moved across the masked slit at precisely the speed of the images, each horse is recorded on the film as it comes within the 6-in. (15·24 cm.) field of view of the camera.

The flasher is fixed to the winning post and operates a neon tube with a 25-in. (62·6 cm.) light length to make a periodical timing mark on the moving film. The neon tube is flashed at 50 c/s, each flash being of very short duration and registering a series of vertical "bars" on the photograph, which furnish the judges with accurate intervals of 1/50th of a second. The flasher is operated with a.c. at 50 c/s and causes the neon tube to emit a single flash of 30 micro-sec. duration once per cycle. A transformer charges a condenser bank to about 1,200 V, somewhat below that required to initiate a discharge in the lamp. A second transformer, arranged to give an impulse at the required time in the cycle, causes the neon tube to "strike" when the energy stored in the condensers discharges through the lamp.

Two "Osram" thermionic rectifiers are used, one of which serves to determine which half of the a.c. supply is employed for charging the condensers and the other cuts off the impulsing transformer once the main discharge commences. The tube, which is 32·5 in. (82·5 cm.) long, contains neon gas and uses electrodes specially treated to withstand the heavy discharge impulses. It takes the form of a letter "I" and its 25 in. (62·6 cm.) light length is in 10 mm. tubing. There is an external ionizing spiral in contact with one electrode to carry triggering impulses from the second transformer along the length of the tube.

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First Post on Monday**, subject to space being available, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1. (*See Notice below for Christmas.*)

THE CHARGE for advertisements in this section is 3/- per line (approx. 7 words) per insertion; ***ONLY OFFICIAL AND GOVERNMENT ANNOUNCEMENTS CAN NOW BE DISPLAYED***:—42/- per inch. Where the advertisement includes a Box Number this counts as two words and there is an additional charge of 1/-.

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.

CHRISTMAS
CLASSIFIED ADVERTISEMENTS
December 26 issue has now closed for press.

OFFICIAL NOTICES, TENDERS, ETC.

COUNTY BOROUGH OF STOCKPORT ELECTRICITY DEPARTMENT

Tender for Storage Battery

TENDERS are invited for the supply, erection and commissioning of a new Storage Battery at the Millgate Generating Station, Stockport, and, as an alternative, for the replating of the existing battery. Rectifiers will also be required for float and trickle charge and must be included in the tender.

Tenders, enclosed in a plain sealed envelope endorsed "Tender for Battery," addressed to the Chairman of the Electricity Committee, 23, Tiviot Dale, Stockport, must be received not later than first post on Monday, 9th February, 1948. The Corporation do not bind themselves to accept the lowest or any tender.

Copies of the specification and conditions of contract can be obtained on application to the undersigned.

W. R. ALLCOCK,
M.I.E.E., M.I.Mech.E.,
Borough Electrical Engineer.

Electricity Offices,
23, Tiviot Dale,
Stockport. 575

BETHESDA URBAN DISTRICT COUNCIL

THE above Council as Electricity Undertakers invite tenders for the supply of Substation Switchgear Low Tension Cable and Overhead Line at Bethesda. Further particulars and specification may be obtained on application to the undersigned.

Tenders to be in hand on or before 31st December, 1947.

ROGER EVANS,
Clerk to the Council.

Council Offices, Bethesda.
19th December, 1947. 574

I.M.E.A. CONVENTION

THE British Electrical Development Association has been invited to arrange an Exhibition in connection with the Incorporated Municipal Electrical Association's Convention, which is to be held at Eastbourne from the 7th to 11th June, 1948. Manufacturers desirous of representation in the Exhibition are requested to notify the General Manager and Secretary, British Electrical Development Association, 2, Savoy Hill, London, W.C.2, immediately. 609

SITUATIONS VACANT

Vacancies advertised are restricted to persons or employments excepted from the provisions of the Control of Engagement Order, 1947.

BRITISH ELECTRICITY AUTHORITY

Appointments to be made by Area Boards

1. The Chairmen-designate of the various Area Boards have requested the British Electricity Authority to bring to general notice the following considerations concerning the making of certain senior appointments in the early future on the distribution side, when the Area Boards have been constituted.

2. The Chairmen-designate will be consulting their Boards as soon as they are constituted with a view to the appointment of the Chief Executive Officers of the Area Boards. The Boards will probably make the following initial appointments, viz.:—

Chief Engineer	Chief Commercial Officer, and
Chief Accountant	Secretary

3. The Chairmen-designate accordingly desire to invite applications from all who wish to be considered for these appointments. Applications should be made prior to 6th January, 1948, DIRECT TO THE AREA BOARD FOR THE AREA IN WHICH THE APPLICANT MAY WISH TO SERVE, supported by details of his experience and qualifications.

4. The appointments will be made at salaries related to the responsibilities of each post, but regard will be given to the possibility of continuing existing salaries where these are in excess of the approved rates. Such personal emoluments will be limited to the individuals concerned and will not extend to future appointments, which will be made at the approved rates. Whilst the salaries will differ for the various appointments, the Chairmen-designate consider that the salaries will fall between £2,000 and £3,250 per annum, according to the responsibilities of each post.

5. Letters will shortly be addressed to all Electricity Undertakings requesting them to bring this invitation for applications to the notice of their staffs. Forms of application will then be available at the Undertakings or can be obtained directly from the British Electricity Authority, Portland Court, Great Portland Street, W.1.

6. It should be emphasised, however, that applications should be sent direct to the Area Board offices for the area in which the appointment is desired. The addresses of the Area Board offices will be listed on the forms of application referred to in paragraph 5 above. Applicants for forms should state for which of the above categories of appointment they desire to have application forms.

7. Appointments below the above level will be appropriately graded, and later announcements will be made by the Area Boards in regard to the method of appointments where such are necessary prior to vesting day. Where duties and responsibilities are analogous with the existing grades and salary scales these will be observed. In other cases the salaries will be regarded as provisional until final scales have been negotiated with such organisations as are appropriate. Only a limited number of appointments will however be made. The great majority of personnel within the industry will continue after vesting day in their present occupations under their existing contracts of service, although, of course, they will automatically transfer to the employment of either the Central Authority or the Electricity Board for the area in which they are employed. 573

THE WOKING ELECTRIC SUPPLY CO. LTD.

Appointment of Shift Charge Engineer

A vacancy occurs for a Shift Charge Engineer with the above company, and applications are invited which should supply all particulars and experience. Preference will be given to those with Ljungstrom turbine experience. Salary will be in accordance with Grade 8, Class E, of the National Joint Board Scale, at present £413.

F. WOODS, M.I.E.E., General Manager.
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HIS MAJESTY'S COLONIAL SERVICE

The Colonial Engineering Service

A vacancy exists for an Engineer in the Technical School, Posts and Telegraph Department, Nigeria. Qualifications entitling applicants to consideration are Associate Membership of the Institution of Electrical Engineers, or degrees or diplomas recognised by that body as granting exemption from Parts A and B of its examination. Preference will be given to candidates who have had teaching experience in a technical school.

Candidates must be British subjects, physically fit, and must have been born after the 1st January, 1907. The appointed officer will be required to conduct practical and theoretical courses in the principles of telecommunication, including V.F. telegraphy, carrier auto-telephony, radio-communication, lines plant practice and elementary transmission up to the standard of the examinations of the City and Guilds of London Institute, and to assist in the administration of the Technical School.

Appointment will be on probation for permanent and pensionable employment within the incremental salary scale £510 to £1,000 (basic) per annum, point of entry depending on age, civil experience and length of approved war service. An expatriation allowance of £150 to £300 per annum is payable in addition. Outfit allowance of £90 on first appointment on salaries not exceeding £720 (basic). Partly furnished Government quarters are provided, if available, at a rent of £60 to £90 per annum. Medical attention is free. Free passages are provided for the officer and, if married, for his wife, once each way each tour. Home leave on full pay is granted after tour of 18 months at the rate of seven days for each month of resident service.

Intending candidates should write at once to the Director of Recruitment (Colonial Service), Colonial Office, 15, Victoria Street, London, S.W.1, stating age, professional qualifications and brief details of experience. 530

METROPOLITAN BOROUGH OF FULHAM ELECTRICITY DEPARTMENT

Assistant Contract Engineer, Grade III

(By permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1947.)

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 equivalent 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 J, Grade 9a, at present £408 9s. per annum.

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 noon on the 15th January, 1948.

CYRIL F. THATCHER,
Town Hall, Town Clerk.
Fulham, S.W.6.
December, 1947. 576

CENTRAL ELECTRICITY BOARD, SOUTH-WEST ENGLAND AND SOUTH WALES AREA

Assistant Control Engineer

THE Central Electricity Board have a vacancy at their Control Centre in Bristol for a First Assistant Control Engineer, age not exceeding 35. Commencing basic salary £435 per annum, rising to £560. To the basic salary will be added a temporary salary adjustment in accordance with the arrangements in force from time to time. At present this temporary salary adjustment is £62 8s. p.a.

Applicants must have technical qualifications up to Grad. I.E.E. standard. Experience in a power station or a manufacturer's works is essential. Applicants should state their age and give full particulars, with dates, of education, technical training, experience, degrees, diplomas, etc. The selected applicant will be required to undergo a medical examination, and, if approved, will be required to join the Board's Superannuation Scheme. Applications must be submitted in writing to the District Manager, Central Electricity Board, 26 Oakfield Rd., Bristol, 8. 474

BOROUGH OF CHESTERFIELD ELECTRICITY DEPT

Appointment of Mains Superintendent

APPLICATIONS are invited from qualified engineers for the position of Mains Superintendent in the Borough of Chesterfield Electricity Department. The salary scale for the position will be that of Grade 3, Class G, as prescribed by the National Joint Board for the Electricity Supply Industry and will commence at £681 p.a.

Candidates must have had a sound technical training, be Corporate Members of the Institution of Electrical Engineers, and possess extensive practical experience of high voltage and medium voltage networks, transforming stations and their equipment, and be conversant with the change-over of direct current networks to alternating current operation. The person appointed will be required to take full charge of the high voltage and medium voltage systems, substations, mercury arc rectifiers and rotary convertors.

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.

Forms of application may be obtained from the Electrical Engineer and Manager, W. W. Grimes, Esq., 172, Chatsworth Road, Chesterfield, and should be returned to the undersigned not later than 10 a.m., Thursday, 8th January, 1948. Canvassing in any form, either directly or indirectly, will be a disqualification, and candidates must declare whether they are related to any member of the Council or to the holder of any senior office under the Council.

RICHARD CLEGG, Town Clerk.
567

BOROUGH OF DOUGLAS ELECTRICITY UNDERTAKING

Appointment of Power Station Superintendent

APPLICATIONS are invited for the above appointment from candidates having a sound technical education and practical experience in the operation and maintenance of a modern steam generating station. Preference will be given to Corporate Members of the Institution of Mechanical Engineers, not more than 40 years of age, who have had actual experience in the supervision of power station staff.

The salary will be in accordance with National Joint Board Schedule, Class E, Grade 3, commencing at £619 per annum.

The appointment will be an established post under the Superannuation Scheme of the Corporation, and the successful candidate will be required to contribute to the Council's Superannuation Fund. The Council's Superannuation Act does not provide for the receipt or payment of any transfer value on entering or leaving the Council's service. The successful candidate will be required to pass a medical examination.

Applications, endorsed "Power Station Superintendent," giving particulars of age, qualifications and experience, together with not more than three copies of recent testimonials, should be addressed to the Borough Electrical Engineer and Manager, Electricity Offices, Ridgeway St., Douglas, Isle of Man, not later than 5th January, 1948.

PERCY M. SHIMMIN,
Town Hall, Douglas, Town Clerk.
Isle of Man.
12th December, 1947. 577

BOROUGH OF ABERYSTWYTH ELECTRICITY DEPT

APPLICATIONS are invited for the position of Fitter-Driver in the Council's Generating Station, which is in continuous operation, employing diesel oil engines. The present capacity is 2,420 kW, but new plant is being installed. Candidates should have experience in the operation and maintenance of large diesel engines. The duties will be to assist the station foreman in the overhaul and maintenance of the plant, but also to act as a driver when required.

The salary will be governed by the D.J.I.C. agreement, the present rate being £5 17s. 4d. per week of 44 hours, plus extra payment when performing shift duties.

Owing to the difficult housing situation, preference will be given to a single man.

Applications, stating age, present position and experience, with copies of two references, should reach the undersigned not later than 2nd January, 1947.

This advertisement is published by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1947.

E. W. FAITHFUL,
Electricity Offices, Borough Electrical Engineer.
Mill Street, Aberystwyth. 549

COUNTY BOROUGH OF NEWPORT ELECTRICITY DEPARTMENT

Mains Assistant Engineer (Junior)

THE Newport Corporation Electricity Department invite applications for the position of Mains Assistant Engineer (Junior). Applicants should hold the Higher National Certificate or its equivalent, and have had experience in the construction, maintenance and operation of 3-phase high tension and low tension overhead and underground transmission and distribution systems, including experience of direct current distribution systems.

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

The conditions of employment will be in accordance with the agreement of the National Joint Board of Employers and Members of Staff for the Electricity Supply Industry, and the salary will be that attaching to Class H, Grade 9a (commencing at £365 per annum).

Applications, stating the applicant's age, whether married or single, and giving details of qualifications, previous appointments and experience, together with copies of not more than three testimonials, should be addressed to the undersigned, marked "Mains Assistant Engineer (Junior)," and delivered not later than Monday, 5th January, 1948.

T. H. WOOD,
Borough Electrical Engineer
and Manager. 517

Electric House,
Dock St., Newport, Mon.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY

Appointment of Assistant Statistical Officer

APPLICATIONS are invited from qualified engineers for the position of Assistant Statistical Officer in the Chief Engineer's Department of the above-mentioned Authority. Applicants should possess the Higher National Certificates in electrical and/or mechanical engineering, and Corporate Membership of the Institution of Electrical and/or the Institution of Mechanical Engineers will be an added advantage. Candidates should have had experience in the collection, collation and interpretation of technical statistics related to the generation and distribution of electricity and in the application of the principles of statistics to various types of problems.

The salary offered will be £510 per annum.

The appointment will be subject to the Authority's Superannuation Scheme under the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination.

Applications, stating age, education, present occupation and engineering training, also full particulars of experience in the operation of generating stations, distribution of electricity, and in statistical work, accompanied by copies of three recent testimonials, should reach me not later than the 31st December, 1947. Canvassing, either directly or indirectly, will disqualify.

H. F. CARPENTER,
Clerk and Manager.

Phœnix Buildings,
Dudley Rd., Wolverhampton.
8th December, 1947. 547

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY

Appointment of Assistant Constructional Engineer

THE above-named Authority invite applications for the position of Assistant Constructional Engineer on the permanent staff of the Authority at a salary of £925 per annum. Applicants must have been trained in a manufacturing works and have had a wide experience in the design and construction of electricity generating stations. They should, preferably, possess a degree in mechanical or electrical engineering and be Corporate Members of either the Institution of Mechanical Engineers or the Institution of Electrical Engineers.

The appointment will be subject to the Authority's Superannuation Scheme under the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination.

Applications, stating age, education, qualifications and full details of practical training and experience, accompanied by copies of three recent testimonials, should reach me not later than the 31st December, 1947. Canvassing, either directly or indirectly, will disqualify.

H. F. CARPENTER,
Clerk and Manager.

Phœnix Buildings,
Dudley Rd., Wolverhampton.
8th December, 1947. 546

BOROUGH OF CHESTERFIELD ELECTRICITY DEPT

Appointment of Shift Charge Engineer

APPLICATIONS are invited from qualified engineers for the position of Shift Charge Engineer at the Corporation Temporary Arrangement Generating Station. The salary scale for the position will be that of Grade 8, Class G, as prescribed by the National Joint Board for the Electricity Supply Industry and will commence at £467 per annum.

Candidates must have had a sound technical training and should have considerable experience in the operation of water tube boilers, turbo-generators and auxiliary plant, rotary convertors and high and medium voltage switchgear. The person appointed will be responsible for the operation of the generating station and will take full charge of his shift.

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.

Forms of application may be obtained from the Electrical Engineer and Manager, W. W. Grimes, Esq., 172, Chatsworth Road, Chesterfield, and should be returned to the undersigned not later than 10 a.m., Thursday, 8th January, 1948. Canvassing in any form, either directly or indirectly, will be a disqualification, and candidates must declare whether they are related to any member of the Council or to the holder of any senior office under the Council.

RICHARD CLEGG, Town Clerk.
508

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY

Charge Engineer, Wolverhampton Generating Station

THE above-named Authority invite applications for the position of Charge Engineer at Wolverhampton generating station, at a salary of £481 per annum, Class H, Grade 8, of the National Joint Board Schedule. An additional emolument of £50 per annum will be payable for extra duties in connection with load control.

Candidates must have had a thorough practical engineering training and be experienced in the operation of large steam turbo-alternators, switchgear, high-pressure boilers and auxiliary plant in a modern generating station. Corporate Membership of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers will be an advantage.

The appointment will be subject to the Authority's Superannuation Scheme under the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination.

Applications, stating age, training and experience, accompanied by copies of three recent testimonials, should reach the undersigned not later than the 31st December, 1947. Canvassing, directly or indirectly, will disqualify.

H. F. CARPENTER,
Clerk and Manager.

Phœnix Buildings,
Dudley Rd., Wolverhampton.
8th December, 1947. 548

CITY OF COVENTRY ELECTRICITY DEPARTMENT

Appointment of Lady Demonstrator

APPLICATIONS are invited for the above appointment at a salary in accordance with the National Joint Council Scale, Clerical Division (£252/£288), plus cost-of-living bonus at present £48 4s. 8d. per annum.

Candidates must have had a good general education, be able to conduct lecture-demonstrations, visit consumers in their homes, and assist in the showrooms. They must have a thorough knowledge of domestic electrical appliances, and be able to advise customers on their selection and uses. The possession of a Domestic Science Diploma and/or the E.A.W. Electrical Housecraft Diploma will be an advantage.

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 particulars of age, training, qualifications, experience, etc., and accompanied by copies of recent testimonials, should be forwarded to the undersigned not later than first post on Wednesday, 24th December, 1947. Envelopes should be endorsed "Lady Demonstrator."

F. W. GODDEN, M.I.E.E.,
Electrical Engineer
and Manager.

Council House,
Coventry.
6th December, 1947. 479

COUNTY BOROUGH OF SWANSEA ELECTRICITY DEPARTMENT

Appointment of Instrument and Efficiency Engineer

APPLICATIONS are invited from men not over the age of 45 years, unless at present in the employ of a Local Authority, for the position of Instrument Engineer at Tir John Power Station at a salary corresponding to Grade J8b of the N.J.B. Schedule, at present £456-£477 per annum.

Candidates should be technically qualified for Associate Membership of either the Institution of Electrical or Mechanical Engineers, and should have a wide experience of the installation and upkeep of all classes of power station metering equipment. Experience in the preparation of heat balance sheets and the running of efficiency tests would also be an advantage.

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

Applications, stating age, qualifications, training and experience, together with copies of not more than two recent testimonials, must reach the undersigned not later than Wednesday, 31st December, 1947. Canvassing, either directly or indirectly, will be a disqualification.

T. B. BOWEN,
Town Clerk.

Guildhall, Swansea.
11th December, 1947. 551

BOROUGH OF ACCRINGTON ELECTRICITY DEPT.

APPLICATIONS are invited for the following positions at Hyndburn Road Generating Station: Two Switchboard Attendants, Class F, Grade 9a, of the National Joint Board Schedule, at present £327 per annum. Candidates must have had sound technical training and practical experience in the control of H.T. and L.T. switchboards. Preference will be given to candidates possessing the National Certificate.

The successful candidates will, if satisfactory, have the opportunity of being transferred to the new Accrington Huncoat Generating Station when the same is ready for commissioning.

Both appointments will be subject to the provisions of the Local Government Superannuation Act, 1937, and the selected candidates will be required to pass a medical examination.

Applications, stating age, full particulars of training and experience, accompanied by copies of three recent testimonials, should reach me not later than Tuesday, the 6th January. Canvassing, either directly or indirectly, will disqualify.

P. D. WADSWORTH, Town Clerk.

Town Hall, Accrington. 580

METROPOLITAN BOROUGH OF WOOLWICH ELECTRICITY DEPARTMENT

Appointment of Three Control Room Engineers

APPLICATIONS are invited for the appointment of three Control Room Engineers for shift duties at the Woolwich Power Station. Candidates should have had previous experience in a similar position, must have first-class technical qualifications and sound practical experience in the operation of a modern power station.

The salary will be in accordance with Class K, Grade 9, of the National Joint Board Schedule, commencing at £477 15s. per annum. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidates will be required to pass a medical examination.

Applications, stating age, qualifications and experience, together with not more than three testimonials, must be received by me not later than 29th December, 1947. Canvassing, either directly or indirectly, will disqualify.

DAVID JENKINS,
Town Clerk.

Town Hall,
Woolwich, S.E.18. 413

BOROUGH POLYTECHNIC, BOROUGH RD., S.E.1

Department of Electrical Engineering and Physics

THE Governors invite applications for the post of Lecturer in the Department of Electrical Engineering and Physics. The candidates should have had industrial experience and possess a university degree or its equivalent, and should be qualified to teach electrical technology and electrical machines up to Higher National Certificate standard. The salary will be in accordance with the Burnham (Technical) Scale.

Forms of application and conditions of appointment may be obtained by sending a stamped addressed envelope to the Principal, Borough Polytechnic. 520

BOROUGH OF RADCLIFFE ELECTRICITY DEPT.

Appointment of Meter Repairer

APPLICATIONS are invited for the position of Meter Repairer. Applicants should be skilled in the repair of all types of direct current and alternating current consumers' meters. Wages and conditions will be in accordance with the agreement of the National Joint Industrial Council for the Electricity Supply Industry, No. 3 Area, at present 2s. 8d. per hour, 44-hour week.

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. Canvassing will disqualify, and candidates must disclose in their applications any relationship to any member or officer of the Council.

Applications, stating age, qualifications and experience, together with copies of not more than three recent testimonials, must reach the undersigned, endorsed "Meter Repairer," not later than Wednesday, 31st December, 1947. This advertisement is published by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1947.

H. A. FOX,
Town Clerk.

Town Hall, Radcliffe, Lancs.
13th December, 1947. 578

COUNTY BOROUGH OF SOUTHEND-ON-SEA

Southend Municipal Hospital, Rochford

APPLICATIONS are invited for the post of Second Assistant Mechanical and Electrical Engineer in Grade II of the Council's scale (£360-£15-£405, plus bonus £59 10s. per annum). The appointment is subject to the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

It is intended to provide suitable housing accommodation adjoining the hospital.

Applicants must hold a First Class Board of Trade Certificate, and preferably have experience in a similar position.

Applications, stating age, training, experience and past and present employment, with one copy testimonial and names and addresses of two references, to be sent to the Borough Engineer at this address by 10th January, 1948. Canvassing will disqualify.

ARCHIBALD GLEN,
Town Clerk.

Municipal Buildings,
Southend-on-Sea.
12th December, 1947. 581

STRETFORD AND DISTRICT ELECTRICITY BOARD

Appointment of Shift Charge Engineer

APPLICATIONS are invited for the above position at the Board's Trafford Power Station. Candidates must have had experience in the operation and efficient running of a selected station in parallel with the C.E.B. System, and preferably have had manufacturers' works experience.

The salary will be in accordance with N.J.B. Schedule, Class H, Grade 8, at present £181 per annum rising to £507. The appointment will be subject to the provisions of the Local Government Superannuation Act, and a medical examination is necessary.

Applications in writing, endorsed "Shift Charge Engineer," giving details of age, training and experience and accompanied by copies of recent testimonials, should be forwarded not later than Friday, the 2nd January, 1948, to: H. G. Bell, M.Sc.(Tech.), M.I.E.E., Chief Engineer and Manager, Stretford and District Electricity Board, Trafford Power Station, Trafford Park, Manchester, 17. 482

UNIVERSITY OF ADELAIDE

Department of Electrical Engineering

APPLICATIONS are invited for the position of Lecturer in Electronics. Applicants must be graduates in either science or engineering, and experience in development of radar, cathode ray oscillograph and wide band receiving equipment is desirable.

The salary range will be £600-£750 per annum (Aust.) according to qualifications and experience. The appointment will be for the period of rehabilitation training and in the first instance for three years. Further particulars may be obtained from the Secretary, Universities Bureau of the British Empire, 8, Park Street, London, W.1. Closing date for the receipt of applications is 12th January, 1948. 531

COUNTY BOROUGH OF WIGAN ELECTRICITY DEPT

Assistant Power Station Superintendent

APPLICATIONS are invited for the position of Assistant Power Station Superintendent at the Bradford Place Generating Station, Wigan. Applicants must have had a sound technical training and a wide experience in the maintenance and operation of mechanical and electrical power station plant.

The salary will be in accordance with Grade 6, Class G, of the N.J.B. Schedule. The commencing salary is £540 per annum. The successful applicant will be required to pass satisfactorily a medical examination for the purpose of the Local Government Superannuation Act, 1937, and the conditions of service and sickness regulations will be in accordance with the N.J.B. Agreement.

Applications, giving full details of the candidate's age, general education, engineering education, practical training and subsequent experience, together with copies of three recent testimonials, should be addressed to the Borough Electrical Engineer, Electricity Dept., Bradford Place, Wigan, endorsed "Assistant Power Station Superintendent," and must be delivered not later than Monday, 5th January, 1948.

ALLAN ROYLE, Town Clerk.

3rd December, 1947. 440

COUNTY BOROUGH OF HUDDERSFIELD ELECTRICITY DEPARTMENT

APPLICATIONS are invited from engineers who are Graduates or Corporate Members of the Institution of Electrical Engineers for the position of Mains Assistant. Experience is essential in the design, erection, maintenance and operation of E.H.T. and L.T. overhead and underground distribution and protective systems up to and including 33,000 volts; layout and development of housing schemes and general estimates, and control of staff.

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.

The salary will be £455/£476 per annum, in accordance with Class H, Grade 8a, of the N.J.B. Schedule of Salaries and Conditions of Service.

Applications to be addressed to the Borough Electrical Engineer and Manager, Market Street, Huddersfield, endorsed "Mains Assistant," not later than the first post Friday, 2nd January, 1948.

F. A. ELLIS, M.I.Mech.E., M.I.E.E.,
Market Street, Borough Electrical Engineer
Huddersfield. and Manager.
9th December, 1947. 519

COUNTY BOROUGH OF SOUTHPORT ELECTRICITY DEPARTMENT

Appointment of Draughtsman

APPLICATIONS are invited for the above appointment at a salary in accordance with Class G, Grade 8b of the National Joint Board Schedule of Salaries at present £408 per annum rising to £422 per annum. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination.

Candidates should have had experience in electrical and mechanical drawing and design, preferably in an Electricity Supply Undertaking.

Applications endorsed "Draughtsman," stating age and giving full particulars of training, qualifications, and experience, and accompanied by copies of not more than three testimonials, should be sent to the Borough Electrical Engineer, 188, Lord Street, Southport, not later than Saturday, 27th December, 1947.

R. EDGAR PERRINS,
Town Hall, Southport. Town Clerk.
13/12/47. 579

COUNTY BOROUGH OF DONCASTER EDUCATION COMMITTEE

Technical College (Principal: Hugh Richmond)

APPLICATIONS are invited for the post of full-time teacher in the Engineering Departments. Candidates should possess a degree in mechanical or electrical engineering (or equivalent qualification). Salary in accordance with the Burnham (Technical) Scale.

Application forms may be obtained from the undersigned, and should be completed and returned as soon as possible.

V. H. HOSKIN,
Education Offices. Chief Education Officer.
Doncaster. 550

BOROUGH OF DARWEN ELECTRICITY DEPT.

Mains Assistant

APPLICATIONS are invited for the appointment of Mains Assistant. Salary and conditions in accordance with N.J.B., Class D, Grade 8 (commencing salary £397 per annum). Candidates, who should preferably be Corporate or Graduate Members of the Institution of Electrical Engineers, must have had a sound technical training and be experienced in the work of planning, connection and maintenance of E.H.T. and L.T. distribution systems, including substations. Experience in D.C. and A.C. change-over work will be an added recommendation.

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

Applications, giving full particulars of age, training and experience, together with copies of three testimonials, should be forwarded in envelopes endorsed "Mains Assistant" to the undersigned not later than 22nd December, 1947.

ALEX. WATSON, A.M.I.E.E.,
Electricity Works, Borough Electrical Engineer.
Robin Bank, Darwen. 502

BOROUGH OF RADCLIFFE ELECTRICITY DEPT.

Appointment of Substation Charge Engineers

APPLICATIONS are invited for the following positions: Two Substation Charge Engineers. Candidates should have a good general and technical education, and have had recent experience in the operation and maintenance of rotary converting plant, high and low tension control switchgear, etc. Salary will be in accordance with the National Joint Board Agreement, Grade 8b, Class E, commencing at £360 per annum.

The appointments will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidates will be required to pass a medical examination. Canvassing will disqualify, and candidates must disclose in their application any relationship to any member or officer of the Council.

Applications, stating age, qualifications and experience, together with copies of not more than three recent testimonials, must reach the undersigned, endorsed "Substation Charge Engineer," not later than Wednesday, 31st December, 1947.

H. A. FOX,
Town Hall, Radcliffe, Lancs. Town Clerk.
6th December, 1947. 475

COUNTY COUNCIL OF THE STEWARTRY OF KIRKCUDBRIGHT ELECTRICITY DEPT.

Appointment of District Engineer

APPLICATIONS are invited for the post of District Engineer, Castle Douglas. Candidates should have suitable technical qualifications and be experienced in controlling wiring, service and apparatus repair sections and operating a distribution system.

The conditions of employment will be in accordance with the N.J.B. Agreement with a salary under Grade 7, Class D, at present £420-£439 per annum. (This is expected to rise to Class E). The person appointed will be required to provide a car and will receive travelling expenses in accordance with the Council's scales.

Applications, stating age and giving full particulars of training and experience with two recent testimonials should be forwarded to the undersigned by 10th January, 1948.

The appointment is subject to the provisions of the Local Government Superannuation (Scotland) Act and the successful applicant will be required to pass a medical examination.

ROBT. C. MONTEATH,
County Offices. County Clerk.
Kirkcudbright. 480

FIRST GARDEN CITY LIMITED

Home Service Adviser

LADY, conversant with all domestic uses of electricity and able to advise upon the selection of appliances, to hold lecture demonstrations, to visit consumers' houses and to assist in sales development. Qualifications must include a recognised domestic science certificate and/or E.A.W. diploma. Salary £329 p.a., plus car allowance.

W. A. BROWN,
Works Road, Electrical Engineer and Manager.
Letchworth, Herts. 329

ARMATURE Winders. Steady job, good conditions.—Service Electric Co. Ltd., Water Road, Alperton, Wembley, Middx. Perivale 7251. 157

ASSISTANT Buyer by electrical wholesaler (London). Must have first-class knowledge of markets and material.—Box 41.

ASSISTANT Electrical Engineer for installation of light alloy strip mill. Age 26-35; must have rolling mill experience. Apply to General Engineering Department, Northern Aluminium Co. Ltd., Rogerstone, Nr. Newport, Mon., marking your envelope "Confidential." State age, qualifications and experience. 543

B.B.C. invites applications for a number of posts for Senior and Junior Engineers in the Designs Department in London. Applicants should have a university degree in engineering or an equivalent qualification, preferably in communication subjects. The work of the department covers design of testing equipment and transmission equipment for music and for 405-line television, the design of transmission apparatus for teleprinter and telephone carrier transmission, and for the various systems of disc and magnetic recording and reproducing equipment used in broadcasting. Specialist knowledge and experience in design work in any of the above is essential in the higher grades and will be an advantage in all cases. Starting salaries dependent on qualifications and experience; appointments will be in grades ranging from £580 per annum maximum for junior designers to £995 per annum maximum for senior designers. Applications, stating age, qualifications and experience, should reach the Engineering Establishment Officer, Broadcasting House, London, W.1, within 14 days of the appearance of this advertisement. 554

B.B.C. invites applications for the post of Engineer in the Audio Frequency Section of the Research Department, based in London. Candidates must possess a university degree or equivalent qualifications in physics or electrical engineering, and must have taken telecommunication as part of their training. A knowledge of electrical measurements, measuring instruments and experience in microphone and loudspeaker technique is essential. The work includes research into microphones and loudspeakers and embraces all other aspects of audio frequency research and development. Preference will be given to a candidate with the ability to guide development work in drawing office and workshops. Musical ability is an advantage. The salary is on a grade rising by annual increments of £40 to a maximum of £890 per annum. Applications, stating age, qualifications and experience, should reach the Engineering Establishment Officer, Broadcasting House, London, W.1, within 14 days of the appearance of this advertisement. 552

B.B.C. invites applications for two posts of Engineer in the Field Strength Section of the Research Department, based at Oxford. Candidates should possess a university degree or a recognised diploma, and should have taken telecommunication as part of their training. They must be capable of conscientiously carrying out experiments involving radio frequency measurements in any part of the British Isles, and should have an interest in field strength, measurement work and allied problems of propagation applicable to broadcasting. Experience of transmitter and aerial work and the use of receiving equipment is desirable. The successful candidates will be based at Oxford in the first instance, but will be required to spend a large proportion of their time away from base, and at a later date the base will be transferred to the London area. The salary is on a grade rising by annual increments of £30 to a maximum of £680 per annum. Applications, stating age, qualifications and experience, should reach the Engineering Establishment Officer, Broadcasting House, London, W.1, within 14 days of the appearance of this advertisement. 553

B.B.C. invites applications to fill a vacancy in the Research Department of the Engineering Division. The work involves theoretical and practical investigations on aerials, transmitters and systems of modulation. Practical experience of such work is desirable but not essential. Applicants must possess recognised academic qualifications, including a knowledge of the theory of wave propagation, and an aptitude for original investigation. The salary is on a grade rising by annual increments of £25 to a maximum of £580 p.a.; good promotion prospects. The successful candidate will be based at Oxford, but will later be transferred to a permanent base near London. Applications, stating age, qualifications and experience, should reach the Engineering Establishment Officer, Broadcasting House, London, W.1, within 14 days of the appearance of this advertisement. 535

DESIGNER of A.C. motors required by established manufacturers. Must be capable of undertaking electrical designs of single-phase, 1 to 24 h.p.; 3-phase, 1 to 200 h.p., and alternators up to 75 kVA. Knowledge of D.C. design advantageous. State age, qualifications, experience and salary expected.—Box 559.

CONSULTING Engineers with offices in London and the provinces require qualified electrical engineers. Applicants should be holding a position of responsibility and have experience in the design and operation of modern electrical plant in steelworks, mines or large industrial installation. Only those with full University training and an engineering degree will be considered. Age 28-40. Salary according to qualifications and experience.—Box 484.

DESIGNER, experienced in electrical machine design for traction application, required by an electrical eng. firm in the Midlands. Housing accommodation provided. Reply, details of training and experience, to—Box No. 421, 8, Serle St., London, W.C.2. 385

DESIGNER-Draughtsman required. Must be proficient in higher mathematics, and thoroughly conversant with design of gyroscopic apparatus. Good prospects and progressive appointment for the right man. Subject to the Control of Engagement Order.—R. B. Pullin & Co. Ltd., Phœnix Works, Great West Road, Brentford. 608

DRAUGHTSMAN (young), by consulting engineers (London West End) for cable diagrams, switchgear work, etc. Previous electrical experience useful but not essential. Permanency, pensionable. Reply, with full particulars, to—Box D.305, c/o Streets, 110, Old Broad Street, E.C.2. 505

DRAUGHTSMEN, age 25/30, with experience of design of small electro-mechanical apparatus, preferably domestic appliances (South London area). The work offers good prospects of promotion to keen men. Write, stating salary required, to—Morphy-Richards Ltd., St. Mary Cray, Kent. 523

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 Engineer, by gold mining company in West Africa. Applicant must have wide experience in the installation and maintenance of electrical plant consisting of power stations, H.T. and L.T. A.C. and D.C. overhead transmission, underground distribution systems, motors, switchgear and lighting. Experience on the mechanical side an additional advantage. Should also be member or associate member of the Institution of Electrical Engineers. Salary £65 per month, plus £5 per month cost-of-living bonus. In addition staff bonus scheme in force. Tour of duty 15 months, with three months' leave on full pay. Write, stating age, qualifications and experience, to—Box 3154, Whites Ltd., 72/78, Fleet St., London, E.C.4. 534

ELECTRICAL Engineer Salesman, by firm in West Bromwich, to act as assistant to technical director. Applicants should be in the region of 24/34 years of age, and should be familiar with all heavy industrial electrical installations and equipment, and have had a sound technical training and possess a motor car driving licence. Salary £350/£400 per annum according to age and experience.—Box 556.

ELECTRICAL Engineering Manufacturers in the Midlands have a limited number of vacancies for Junior and Senior Engineers with professional qualifications in electrical or mechanical engineering for tendering, contracts and design work in relation to switchgear rotating machines and transformers. Apply, quoting Ref. 85 and stating age, qualifications, experience and salary required, to—Box 390.

ELECTRICAL and Mechanical Engineers (manufacturing) have vacancy for Outside Representative, fully conversant with power plant. Application, with age, references, salary required, to—Box 565.

ENGINEER for laboratory investigation and measurements in conjunction with radio and electronic devices. Experience in electron optics desirable, with ability for original design. Applicants should have reached accepted standard of education and carry adequate production-design experience. West Middlesex area. Apply, giving age, full details of education and experience, to—Box 522.

ESTABLISHED company with branches throughout the country manufacturing patented mechanical ventilating equipment requires experienced Sales Manager for London and Home Counties sales, and ultimately sales throughout the country. Write stating age and previous experience.—Box 521.

ESTIMATOR Draughtsman with some experience in switchboard work. (London district). Reply, with full particulars of experience, age, salary required, etc.—Box 483.

EXPERIENCED Designer of fractional h.p. motors, by large company in the East London area. Applicants must possess qualifications to cover completely both practical and technical design of universal and induction type motors. State full details of experience, qualifications, age and salary to—Box 533.

EXPERIENCED Transformer Draughtsmen required for all sizes of transformers and associated equipment for employment in office in Central London of large heavy electrical plant manufacturing company. Security and prospects for suitable men.—Box 445.

FOREMAN Armature Winder for C. Horne & Co. Ltd., Dock Street, Middlesbrough. Must be experienced in all classes of A.C. and D.C. rewinds. Permanent progressive position. Applications, stating age, experience and salary required, to be forwarded to—The Manager, Ministry of Labour and National Service, Employment Exchange, 36, Grange Road, Middlesbrough. 7034

FOREMAN for East London factory, to take charge assembly and testing fluorescent fittings. Able to train and control male and female staff. Good remuneration and prospects for right man.—Box 569.

FOREMAN for small works in Birmingham district doing winding and heavy machinery, priority work, full particulars of experience, wages, etc.—Box 596.

FOREMAN Electrician required, commencing New Year for Newcastle-on-Tyne area. Experienced large power and lighting installations, must be good disciplinarian. Excellent prospects and terms to suitable man. Write in first instance to—Box 7077.

JUNIOR Draughtsman for transformer works. Good position with prospects. State age, experience, salary. —Brentford Transformers Ltd., Kidbrooke, S.E.3. 501

LABORATORY Assistants, for work in design dept. developing domestic thermo-electric and mechanical devices. Applicants should be of Higher National Certificate standard (electrical). The appointment has good prospects for keen men with design ability and works training. Salary £350-£600 p.a.—Morphy-Richards Ltd., St. Mary Cray, Kent. 524

LARGE electrical engineering firm in Lancashire urgently require a number of Radio Engineers. Applicants must have had a number of years' experience on the development and design of radio communications or radar equipment, or alternatively be of university degree standard. Salary £400 to £700 p.a. according to qualifications and experience. This advertisement does not come within the scope of the Control of Engagement Order. Apply, with particulars of age, exp. and present salary to—Box 572.

LONDON Power Co. Ltd., Ergon House, Horseferry Road, S.W.1. Applications are invited from qualified engineers to fill the following vacancies. Conditions of employment are in accordance with N.J.B. Schedule. Chief Assistant Electrical Repairs and Maintenance Superintendent, Grade 8b, Class M: Candidates should have served a suitable apprenticeship and have had wide experience in the construction, testing and maintenance of heavy E.H.T. switchgear, transformers, motors and control gear, with some knowledge of boiler and turbine heat economy instruments. Boiler House Technical Assistant, Grade 9, Class K: For work in connection with the efficient operation of boiler plant, including boiler trials; candidates should have had wide experience in boiler house operation. Applicants, who must be well qualified technically up to at least the Higher National standard, should be between 30 and 40 years of age. Successful candidates would be required to contribute 5% of salary to a superannuation scheme, the appointments being subject to satisfactory medical report from the company's doctor. 416

MACHINE Minders (Male), for stem-making, sealing-in and flare machines for fluorescent lamp assembly department. Staff position, 5-day week, good prospects and working conditions, canteen, etc. Apply — Personnel Officer, Ferguson Radio Corporation Ltd., Gt. Cambridge Road, Enfield. 404

MAN for position of Progress Clerk in factory in London area producing small wires and cables. Must have some technical knowledge and be capable of dealing tactfully with works and customers. Write details, experience and age and salary required.—Box 7079.

MANUFACTURERS require Representatives throughout the U.K. to market their special moving coil pick-ups and other specialities. Write—Box 331.

OUTSIDE Contracts Manager, by electrical contractors in N.W. London area. Must be capable of supervising contracts and control of labour and fully experienced in customer contact and estimating. Salary £600-£800 according to ability of applicant. Only first-class men need apply, giving age and full details of previous experience.—Box 458.

PRODUCTION Chemist, by old-established cable works (London area) having a specialised production of insulated cables, cords and wires for telecommunications, radio and other light current apparatus. Permanent position for suitable applicant. Write, giving full details of experience, to—Box 7030.

SALES Engineer for London area, with technical knowledge of small electric motors and switchboards.—Box 555.

PRODUCTION Staff for rapidly expanding fluorescent lamp works. Excellent opportunity for keen men Foremen and Machine Setters particularly required. Staff positions, 5 day week. Good prospects and salary. Apply, Personnel Officer, Ferguson Corporation Ltd., Great Cambridge Road, Enfield. 594

RADIO Engineering Assistant required with full electrical qualifications and 3 to 4 years' radar experience. Commencing salary £450 rising £18 annually to £550, plus £90 consolidation bonus. Write, stating age, experience and qualifications, to—Box D.303, c/o Streets, 110, Old Broad Street, E.C.2. 506

REPRESENTATIVE for sale of spirals, firebars and pencil elements to manufacturers and wholesalers on commission basis, for (a) Scotland and (b) South of England.—Box 532.

REPRESENTATIVE required, well educated, tall, good approach, experienced contact with principals, 30 to 45, London area, own car, salary expenses commission basis, electrical equipment, interview London.—Box 599.

SENIOR Draughtsman with experience in motor control gear required by manufacturing firm in N.W. area. Final settlement of this situation must be made through the Ministry of Labour and National Service Officer. Apply, stating education, experience and salary required, to—Box 536.

SENIOR and Junior Draughtsmen. A large reputable engineering company in the East London area has a number of interesting situations in their research and development departments. The appointments concerned are in connection with: (1) test gear design; (2) electronics; (3) light electrical mechanical engineering; (4) special design work for H.M. Government; (5) fractional h.p. motors. Applicants in the first instance should state age, experience, the kind of work for which they have preference, and the salary that they require.—Box 598.

SOUTH Wales Switchgear Ltd., Blackwood, Monmouthshire, has vacancy for Designs Engineer Draughtsman for 33,000-volt switchgear. Applications in writing, giving full details of experience. House available. 384

SURVEYOR, experienced overhead wood pole lines. Good salary and conditions. Prospects of early promotion to field engineering staff for keen worker. State full particulars to—James Scott & Co. (Electrical Engineers) Ltd., Transmission Department, 22, Morrison St., Edinburgh, 3. 570

THE Decca Navigator Co. Ltd. require Draughtsmen for layout and design work in connection with radio transmitting stations and associated equipment to work in close co-operation with station planning and research engineers. A.E.S.D. London rates minima. Applicants should write, stating age, experience, etc., and quoting reference "S.E.," to—The Decca Navigator Co. Ltd., 247, Burlington Road, New Malden, Surrey. 407

THE establishing of a transformer drawing office in London by a large electrical manufacturing firm creates an opening for an experienced Senior Transformer Draughtsman to take charge. Excellent prospects for first-class man experienced in controlling D.O. staff.—Box 446.

THIS advertisement is published by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1947. The English Electric Company's heavy electrical plant commitments urgently need the services of additional Senior and Junior Draughtsmen for design and detail work. Knowledge of appropriate class of equipment advantageous, but a good electrical or mechanical drawing office experience is the essential requirement. Vacancies exist in the following departments: Heavy Electrical Machine D.O., for sections covering water wheel, steam and diesel-driven alternators, rectifiers, rolling mill motors (Order Nos. 722 and 723); Transformer D.O., all sizes of transformers and associated equipment (Order No. 721) (also vacancies in London, Order No. Kings Cross 6740); Switchgear D.O., sections covering control boards, outdoor gear, cubicle and truck gear, wiring diagrams, circuit breaker development, instrument transformers (Order No. 720); Plant D.O., covering plant layout, electrical power, distribution, steam generation, factory water, gas and air services (Order No. 727). Good prospects and security for suitable men. Staff pensions scheme. Applications to—The Manager, Employment Exchange, 132, Newport Rd., Stafford. 444

WANTED for development work by Messrs. Dorman, Long & Co. Ltd., Royal Exchange, Middlesbrough: First-class Senior Draughtsmen, preferably experienced in modern open hearth blast furnace and steelworks plants (Order No. 2424); also Senior Electrical Draughtsman, preferably with electrical installation experience on open hearth blast furnace and steelworks plants (Order No. 1986). Applications, stating age, experience, salary required, and quoting order number, should be forwarded to—The Manager, Employment Exchange, 36, Grange Road, Middlesbrough, Yorks. 57

TRANSPORT and Shipping Manager for electrical company concerned with export documents and home transport. Reply, stating age, experience and salary required to—Cooke & Ferguson Ltd., Victoria Street, Openshaw, Manchester, 11. 4969

WANTED for London office, young Engineer with some experience in design or construction of, and scheduling of materials for, overhead transmission lines, all voltages and types of construction. Write—Box 239, c/o Judds, 47, Gresham Street, E.C.2. 595

WELL-known loudspeaker manufacturers require Junior Acoustic Engineers for development work in research laboratory. Write, stating age, qualifications, salary now received, and remuneration required, to—Box 597.

YOUNG Man for internal routine work in lighting fittings (industrial and commercial) department. Apply in writing, stating experience, age and salary required, to—F. A. Crosse, Veritys Ltd., Maxlume Department, Brettenham House, Lancaster Place, London, W.C.2. 503

APPOINTMENTS FILLED

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

COUNTY Borough of Gt. Yarmouth—Charge Engineer, Relief Charge Engineer and Junior Charge Engineer. All applicants are thanked.

SITUATIONS WANTED

ADVERTISER, age 50, with practical, technical and 15 years' pre-war commercial experience as importer and exporter of electrical technical goods, offers his services to a firm seeking a reliable administrator. Could take charge of London office, sales management, or technical representative. Salary required £450-£600.—Box 7068.

B.Sc. (Eng.) Hons. Works Manager (35), 17 years' in industry, available for progressive post. Full administration, ability to secure max. output, mathematician. Would consider post at technical college. London or Surrey.—Box 7042.

ELECTRICAL Contractors' Engineer & Manager, wide technical and commercial experience, estimating, supervision, designing.—Box 6996.

ELECTRICAL Engineer (Honours Graduate), with industrial and research experience, seeks position with firm in Yorkshire. Design or development work of any kind preferred.—Box 7020.

ELECTRICAL Engineer (25) seeks a suitable situation. Five yrs.' general apprenticeship, holder of O.N.C. and H.N.C. (Elect.), late E.A., R.N. Experience mostly rotating machinery and switchgear. London area preferred.—Box 7069.

ELECTRICAL Engineer (39) requires change; 18 years' motor winding, repair and some production experience. Conscientious and good practical man.—Box 7017.

ELECTRICIAN, age 37, 21 years' experience maintenance, contracting, cinema theatres, flats, desires change; prefer maintenance.—Box 7058.

GRAD. I.E.E. (23), a good draughtsman, requires progressive position, preferably in London. Good technical education (H.N.C.); 7 yrs. in power station D.O. Prepared to accept a period of training at reduced salary in any situation in order to progress.—Box 7033.

SUPERVISING Foreman, 26 years' experience all types of contracting, requires situation, Cheltenham, Stroud districts.—Box 7080.

FOR SALE

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

STALYBRIDGE, HYDE, MOSSLEY & DUKINFIELD TRANSPORT AND ELECTRICITY BOARD

Electricity Department

FOR sale: One 8-h.p. Aveling-Barford Calf-dozer, blade 4' 6" wide, straight and angle dozing and grading; one 35-h.p. Petrol-driven Chaseside Hi-lift Shovel, model A, ¾-yard scoop, shovel boom and crane jib on tractor chassis.

Can be inspected at the Hartshead Generating Station, Heyrod, Stalybridge. Offers to be addressed to J. Harwood Lumsden, M.I.Mech.E., A.M.I.E.E., Chief Engineer, Electricity Offices and Showrooms, Tame Valley, Stalybridge. 538

A. Cooksley & Co. Ltd. offer large selection of used Electric Motors, D.C. Write—21/25, Tabernacle Street, London, E.C.2 (Monarch 3357/58). 46

A few new Diesel Alternator Sets, 60 kW, 400/230 v., 3-ph., 50 c. Delivery 4/5 weeks. Maker's guarantee. —Box 410.

A bargain: Brand new Coventry Climax/Crompton petrol-driven, complete self-contained Generating Plants, 3.5 kW, 230 v., 1-ph., 50 cycles, price £130. Also brand new similar Sets, with separate new switchboards and automatic voltage regulators, 9 kW, price £400. Full details —Max Electric Co. Ltd., 190, Thornton Road, Croydon. Phone, THO. 4276/8. 162

(A) Motor Generator Set with starter, in first-class condition, input 415 volts, 3-phase, and 250-volt D.C., 15-amp. Generator, flexible coupling, 500 r.p.m., on steel baseplate, ball and roller bearing, may be viewed on site at Leicester. (B) One D.C. Generator by B.T.H., .88 kW at 1,075 r.p.m., 220 volts, 4 amps., sleeve bearings. —Electrical Equipment Co. (Leicester) Ltd., 100, London Road, Leicester. 611

A.C. Generating Sets, petrol, 3-phase, 50 periods, 400 volts and 230 volts; 50 periods, single-phase, 5 to 15 kVA; 40 sets available.—Midland Counties Elec. Eng. Co. Ltd., Grice Street, West Bromwich. 43

A.C. Motors, 400/3/50, slipring type, reconditioned, 300 h.p., 160 h.p., 80 h.p., 30 h.p., 20 h.p., medium speed; quick delivery.—Electroplant Co., Wembley. 566

A.C. and D.C. House Service Meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one year. Repairs and recalibrations.—The Victa Electrical Co., 47, Battersea High Street, S.W.11. Tel. Battersea 0780. 138

A.C. and D.C. Motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22. Forest Hill 2278-9. 102

A.C. and D.C. Motors, Generators, from stock.—Service Electric Co. Ltd., Water Road, Alperton, Middx. Perivale 7251/2/3. 91

ADHESIVE Thread. Just what you have been looking for! Particularly suitable for binding ravelled ends of flexible wires; 100 yards, 4s. 6d., subject.—Barries Electrical Agencies Ltd., King Street, Brighton. 127

ALTERNATOR, 27.5 kVA, 3-phase and neutral, new, Mawdsley, 400/230 v., 50 cycles, 1,000 r.p.m., complete with overhung exciter, £450, ex stock; 10-kVA, 220-volt Onan Petrol Generator, electric start, auto-voltage control, radiator cooled, £225.—F. T. Arnold, 178, Crawley Road, Horsham, Sussex. 7063

APPROXIMATELY 300 yards heavy duty Electrical Cable, suitable for carrying 30-50 kW. First reasonable offer. Sample sent on request.—317, Regent's Park Road, N.3. Finchley 5143. 178

B. & W. Water Tube Boilers for disposal: Two 50,000 lb. evap., 310 lb. w.p.; one 30,000 lb. evap., 2601b. w.p.; one 20,000 lb. evap., 175 b. w.p.; two 16,000 lb. evap., 190 lb. w.p.; one 12,000 lb. evap., 200 lb. w.p.; one 9/10,000 lb. evap., 200 lb. w.p. We install complete, including brickwork. Economisers, Pumps, Piping, Valves, Motors in stock. We can give immediate delivery.—Burford, Taylor & Co. Ltd., Boiler Specialists, Middlesbrough. Tel. No. Middlesbrough 2622. 32

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 2859. 97

BATTERY Chargers, input 230/1/50, output 18-36 volts, 40 amps.—H. Crawshaw, 75, Acre Street, Lindley, Huddersfield. 7074

B.I.C. Spot Welder for 400 v., 50 cycles supply, fitted with N.P.C. automatic timing contactor and designed for spot welds up to a maximum of ¼" M.S. plate. Treadle operated. Horizontal arms allow throat depth of 3' from electrodes.—C.S. Ltd., Staffa Rd., Leyton, E.10. 176

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

CABLE, twin flat, 3.029, 55s. per 100 yds.; Insulated Staples, 9s. per 1,000; Rubber Grommets, 100 assorted, 4s. 6d.; Ross Courtney Terminal Tags, 2s. 6d. per 100 assorted; Petrol Electric Generators, 500 watts, J.A.P., £18; Contactors on bakelite base, 1s. 6d. each; Push or Foot Switch, totally enclosed, with cable entry, 1s. 6d. each; Switches, 24 assorted, £1; Flex Connectors, miniature 2-amp. type, 9s. per doz.—W. D. Sales, 42-46, Windmill Hill, Ruislip, Middx. 516

CABLE, 1/.044, 3/.029, 7/.029, 7/.044, P.V.C., single, twin, triple, from stock. Lists available.—Barries Electrical Agencies Ltd., King Street, Brighton. 76

CABLES, Condensers, Wire, Volume Controls, etc. Write for a list, guaranteed delivery.—H. Fisher & Co. Ltd., Titan House, The Quadrant, N.W.4. 171

CANDLE Lamps, British made, guaranteed, all voltages, 25/40 watts, all caps, olive and twisted. Export enquiries welcomed. State requirements.—Thos. Handley & Co. Ltd., Britannia House, 74 Wellington St., Leeds. 4945

CENTRIFUGAL Switches. Manufacturers are now in full production of Centrifugal Switches. Enquiries and orders invited.—Box 601.

CHANGE Pole Squirrel Cage Motors, 3/2/1½/1 h.p., speed 1,450, 970, 720, 460 r.p.m., 400 v., 3-ph., 50 cyc.; Two-speed Flange Mounting Squirrel Cage Motors, 2 h.p. at 1,425 r.p.m., 1 h.p. at 705 r.p.m., 400/440, 3-ph., 50 cyc.; 2-h.p. and 1-h.p. Flange Mounting Squirrel Cage Motors, speeds 2,850, 1,425, 945 r.p.m.—Burdette & Co. Ltd., Stonhouse St., Clapham, S.W.4. Macaulay 4555. 141

CHANGE-over Switches, new, 500 v., 30 amps., 3-pole, 75s. each.—Universal, 221, City Rd., E.C.1. 424

CONDENSERS: 2 at 19 kVA, 400 v., 1-ph., 50 periods; also 3-h.p., 200-v., 1-ph., 1,440-r.p.m., 50-period Motor, D.E. shaft with starter.—Asquith & Colley, 13, Woodsley Street, Leeds, 6. 7072

D.C. Motors, ½ h.p., 200/220 v., new, Crompton, with spares; 27 available, £14 each cash.—Box 325.

D.C. to A.C. Motor Alternators, 110 v. D.C. input, 220 v., 50 cycles, single-phase A.C. output, 250 watts, ball bearings, £12 10s.; 1,000 watts, £20.—Johnson Engineering, 319, Kennington Rd., S.E.11. Reliance 1412/3. 99

DELIVERY from stock, Ratcliffe 2-kW, Immersion Heaters, 28" circulator type, also 15-a. Plugs & Sockets, Switches, Xmas Sets, Thermostats. Govt. surplus, including Fractional Motors, Responsor Units, etc. Send 1d. stamp for lists.—Northern Industries, 199, Broughton Lane, Salford, 7. 135

DIESEL Electric Generating Sets for immediate delivery, 60/80 and 100 kVA, 400/230 volt, 3-phs., 50 cycle, 4-wire, single or twin G.M.C. engines, fan cooled radiator complete with electric starting, 24-volt batteries, separate battery charger, fuel tank, control panel and silencer, guaranteed. Also 30 and 50 kVA, 400/230 volt, 3-phs., 4-wire, new Layland, fan cooled, electric starting. Dec./Jan. delivery.—R. S. & E. (Surbiton) Ltd., 8, Claremont Road, Subiton, Surrey. Elmbridge 5095. 7039

DIESEL Engines, 5-16 h.p., brand new, guaranteed, from stock or a few days.—Box 4578.

DIESEL Generating Sets for immediate delivery, A.C. or D.C., from 5-300 kW; also large stocks of A.C. and D.C. Motors, etc.—H. V. Stone & Co., 39, Spring Street, Paddington, W.2. Paddington 4667 & 2700. 7064

DIESEL Generating Sets, various sizes, from 2 to 72 kW D.C. and 5 to 330 kVA A.C.—Box 4917.

DIESEL Generating Sets: 2 63-kVA new Generating Sets, 400/3/50, 4-wire, Meadows diesel engines (delivery 28 days); 1 unused 15-kVA Lister Diesel Set, complete, 230/1/50, £850; 1 in excellent condition, £750; 2 10-kW Petrol Sets, 230/1/50, self-contained units, £350 each.—Harold W. Worboys (Sales) Ltd., Eastern Works, By-Pass Rd., Barking, Essex. Tel. Rippleway 1173. 7061

DIRECT-coupled Diesel-driven Generating Sets. 200-kVA General Motors Diesel Engine: 200-kVA, 3-phase, 50-cycles, 400/230-volt, 1,000-r.p.m. Alternator and Switchboard. 125-kW Cummins Diesel Engine; 125-kW, 3-phase, 50-cycles, 400/230-volt, 750-r.p.m. Alternator and Switchboard. 10-kW Chicago Pneumatic Diesel Engine and 100-kW, 3-phase, 50-cycles, 400/230-volt Alternator and Switchboard. 50-kW Hercules Diesel Engine and 50-kW, 3-phase, 50-cycles, 400/230-volt, 1,000-r.p.m. Alternator and Switchboard (5 sets available). 35-kVA Hill Diesel Engine and 35-kVA, 3-phase, 50-cycles, 400/230-volt Alternator. 25-kVA Hill Diesel Engine and 25-kVA, 3-phase, 50-cycles, 400/230-volt Alternator. 16.9-kVA Ruston Diesel Engine and 16.9-kVA, 3-phase, 50-cycles, 400/230-volt Alternator and Switchboard. 15.5-kVA Hill 4-cylinder Diesel Engine and 15.5-kVA, 1-phase, 50-cycles, 230-volt Alternator and Switchboard (4 sets available). 300-kW Baldwin Diesel Engine, 400 r.p.m. and 300-kW, 120/240-volt D.C. Generator (2 sets available). 300-kW General Motors Diesel Engine and 300-kW, 120/240-volt D.C. Generator and Switchboard. 15-kW Lister Diesel Engine and 15-kW, 230-volt D.C. Generator. 12-kW Lister Diesel Engine and 12-kW, 110-volt D.C. Generator. 5-kW Lister Diesel Engine and 5-kW, 230-volt D.C. Generator.—Newman Industries Limited, Yate, Bristol. Phone, Chipping Sodbury 3311-17. London: 32 Victoria Street, Westminster S.W.1. Phone, Abbey 2023. Manchester: Calder Street, Regents Bridge, Salford, 5. Phone, Blackfriars 5423. Glasgow: Baltic Chambers, 50, Wellington St. Phone, Central 2534. 397

DISTRIBUTION Boards, 200, 3-pole, 5, 15, 30 amps, From stock.—Weldaneon Signs Ltd., 125, Water Lane, Leeds, 11. 7031

ELECTRIC Motors, A.C. and D.C. We supply all types and sizes of electrical machinery, motorised slow speed reduction gears built to customers' specific requirements. Short deliveries.—Electropower Co. Ltd., 3, Retreat Close, Kenton, Wordsworth 4928. 42

ELECTRIC Motors: 11 2-h.p. and 5 4-h.p. Trislot, 400/3/50, 960 r.p.m., high torque starting.—Harold W. Worboys (Sales) Ltd., Eastern Works, By-Pass Road, Barking, Essex. Phone, Rippleway 1173. 7060

ELECTRIC Welding Plant, Engine and Electric, A.C. driven, 300 amps. output, complete with weather-proof covers.—Box 34.

ELECTRIC Motors: A.C., 3-ph., single-ph., and D.C. Motors; also 2 Motor Alternators, one with single-ph. output, one with 3-ph. output. Electric Motor-driven Pumps and Blowers. Electric Starters: 1 Allen West, 20 h.p., 400-440 v., 3-ph., star/delta; 1 Allen West, 5 h.p., slipring, 400/440 v., 3-ph.; also 3-ph. and single-ph. Direction Starters. Switchgear and Fuseboards: 1 500-v., 400-amp. D.P. Circuit Breaker, with trip release; 2 210-v., 300-amp. Circuit Breakers, made by P.E.C.; 1 B.T.H. 3-ph. Oil Circuit Breaker with no-volt release and overloads; 2 500-v., 200-amp. D.P. I/c M.E.M. Switch Fuses; 1 Glasgow Premier M.E.M. I/c Switch Fuse, D.P.; 2 500-v., 200-amp. I/c M.E.M. Cutouts; 1 500-v., 200-amp. D.P. M.E.M. Busbar Chamber; 1 500-v., 350-amp. I/c M.E.M. Switch with amp. meter. Electric Welders: 1 British Federal Electric Flash Butt Welder, 100 kVA, 50 cycles, 400 v., water cooled; 1 Metropolitan-Vickers Flash Butt Welder, 60 kVA, 400-440 v., 1-ph., water cooled. Electric Furnaces: 2 Birmingham Electric Furnaces, 25 kW, 400 v., 36 amps., 3-ph., 50 cycles, zones 1, temp. range 0-700° C.; 1 R. M. Catterson-Smith, type QF, 230 v., 5.5 kW, temp. range 0-1,500° C.; 1 Birlec-Cassel Carboneutral Furnace, 40 kW, 420 v., 55 amps., 3-ph., 50 cycles, zones 1, temp. 0-1,400° C., complete with transformer and control panel; 1 Birlec, 40 kW, 400 v., 57.7 amps., 3-ph., 50 cycles, zones 1, temp. 0-1,000° C., complete with transformer and control panel. Electric Blowers and Exhausters: 4 Keith Blackman Blower Exhausters, type 30, 400 v., 20 amps., 15 h.p., 2,900 r.p.m.; 4 do., type S4, 400 v., 11 amps., 8 h.p., 2,900 r.p.m. Rotary Converter: 1 Vickers, 200 kVA, 220/150 v., 50 cycles, 750 r.p.m., 6-ph., complete with starting panel. 1 Lucas Twin Chambered Hardening Furnace, 6' × 3' × 9', with air unit, 3' × 2' × 5'; 1 Wild Barfield H.M.3 Furnace, 3' × 5' × 6'; 2 Oil Feed H.T. Furnaces with motor-driven blowing fan. Foalis Wall Tyne Indicator, low pressure gas and air blast burner, 10' × 10' × 10'; 1 Birlec type V.F.C. 2018 Furnace, 4° dia. × 6° H.T.; 1 Brayshaw Oil-fired Furnace, 8' × 6' × 10'; 1 Motor-driven Blowing Fan, 3' × 3' × 2'; 1 do., 2' × 2' × 1'; 1 Oil-fired Salt Bath, 4' × 4' × 3'; 1 Motor-driven Blowing Fan; 4 Oil S.1 Furnaces, 1' 8" × 10"; 1 Electrically-driven Fan and Motor, 5' × 5' × 5'; 1 Preheater, I.C.I.; 1 Foster Indicating Pyrometer, 2' × 2' × 5'.—C. J. Rice, 137 Mayplace Road West, Bexley Heath, Kent. Bexley Heath 3282. 55

ELECTRIC Motors, A.C. We have available a large selection, both new and reconditioned. Inspection invited. Repairs and maintenance given immediate attention. Send particulars of your requirements to—Max Electric Co. Ltd., 190, Thornton Road, Croydon. Thornton Heath 4270. 72

ELECTRIC Motors now available: New British-made Squirrel Cage, 1, 1½ and 2 h.p., 3-phase, 1,450 r.p.m. Full specification and price may be obtained from the sole distributors—Douglas, Oliver & Co. (London) Ltd., 91/93, Bishopsgate, London, E.C.2. 6982

ELECTRIC Motors and Dynamos. We hold one of the largest stocks of new and secondhand motors. Secondhand machines are thoroughly overhauled. Inspection and tests can be made at our works. For sale or hire. Send your enquiries to—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Phone, 5512-3 Clerkenwell). 13

ENAMELLED Copper Wire. Will exchange 16, 19, .025" 23 Enamel; 17, .052" Bicolon 13, .088" 15, .068" 28, Double Cotton Fine, all s.w.g., for 21, 24, 26, 28, 34 Bicolon or 29 and 31 Enamel, all s.w.g. Copper Wire, single cotton-covered, for disposal.—Electro Dynamic Construction Co. Ltd., St. Mary Cray, Kent. 510

FANS, 110 v. D.C., desk or bracket type, 12", G.E.C., all new. State quantity required.—Barries Electrical Agencies Ltd., King Street, Brighton. 89

FIVE 35-kVA, 400-v., 3-ph., 50-cycle Diesel Alternator Sets for delivery January/February, 1948; one 60-kVA, 400-v., 3-ph., 50-cycle Diesel Alternator Set for delivery December, 1947.—British Electric Co. (BECO Ltd.), 25/29, Lower Rd., Rotherhithe, S.E.16. 335

FLUORESCENT Chokes, 80 watt. Low noise level, for satisfied users; long life, for low replacement costs; characteristics matched with lamp, for rated lamp life and light output. Prompt deliveries.—Micramatic Ltd., Meico Works, Congleton, Cheshire. 73

FLUORESCENT Lighting. Instantaneous Starting Control Units for 5' 80-watt lamps dispense with starter switch trouble, guaranteed to strike tubes regardless of supply voltage reduction. Each unit guaranteed. For full details apply—Scemco Ltd., 6 & 7, Soho Street, London, W.1. Gerrard 1461 (3 lines). 111

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FOR immediate disposal, brand new single-phase A.C. Generators, 9 kVA, 0·8 P.F., 50 cycles, 230 v., 39.2 amps., 1,500 revs. Complete with exciter and Isenthal automatic voltage regulator. Powered by Coventry Climax petrol-driven engine, radiator and fan cooled, with water pump additional cooling, governor controlled, R.A.C. rating 15 h.p., 51 b.h.p. at 3,500 r.p.m. Mounted on steel-framed chassis, direct coupled, and with approx. 25 gall. petrol tank. Apply—Commercial Structures Ltd., Staffa Works, Staffa Road, Leyton, E.10. 175

FOR immediate disposal: One 22-kW Diesel Generating Set comprising 4-cyl. Lister engine direct coupled to Mawdsley D.C. generator, 220 v., mounted on baseplate and complete with control panel. Offers.—Box 511.

FOR sale, supplementary to requirements: One brand new McLaren M.R. 5-cylinder Diesel Power Unit with built-in radiation, extension shaft, outboard bearing, the whole mounted on one bedplate. Available for immediate delivery at manufacturers' list price.—317, Regent's Park Road, N.3. Finchley 5143. 140

FOR sale, supplementary to requirements: One Oil Fuel Tank, capacity 1,100 gallons.—317, Regent's Park Road, N.3. Finchley 5143. 179

FOR sale, supplementary to requirements: One 100-kW, 500-v., compound wound Mawdsley D.C. Generator; also one 100-kW, 250-v., compound wound Mawdsley D.C. Generator; also one 100-kW, 110-v., compound wound Brush Electric D.C. Generator. Each offered subject to remaining unsold.—Holden Automotive & Marine Co. Ltd. (Naval Architects, Marine & Electrical Engineers), 317, Regent's Park Rd., N.3. Finchley 5143/1087. 168

FRACTIONAL H.P. Motors, ex stock. We have purchased a large quantity of new Fractional H.P. Electric Motors, available ex stock now and in monthly batches thereafter. Brief specification: Single-phase, 50 cycles, 4-pole, capacitor type, screen protected, ball bearing induction motors, complete with capacitor condenser. Rated to develop outputs: 110/120 v., 1/32 h.p., 1,390 r.p.m.; 200/240 v., 1/30 h.p., 1,400 r.p.m. Full specification, for home and export.—Civitas Trading Corporation Ltd., 10, Portman Street, London, W.1. Tel. Mayfair 6522. Cables, Civitas, London. 70

FRACTIONAL H.P. Motors, ex stock, single-phase and 3-phase, brand new; 45-h.p. Motor, 725 r.p.m., 400/3/50, slip-ring, B.B., with oil control gear; 150-h.p. Motor, 480 r.p.m., 400/3/50, slip-ring, and oil-immersed control gear, suitable for coupling.—Electropower Co. Ltd., 3, Retreat Close, Kenton, WORdsworth 4928. 606

FRACTIONAL Motors. Manufacturers invite enquiries and orders for ¼ and ½ h.p. single-phase, split phase and capacitor motors, ex stock.—Box 602.

FRIDEN Tabulation Machine, hardly used, perfect condition, £175. Write—Truvox Engineering Co. Ltd., Exhibition Grounds, Wembley. 561

FRINGES, Braids, Tassels for lampshades always in stock.—Philip Cohen, 77, Great Portland Street, London, W.1. Langham 1385. 38

GEARED Units, built to customers' requirements, any voltage; short deliveries. All enquiries to—Electropower Co. Ltd., 3, Retreat Close, Kenton, Middx. Wordsworth 4928. 497

G.E.C. 200-v, A.C., s/ph., 50-c., 960-r.p.m. Motor, repulsion induction, with starter, £59 10s.—Universal Electrical, 221, City Road, E.C.1. 515

GENERATING Plant. Hampson Industries can supply you with Diesel or Petrol Sets, see below. Switchgear, Switchfuses up to 100 amps. T.P., and up to 200 amps. D.P. Change-over Switches; also several Fuse Bridges, Automatic Voltage Regulators, Switchboards, etc. All ex stock, see blow. Diesel Engines from stock, 4 to 10 h.p., brand new, carrying manufacturers' guarantee for 12 months.—Hampson Industries Ltd., Union Street, West Bromwich. 557

GENERATING Sets, 3-phase, 2.75 kW, 130 volts, new and complete, by Coventry Climax and Crompton, £45.—Box 432.

GENERATING Sets, 10-kVA, diesel-driven alternating sets, 400/440 volts, 3-phase, 50 cycles, 4-wire, complete with switchboard and Isenthal voltage regulator, self-contained units, early delivery, restricted number available. 5-kVA diesel engine driven alternating sets, suitable for a supply voltage of 230 volts, single-phase, 50 cycles, complete with switchboard, incorporating automatic voltage regulation. Limited number available, early delivery.—Berry Hill Plant Division, Cheadle, Staffs. Phone 2181 & 2261. 170

GENERATING Sets, 75 kVA, 400 volts, 3-phase, 50 cycles; G.M.C. Diesel Engines direct-coupled to English Electric Alternators. Complete control panel, electric start and all accessories. Guaranteed one year. Trade price, £2,150, ex works.—Lesco, 10, Lovat Lane, London, E.C.3. MAN. 3838. 610

GENERATORS: Diesel Power A.C. Generating Sets, 50 kW, comprising National 90-h.p. diesel engines direct coupled to 50-kW, 110-v. D.C. generators, complete with battery for starting and water-cooling tanks. State best offer.—Box 558.

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GRID Moulds for starter plates, from 75 guineas, complete with stand. Double impression; quick action. Tested under working conditions before delivery.—B.T.A., 240 Cavendish Rd., London, S.W.12. Balham 0691/2. 58

HALLMARK Refrigerating Unit, complete evaporator condenser, two fans and 2.5-h.p. motor.—Allen & Gibson Ltd., Towcester, Northants. Tel. 197. 7043

HOUSE Meters, 200/240 v. A.C., s/ph., 50 c. Price 17s. 6d. plus 1s. carriage.—Universal Electrical, 221, City Road, London, E.C.1. 129

HOUSEHOLD Electrical Appliances a speciality. A variety of 1-kW and 2-kW Electric Fires (portable and inset types), Artificial Coal Fires, Boiling Rings and other Portable Heaters and Cookers; Hot Plates, Radiators, Convector Heaters, Kettles; a variety of Electric Irons; Table Lamps and Shades, Radios, Moving Coil Pick-ups, Fans, Hair Dryers; Accessories, Flexibles, Switches, Torch Cases and Lighting Batteries; Vacuum Cleaners, various makes; Fluorescent Fittings, good variety with fluorescent tubes; Wash Boilers, actually in stock. New articles added to list weekly. Lists and illustrations on application.—Brooks & Bohm Ltd., 90, Victoria Street, London, S.W.1. Phone, VICtoria 9550 1441. Inland Telegrams: Beebatts, Sowest, London. 66

IMMEDIATE delivery of brand new guaranteed 8 or 10-kVA, 400/3/50, 4-wire Petrol or Diesel Alternator Sets; also new 5-kVA, 9-kVA, 230/1/50 Petrol Alternator Sets from stock.—Hampson Industries, Union Street, West Bromwich, Staffs. 4577

IMMEDIATE delivery of brand new Automatic Voltage Regulators for Alternator Sets.—Box 4575.

IMMEDIATE delivery of one 69-kVA Diesel Alternator, brand new, 400/3/50, four-wire, control panel, radiator, compressed air starting. Price £2,400. Five brand new Lister/Mawdsley Diesel Alternators, 20 kVA, 400/3/50, radiator, panel with A.V.R., complete, never used, date 1946. £1,325 each. Six Lister/Crompton Parkinson 15-kVA Diesel Alternators, 230/1/50, in original packing cases, self-contained units, date 1946. Price £975 each. Four brand new 24-kVA Self-excited Alternators, speed 1,500 r.p.m., 400/3/50, 4-wire. Price £375 each. Fifty brand new 7½-kW "G.E.C." Alternators, 230/1/50, speed 1,500 r.p.m., with Exciters. Price £82 10s each.—Stewart Thomson & Sons (L'pool) Ltd., Gladstone Works, Fort Road, Seaforth, Liverpool, 21 (Bootle 2697); Dacre House, Victoria Street, London, S.W.1. Abbey 4017. 582

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LESLIE Dixon & Co. for Dynamos, Motors, Switchgear, Chargers, Telephones, etc.—214, Queenstown Road, Battersea, S.W.8. Telephone, MACaulay 2159. 18

LISTER Spares: Limited number available, Pistons, Liners, Valves, Gaskets, etc.—Harold W. Worboys (Sales) Ltd., By-Pass Rd., Barking, Essex. Rippleway 1173. 7059

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METAL Rectifier by Walsall, input 200/250 v., single-phase, output 36 v., 56 amps.; Metal Rectifier by Elec. Construction Co., input 230 v., single-phase, output 12 v., 1 amp.; Four Metal Rectifiers, input 200/250 v., single-phase, output 36 v., 56 amps., complete with control boards for three circuits, with ammeter, selector switch and current regulator for each circuit: 17 Glass Bulb Mercury Arc Rectifiers by E.C.C., input 380/440 v., 3-ph., 50 cycles, output 110 v., 50 amps.; Westinghouse Plating Rectifier, input 230 v., single-phase, 50 cyc., max. output 24 v., 300 amps.; Westinghouse Plating Rectifier, input 400/440 v., 3-ph., 50 cyc., max. output 24 v., 300 amps.; 65-kW Glass Bulb Mercury Arc Rectifier by Hewittic, input 400 v., 3-ph., 50 cyc., output 220 v. D.C., unit complete with new spare bulb; 2 65-kW Metal Bulb Mercury Arc Rectifiers by E.E.C., input 400/440 v., 3-ph., 50 cyc., output 110 v. D.C., 590 amps.—George Cohen, Sons & Co. Ltd., Wood Lane, W.12, and Stanningley, Nr. Leeds. 562

MOTOR Converters, 1,500 and 2,000 kW, manufactured by G.E.C., Bruce Peebles and Brush Electric. A.C. input 10,750 v., 3-phase, 50 cycles, D.C. output 440 to 585 v., 500 revs., complete with starting panels, resistances, field rheostats, etc.—John Cashmore Ltd., Eagle Works, Great Bridge, Staffs. Tel. Tipton 1101/3. 95

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MOTORISED ½″ Bench Drilling Machines, 13 speeds, £18 10s.—John Steel, Bingley. Phone 1066. 84

NAMEPLATES, Engraving, Diesinking, Stencils.—Stillwell & Sons Ltd., 153 Far Gosford St., Coventry. 14

NEW Air Compressors, Concrete Block Machines, Mixers, Belt Elevators, Electric Motors, Diesel and Petrol Engines, Cranes, Hoists, Wheelbarrows, etc., now in stock. Immediate despatch.—Selwood for Plant, Chandler's Ford, Hants. Tel. 2275. 4952

NEW Electric Motors offered: 1/50-h.p. Synchronous, 1,450 r.p.m., flange mounted; ¼-h.p., 110-v., 50/60-cycle, 1,440-r.p.m. Capacitor; Geared Synchronous, single-phase, 230 v., 50 cycles.—Keith Barker, 9, Lower John Street, W.1. 7065

NEW Rotary Converter, 24-v. D.C. input, 230-v. A.C., s/ph., 50-c. output, 100-120 watts filtered, £10 10s. each.—Universal Electrical Co., 221, City Rd., E.C.1. 425

NEW Transformers: 8 50-kVA Tubular Oil-cooled Transformers by English Electric Co., primary 400 v., 3-ph., secondary 200 v., 3-ph., connections delta/star, tappings at plus and minus 5%; 86 25-kVA Oil-cooled Transformers by English Electric Co., primary 400 v., 3-ph., secondary 200 v., 3-ph., tappings at plus and minus 5%; 58 5-kVA Air-cooled Transformers by Metro-Vick, primary 400 v., 3-ph., secondary 200 v., 3-ph., tappings at plus and minus 5%; 35 5-kVA Oil-cooled Transformers by English Electric Co., primary 400 v., 3-ph., secondary 200 v., 3-ph., connections star/delta, tappings at plus and minus 2½ and 5%; 20 10-kVA Oil-cooled Transformers by Parson, primary 3,300 v., single-phase, secondary 230 v., single-phase, tappings at plus and minus 2½%.—Geo. Cohen, Sons & Co. Ltd., Wood Lane, W.12; and Stanningley, Nr. Leeds. 369

NEW Generating Sets, by Stuart Turner, 2½ kVA, 230 volt, 1-phase, 50 cps., water cooled, all packed in export cases ready for shipment, 50 available at bargain price.—Burleigh, Brownswood Wks., Exhibition Grounds, Wembley, Middlesex. 7070

NEW 25-h.p. Crompton Parkinson Slipring Motors, 960 r.p.m., 400/3/50 cycles.—Electric Machinery Co. Ltd., Union Works, Ancoats, Manchester. 453

ONE Battery Charging Set, with metal type rectifier. Single-phase, A.C. input, 250 volts, 50 cycles. With a max. D.C. output of 56 amps. at 36 volts. Complete with slate switch panel, 3-voltage regulator. D.C. ammeter reading 0-14 and 3-15 amp. feeder switch and fuse. Steel cabinet with lead covered top measuring 4′ 9″ × 1′ 9″. New condition. Apply—C. S., Ltd., Staffa Works, Staffa Rd., Leyton, E.10. 174

ONE D.C. Generating Set complete. Morris 4-cyl. petrol engine with automatic governor, 25 h.p., direct coupled to a Mawdsley generator, 220 v., 57 amps., in continuous rating.—Commercial Structures Ltd., Staffa Rd., Leyton, E.10. 177

ONE 40-kVA Alternator, 400 v., 3-phase, powered by Hercules petrol engine, new; one 22-kVA Alternator, 400/350 v., complete with control panel, voltage regulator, etc., powered by Lister diesel engine; one 3-cylinder Alternator, Lister diesel engine, 22 kVA, 3-ph., 400 v.; four 9-kVA Alternators, 230 v., on pneumatic-tyred trailer; one Mobile Welding Plant, 110 v., 218 amps., mounted on pneumatic-tyred trailer, secondary circuit for lighting, a totally enclosed unit; two Mobile Welding Plants, 110 v., 79 amps., mounted on pneumatic-tyred trailers, secondary circuit for lighting, a totally enclosed unit.—Boyd Gibbins, 285, Romford Road, Forest Gate, E.7. 87

ONE 93-h.p., 990-r.p.m., 400/3/50-cycles, "No-Lag," slipring Motors by B.T.H. with oil switchgear; three 40-h.p., 960-r.p.m., 400/3/50-cycles, ball bearing, slipring Motors only by L. D. & C.; two 50-h.p., 720-r.p.m. ditto Motors by English Electric.—Newman Industries Limited, Yate, Bristol. 590

OVER 100 Plating and Anodising Generators from 200 to 1,600 amps. D.C. or A.C. motors can be supplied for most sizes.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. Tel. B.S. 1000/1. 153

PETROL Electric Generating Sets, 115 volts, 250 watts, D.C.; 120 volts, 21 amps., A.C., 1-ph., 60 cycles, 125 volts, 3-kVA, 3-phase, 50 cycles; also 5-kVA, 6.3-kVA, 7.5-kVA and 25-kVA Sets.—Scottorn Limited, 173, Kingston Road, New Malden, Surrey. Telephone, Malden 3633. 132

PLATING Generator, ball bearings, enclosed ventilated, 10 volt, 1,600 amp., 1,000 r.p.m., with or without 220-v. D.C. driving motor and C.I. bedplate.—Max Electric, 190, Thornton Rd., Croydon. THO. 4276/7/8. 163

PLATING Generators, unused, several ranging from 350 to 700 amps., 6 to 12 volt, plain or with A.C. or D.C. motor drive. Particulars from—Stewart Thomson & Sons (Liverpool) Ltd., Fort Rd., Seaforth, Liverpool 21 (Bootle 2697); or Dacre House, Victoria Street, London, S.W.1 (Abbey 4017). 63

QUANTITY of 3-way, S.P. and Neutral, 500-v., 15-a. I/C Fuseboards; also quantity 80-watt reprocessed Fluorescent Tubes, d/b or w/w, guaranteed 500 hrs., 15s. each.—Moss Bros., 53 Goodge St. W.1. MUS. 5385. 189

REBUILT Motors and Generators. Long deliveries can often be avoided by purchasing rebuilt secondhand plant. We can redesign or replace surplus plant of any size. Send us your enquiries. Over 1,000 ratings actually in stock here.—Dynamo & Motor Repairs Ltd., Wembley Park, Middlesex (Telephone, Wembley 3121, 4 lines); also at Phœnix Works, Belgrave Terrace, Soho Road, Handsworth, Birmingham (Telephone, Northern 0898). 26

RELAYS, Switch Keys, 100 different types; also Jacks and plugs and a large variety of Telephone Materials.—Jack Davis, Dept. R., 30, Percy Street, London, W.1. Museum 7960. 353

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

ROTARY Transformers, brand new, unused, ex-R.A.F., 24 v. in: 1.230 v. at 200 mA out. Easily converted to fractional h.p. mains motors. Weight approx. 18 lb., size 11¾″ long, 5¼″ diam. Hoovers type T.29, on feet. Offers (near scrap) invited. Several thousand in stock. Also various other elec. surplus.—Auto Collections Ltd., 15, Lawrence Street, Northampton. 429

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SLIDERAILS for electric motors, all sizes. Trade supplied.—W. H. Sugden & Co. Ltd., Glenny Road, Barking. 4903

SECONDHAND Time Switches, in perfect condition, fully guaranteed. Installed if required. Inquiries invited.—J. W. & R. E. Hughes (Clockwork Engineers), 58, Victoria St., London, S.W.1. Tel. VIC. 0134. 128

S.H.E.F.I. Moving Coil Pick-up is now available for both Home Trade and Export. It combines for the first time high fidelity with high output voltage, enabling it to directly replace normal moving iron pick-ups without any extra amplification. It has an exceptionally clean response with no undesirable resonances, thereby reducing needle scratch. In walnut and black plastic finish, 40s. each retail, including Transformer, plus 10s. 4d. purchase tax; in ivory finish, 43s. 8d., plus 11s. 7d. purchase tax. Wholesale and retail inquiries invited. Illustration sent on request.—Brooks & Bohm Ltd., 90, Victoria Street, London, S.W.1. 105

SLIPRING Induction Motors, 400/3/50: 1 120-h.p. Westinghouse, 205 r.p.m., protected; 1 60-h.p. Mather/Platt, 725 r.p.m., E.V.; 1 30-h.p. Met-Vick, 475 r.p.m., E.V.; 1 20-h.p. Asea, 1,500 r.p.m., E.V.; 1 15-h.p. G.E.C., 1,500 r.p.m., E.V.; 1 7-h.p. Brook, 1,500 r.p.m., E.V.; 1 4/1.34-h.p. Higgs, 2,000/670 r.p.m., F.D. This is a commutator motor with control gear.—Oldfield Engineering Co. Ltd., 96, East Ordsall Lane, Salford, 5. 320

SLOTMETERS (Prepayment Meters), A.C. and D.C., all kinds and sizes supplied. Billiard Switches.—Brent Electrical Co., 6 Holmdale Gardens, London, N.W.4. 130

SMALL Gas Engine Plant, approx. 8-10 b.h.p., entirely self-contained with external flywheels and shafting, suitable for direct generation.—317, Regent's Park Road, N.3. Finchley 5143. 139

SPIRAL Elements, Firebars, Boiling Ring Elements, Pencil Elements for manufacturers and wholesalers. Enquiries to—S. I. Engel, 485/7, Harrow Road, London, W.10. 355

SPIRAL Elements for electric fires, boiling rings and other appliances, supplied to order.—Electrothermal Engineering Ltd., 270, Neville Road, London, E.7. 54

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

STAR/Delta and Contactor Starters, 1 to 25 h.p.; Automatic Voltage Regulators, 9 kW; G.E.C., O.T.I. Welding Sets; various items of Electrical Equipment; Hyster 3-ton Mobile Crane; King 2-ton Runway Crane. Delivery ex stock.—A. W. Thompson (Electrical) Ltd., Wath-on-Dearne. Phone 76. 336

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 Stores, offers wanted. Refrigerator, 2-door Kelvinator, 7 cubic feet; Refrigerator, 2-door Marco, 7 cubic feet, both in full working order; Single Insulated Yellow-stranded Steel Telephone Wire, 11 miles; 16,000 Bakelite Headphone Earpieces; 60,000 Telephone Headphone Diaphrams; 3,000 yards 1.044 P.V.C.; 100,000 Assorted Bakelite Insulating Pieces, drilled and undrilled; 10,000 Wound Coils for Telephone Headphone Magnets; 20,000 Assorted ⅜" and ½" 8-6 & 4 BA Screws; 2,000 Telephone Jacks; 100,000 Parts for Telephone Jacks, unassembled; 750 yards .75 Green P.V.C. Sleeving; 6 Motor Cycle Acetylene Headlamps, complete. Offers to —Riv. 2283-4. Rex Lighting & Radio Co., 246a, King Street, Hammersmith, W.6. 296

SWITCHBOARD: Two Crompton Parkinson "Klad" type oil-immersed Circuit Breakers; one 600 amps., 3-pole, complete with ammeter and test link circuit; one 400 amps., 3-pole, complete with voltmeter, ammeter and power factor meter panel. Each of the above breakers mounted on cast-iron floor stands and fitted with incoming and outgoing cable dividing boxes.—Oldfield Engineering Co. Ltd., 96, East Ordsall Lane, Salford, 5. 323

SWITCHBOARDS for Generating Sets, A.C., D.C. These can be made up to customers' requirements in a few days for panels up to 45 kVA; also Instruments, Ironclad Switchgear, A.V.R.'s, etc.—Box 4576.

SWITCHPLUGS, Bakelite, 15 amp., 3-pin. We are now accepting orders for delivery December/January; large quantities available. Price on application. All other types of accessories held in stock. Write for our 1948 price list.—L. Benn & Co. Ltd., 81, City Road, London, E.C.1. CLE. 5546/7. 165

THREE 35-kVA, 750-r.p.m., 400/230-volts, 3-phase, 50-cycles, 4-wire Alternators, with exciters, for despatch in 4 weeks.—Newman Industries Limited, Yate, Bristol. 589

TRANSFORMERS, two (new), 250 kVA, 11,000/550 v., 3-phase, 50 cycles, oil cooled; maker, English Elec. Co.—Box 468.

TRANSFORMERS: Two pairs Scott connected, 80-kVA. 2 to 3-phase, 200 to 400 volts.—Harold W. Worboys (Sales) Ltd., Eastern Works, By-Pass Road, Barking, Essex. Phone, Rippleway 1173. 7062

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TORCHES, Bakelite, asstd. colours, immediate delivery. —Universal Dis. Co., 68, Gt. Eastern St., E.C.2. 173

TUCKER C.G. and Batten S.C.B.C. Brass Lampholders; T.P. and D.P. 15-amp. I.C. Change-over Switches, G.E.C.; D.C. 3-h.p., 110 and 220-v. G.E.C. Starters; A.C. 3-h.p., push button, 3-phase, 400-v. G.E.C. Starters; 3 only, 3-h.p., 3-phase, 400-volt, 1,425-r.p.m. Motors; Glasgow Box 100-amp. D.P. I.C. Switch Fuses; Cantic D.P. H.R.C. 160-amp. Switch Fuses, No. W.B.A. All new London stock.—Ryness Electrical Co. Ltd., 178, Stamford Hill, London, N.16. STA. 7906. 7048

TWO Diesel Generating Plants, brand new, 30 kVA, 3-phase, top grade British make, electric start, radiator cooled, complete with switchboard and maker's guarantee, £1,790 each.—Alliance Electrical Co. Ltd., 2, Henrietta Street, W.C.2. 614

TWO 20-kVA Diesel Generating Sets, for delivery two weeks; two 100-kVA, 3-bearing type Alternators, Exciters and Switchboards, for delivery February, 1948. —The Horseshoe Supply Co. (Spalding) Ltd., Horseshoe Road, Spalding. Phone 2535. 48

UNUSED Ford Petrol-driven Generating Sets for plating and battery charging, 400/800 amps., 15/7½ volts.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 155

UNUSED Plating or Battery Charging Generators, 200/400 amps. at 15/7½ v., direct coupled to new A.C. 440/3/50 motors.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford 154

UNUSED Portable Petrol-driven Welding Sets, by Meadows, with switchboards and resistances. Suitable for electrodes sizes 6 to 14.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. Tel. B.S. 1000/1. 151

UP to 1 ton D.C.C. Copper Wire, .3 × .3, "Lewcos." —Max Electric Co. Ltd., 190, Thornton Road, Croydon. 514

USED Double Flanged Wooden Bobbins, 1,500 gross, approx. measurements 3¾" overall, 3" traverse, 2¼" diameter flange, suitable wire winding. Will sell all or part.—Box 103.

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VARNISHED Silk Tape, 1.13/16" × 6 mil, 30s. per gr. yds.; ⅜" Empire Tape, 8s. per gr. yds.; 40 lbs. 46 s.w.g. Double Silk Cov. Wire, 35s. per lb.; 5 cwts. Flexible Mica Sheet, 6s. per lb. the lot; 600 5-amp. Slydlok Fuses and Bases, 2s. each; 200 15-amp. ditto, 2s. 6d. each; Ironclad ¾" entry Stop Button Controls, 4s. 6d. each. Also large quantity of Ross Courtney Terminals.—Garston Manufacturing Co., 12, Victoria Road, Liverpool, 17. 7076

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XMAS Decoration Sets, min. holders, spare lamps, 24 v. —Universal Dis. Co., 68, Great Eastern St., E.C.2. BIS. 6777/8. 348

1-inch Brass Lampholders, S.B.C. fitting, single ring and 2 porcelain insets. Sample on application; 12 thousand available.—Superlighting Electrical Co., 146, Upper Richmond Road, S.W.15. Putney 6908. 7067

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2 Brookhirst Pillar Type Starters, contactor operated, fitted with ammeters, isolator, for use with two-speed motors, 15/7½ h.p.; 1 flameproof 3-pole, 30-amp. Change-over Switch. Totally enclosed motor-driven Extractor Fans: 8 400/3/50, 18" dia.; 1 230/1/50, 18" dia.; 1 230/1/50, 15" dia.; 1 230/1/50, 8" dia.—Oldfield Engineering Co. Ltd., 96, East Ordsall Lane, Salford, 5. 322

3 Circuit Battery Charging Panels complete with 6" ammeters, 0-14, switches, fusers and three variable resistances, 0-14, on angle iron framework. Price £10. Apply—Hobson & Partners, 7a, Old Road, Linslade, Leighton Buzzard. 545

5-kW Ford Industrial Engine with C.P. generator directly coupled, 200/250 v. D.C., with regulator, volt and ammeter. £130 delivered.—Universal Electrical, 221, City Road, London, E.C.1. 423

8 unused, 1½/2½-h.p., 220-volt, 1,000/1,600-r.p.m., vertical spindle, totally enclosed Motors, by Allen, Admiralty pattern.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 583

9-kVA new Switchboards, 230 v., 1-phase, with instruments, switches and regulators; also Isenthal Automatic Voltage Regulators.—Midland Counties Electrical Eng. Co. Ltd., Grice Street, West Bromwich. 169

15 amp., 3-pin Switched Sockets. Robustly constructed of cast aluminium, box measuring approx. 4¾" × 3¾" × 2½" with florentine bronze finish face plate, box finished cream with 4 knock-outs for ¾" conduits. Special terms to exporters.—Scemco Ltd., 6 & 7, Soho Street, London, W.1. GER. 1461-2-3. 166

45-kVA Spot Welder, by British Federal Machine Co.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 585

47-h.p., 400-v., 3-phase, 50-cycle, 725-r.p.m., slipring, ball-bearing L.D.C. Motor, with Allen West iron-clad control panel, guaranteed perfect.—Max Electric Co. Ltd., 190, Thornton Road, Croydon. 513

50-h.p. Harland S. Cage Motor, 400/3/50, b. brgs., 485 r.p.m., with auto transformer starter, £250.—Electric Machinery Co. Ltd., Union Works, Ancoats, Manchester. 452

160 yards (approx.) 61/.093 Circular Twin Tough Rubber Sheathed Cable.—Britannia Mfng. Co. Ltd., 22/26, Britannia Walk, London, N.1. 408

165-kVA Diesel Alternator Set, comprising Davey Paxman 12-cylinder V opposed Diesel Engine Set, radiator cooled, direct-coupled to 165-kVA Alternator, complete with switchboard, mounted on fabricated base-plate. Can be seen running. Immediate delivery.—Stevens & Hodgson Ltd., Tyburn Road, Birmingham, East 2235. 600

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230 to 110-volt Transformers, 10, 6 and 2.5 kVA; Rectifier Units, 230 volt input, 15 volt, 5 amps. output; M.E.M. 2-pole, 100 and 200-amp. Switch Fuses.—C. Leatherbarrow Ltd., Grand Bdgs., W.C.2. Whitehall 3948 or Liverpool, Central 7251. 593

250-kW Rotary Converters (2), with transformers and switchgear, input 6,600 volts, 3-phase, 50 cycles, output 420/210 volts; also A.C. and D.C. Motors, Switchgear, Generating Sets, Welders, etc.—Midland Counties Electrical Engineering Co. Ltd., Grice Street, Spon Lane, West Bromwich. 36

250-kW Steam Generating Set, 220 v. D.C.; 400-kW Steam Generating Set, 440 v. D.C.; 34-kW Steam Generating Set, 220 v. D.C.; 20,000 gallons C.I. and Steel Sectional Tanks; 2 2½-kW, 130-v. Petrol Generating Sets.—Harry H. Gardam & Co. Ltd., Staines. 60

300 Electric Blowers with heating elements, 230 v., by Hoover & Phœnix. For further particulars apply—Box 4920.

350-h.p. D.C. Machine, 500 volts, 233/350 h.p., 500 volts, 390/590 amps, 900/1,800 r.p.m., excitation compound, rating continuous, size CD44/5L, by English Electric Co., London, coupled to David Brown of Huddersfield gearbox, order 160934, 350 h.p., 1,800/3628 speed, with ¾-h.p., 400-volt, 1.6-amps. electric motor, 945 r.p.m., driving an oil pump to lubricate gearbox. Would consider selling either unit separately. G.M.C. or Leyland Diesel Motors, 186 b.h.p., available to drive above as a D.C. generator, or to sell as separate units.—Laygold & Co., Blackbushe Airport, Camberley, Surrey. Tel. Camberley 1600, Ext. 79. 592

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1941 Generating Unit, 18-h.p. Lister diesel, 110-v., 10-kW Mawdsley Dynamo, complete with fuel tank, pump and switchboard. Moved as one unit, total weight 31 cwt. Telephone: Haslemere 1155. 512

1,800 12-v. Heater Elements in copper case, suitable for motor car de-mister, at 6d. each; and similar quantity of Thermostats, 12/24 v., designed to switch on at freezing point to 45 degrees F., also at 6d. each.—Wade, Smith & Co. Ltd., Star Street, Bradmore, Wolverhampton. 526

2,000 gross 5/32" Whit. Machined Stainless Steel Hex. Nuts. Best offers to—Jackson Electric Stove Co. Ltd., Clifton Road, Luton. Tel. 1303. 527

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A.C. Motors, all h.p., urgently wanted. Burnt-out machines acceptable.—Max Electric Co. Ltd., 190, Thornton Road, Croydon. 12

ACCUMULATORS, 110 2-volt, open-top cells. State lowest price.—Burtons Works, Astley, Shrewsbury. 7037

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NUMBER Motors, ½ h.p., 110 volt and 1 h.p., 220 volts D.C.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 587

ONE American Crocker Wheeler, 450/500-amp., 110/115-volt, D.C. Generator, 1,500 r.p.m.—Streatham Engineering Co. Ltd., 43, Mitcham Lane, London, S.W.16, Streatham 0282. 7004

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ONE Plating Generator, 3,000 amps., 10 v., preferably direct coupled to 3-phase A.C. slipring motor, but generator alone considered. Full output and amps. essential. —Meech, 19/21, Farringdon St., E.C.4. CEN. 9042. 544

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ONE 45-h.p., 220-volt D.C., ball bearing Motor and Starter; 750 r.p.m. essential for direct coupling. Box 591.

ONE 65-h.p. Slipring Motor, with starter, 1,440 r.p.m., 3-phase, 50 cycles.—Messrs. Dow & Nicholson Ltd., 180, Hardgate, Aberdeen. 560

PORTABLE Voltmeter or Volt-Ammeter in wood case, 0/600 v., A.C./D.C.—Ramsbottom, Keighley. 508

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WANTED, D.C. and A.C. ball-bearing Motors. Full details to—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 29

VARIABLE Speed Motors, 400/50/3 (for own use only, not for resale).—Box 37.

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3 5-h.p., variable speed, 400/3/50, speed 200/1,000 or near, 10-h.p. S.C. Motor, 400/3/50, T.E.F.C., 950 r.p.m., for vertical mounting.—Durable Welding Co. Ltd., Gladstone Wharf Wks., Fort Rd., Seaforth, Liverpool. 607

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THE Engineering Design Co. (E. Chidlow, F. J. Thomas), Pride Hill Chambers, Shrewsbury (Tel. 2603). Drawings and Tracings for electrical engineers. Wiring Diagrams a speciality. 7084

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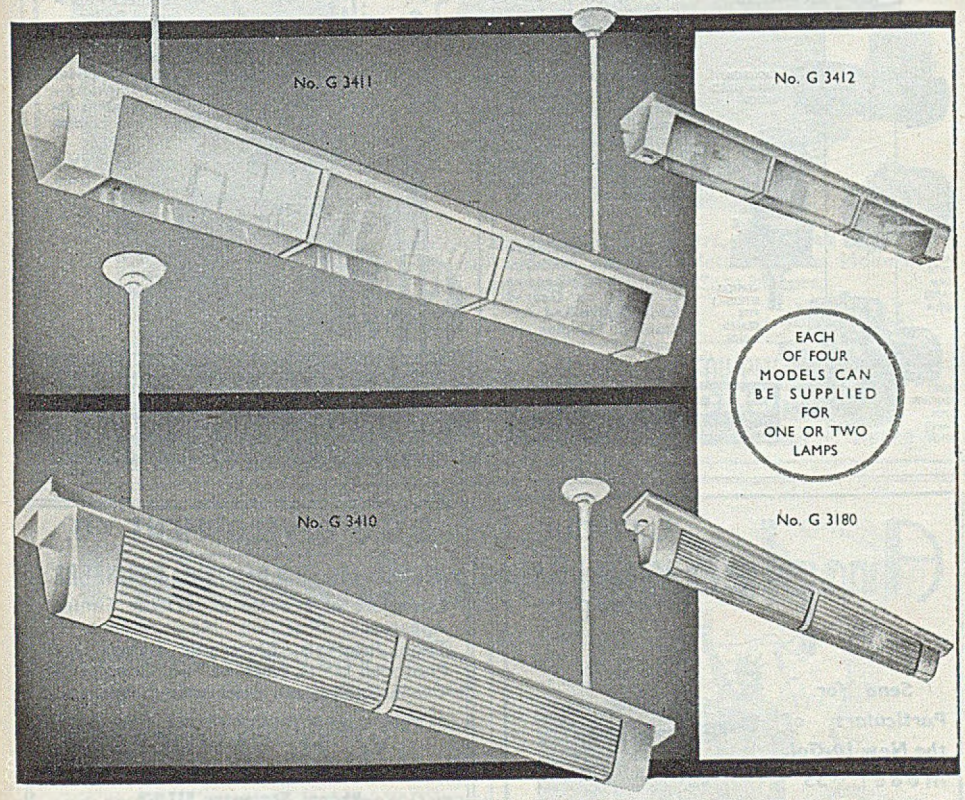

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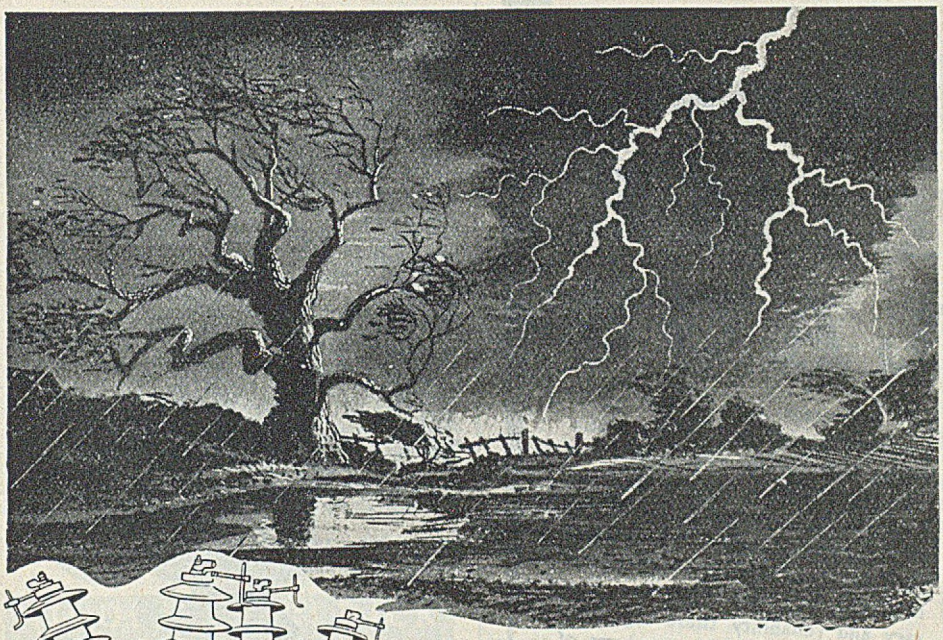

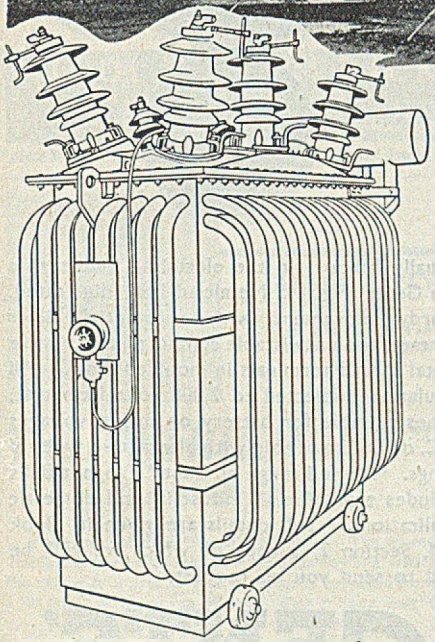

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