ELECTRICAL REVIEW, NOVEMBER 24TH, 1944

ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXV. No. 3496 NOVEMBER 24, 1944 9d. WEEKLY

PRIDE & PREJUDICE

Mr. Grundy attends the inauguration of the Babcock Fusion Welding shop on 16th August, 1932.

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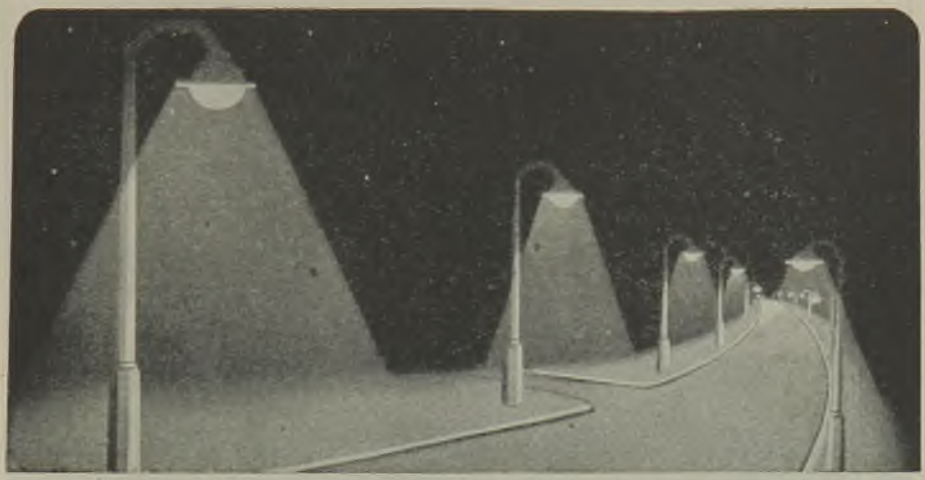

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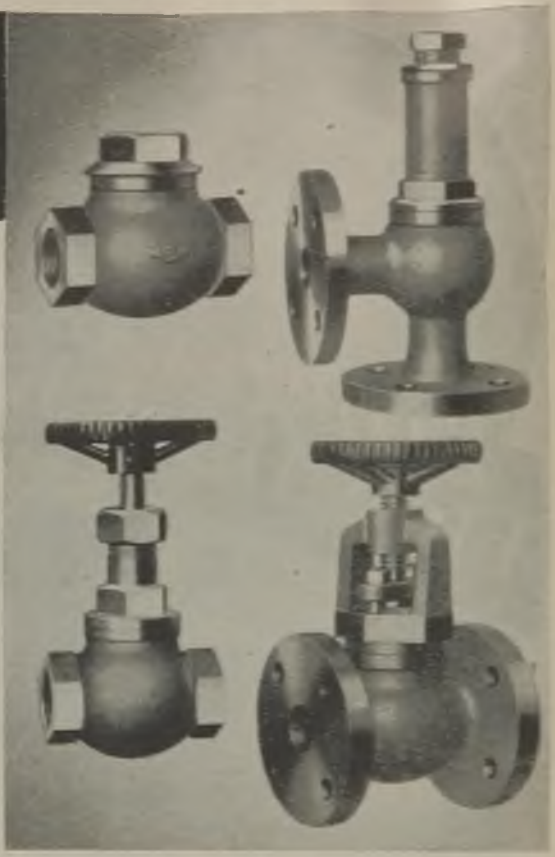
BRONZE VALVES



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CLASS OF VALVE	SCREW	STEAM W.P.	SEATING	PATTERNS
CHECK	—	250 lbs. 500° F.	screwed-in renewable ring	Globe, junction, vertical
STOP AND CHECK	Inside	250 lbs. sat.	screwed-in renewable ring	Globe, junction
STOP AND CHECK	Outside	250 lbs. 500° F.	screwed-in renewable ring	Globe, junction
STOP (high-efficiency)	Outside	250 lbs. 500° F.	special	Globe, junction
STOP (standard)	Inside	250 lbs. sat.	screwed-in renewable ring	Globe, junction
STOP (standard)	Outside	250 lbs. 500° F.	screwed-in renewable ring	Globe, junction
STOP (needle stopper)	Inside	250 lbs. sat.	screwed-in renewable ring	Globe, junction
STOP (needle stopper)	Outside	250 lbs. 500° F.	screwed-in renewable ring	Globe, junction
CHECK	—	150 lbs. sat.	renewable comp. disc	Globe, junction
STOP AND CHECK	Inside	150 lbs. sat.	renewable comp. disc	Globe, junction
STOP	Inside	150 lbs. sat.	renewable comp. disc	Globe, junction
SPRING RELIEF	—	250 lbs. 500° F.	screwed-in renewable ring	Globe, junction, open disch.

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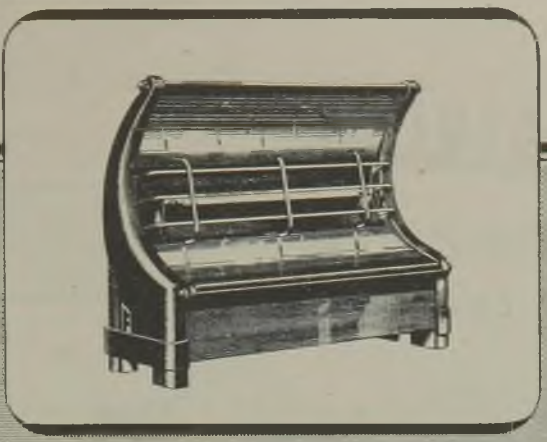

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or a mouse?

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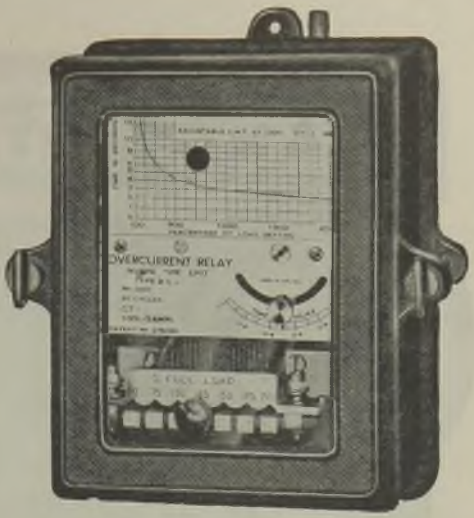

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ELECTRICAL REVIEW

November 24, 1944

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXV. No. 3496. NOVEMBER 24, 1944 9d. WEEKLY

Electricity for All

Growing Influence of E.D.A. in National Life

THIS year the British Electrical Development Association celebrates its silver jubilee. Looking back over the past twenty-five years it is interesting to see how the nature of the Association's work has changed. During the earlier part of its life its mission seems to have been to bring the electrical industry itself to a proper appreciation of its importance and opportunities. Without the active aid of the supply undertakings it was impossible to approach the public on a realistic basis. The mere suggestion that " Electricity is good for you " was unlikely to make much impression unless reinforced by solid information and assistance from the men on the spot—the supply authorities.

It is true to say that this stage has been completed. Stimulated largely by the circle and area organisations of E.D.A. supply authorities are now ready to play their part in development work. The Association is thus at liberty to cultivate the public directly—and it is doing this in many aspects of national and civic life.

Public Relations and Propaganda

Some indication of the variety of its activities is given in the interim report which we review in this issue. Much of this public work is not recognised by the public as emanating from an Association; this is as it should be, for " public relations" are more effective as they get further away from naked propaganda.

E.D.A. is exercising a growing influence on Government Departments and public bodies by acting in an advisory capacity in such matters as housing, kitchen planning, fuel efficiency and large-scale cooking. In the same way much is being achieved by collaboration with some of the leading professions, notably the architects and the doctors. We have stressed on many previous occasions the necessity for securing the ears of architects and builders if electricity is to get in " on the ground floor " instead of having to fight its way into completed buildings already strongly occupied by gas. This increasingly important section of the community must be brought to realise the opportunities which electricity gives them for evolving a distinct twentieth-century style in domestic architecture and internal arrangements—opportunities which have so far been seized only to a comparatively limited extent.

The Women's Part

In its direct contacts with the public E.D.A. has a valuable ally in the Electrical Association for Women which provides active " cells " in hundreds of localities. Much more might be done through films, although entry into cinemas is not a simple matter, even for the Jeanne de Casalis production " Too Easy," under present arrangements. The Association realises the need for films which are entertaining and only broadly propaganda and we look forward to seeing the four new films now in hand in all the country's cinemas.

Giving technical advice to members and others is another way in which E.D.A. is extending the use of electricity and in this direction the setting-up of a testing station is proposed. Until further details are obtainable little can be said about this,

but the subject is one in which there are likely to be some differences of opinion.

At next week's celebration of the silver jubilee there will be a gathering of leading representatives of all departments of national life, testifying to the position and prestige which E.D.A. has achieved.

Replanning Distribution

THE reconstruction of Britain's bombed cities presents an opportunity of replacing old distribution systems, which have grown up piecemeal, by new, adequate and properly designed lay-outs. It is an opportunity welcomed by the engineers of the towns concerned but, as Mr. H. Midgley points out in his article on Plymouth in this issue, it involves the expenditure of a good deal of money—an expenditure which would bear hardly upon the already badly-hit citizens of those towns. Added to this are the continuing charges on destroyed or redundant equipment. Mr. Midgley asks for financial assistance " as a matter of justice " and justice is certainly on his side.

Possible Assistance

LEGISLATION has still to be introduced to cover compensation payable to public utility undertakings. These were excluded from the operation of the War Damage Act, 1941; the Government's proposals with regard to them were outlined in 1941 and given in some detail in a White Paper published in the following year. From this White Paper it would seem that reconstructed or replaced cable systems would qualify for " payments of outlay," due regard being paid to the state of the superseded system. But it is probable that the cost of an entirely new layout would not be covered in this way and further assistance might be necessary. This could possibly take the form of relief from capital charges on the new plant and equipment until it became remunerative, a period of anything between three and five years.

New Generating Plant

THE Central Electricity Board's programme for post-war expansion of generating capacity by 3,000,000 kW, equivalent to 35 per cent. of the aggregate installed at the outbreak of war, is the largest yet put forward in a single list. Nevertheless, the formidable estimate of requirements seems by no means excessive, even by pre-war standards. To judge from insistent warnings to keep off the peak, wartime extensions leave little margin over barest requirements. Of the 2,400,000 kW of turbo-alternators included in the list given on a later page, the manufacture of no less than 876,000 kW is liable to be delayed pending the receipt of further authority from the Government. As arrangements for extensions have to be made three or four years ahead of the load, delays in the construction of generating plant are even more than usually dangerous.

A Basic Necessity

As far back as 1937 the increase in plant capacity budgeted for that year was 774,000 kW, though only 557,000 kW could be installed owing to competing claims of rearmament. No doubt. however, electricity's war record has demonstrated to those ultimately responsible for political decisions of this kind the priority need for adequate generating capacity as a basis for industrial production. Construction of plant may also take somewhat longer in view of the greater average output per generating set now requisite. Of the 62 turbo-alternators to be installed in 34 existing and initially in five new stations, 24 range between 45,000 and 100,000 kW. An average capital cost of £30 per kW is appreciably in excess of the figure for which existing stations were built, but this increase will be an economy if it is incurred in devising means to counteract the much greater proportionate increase in the cost of coal.

Cookers in M.O.W. Houses

AT first glance the placing of contracts for cookers for the first batch of 93,000 of the Ministry of Works emergency houses in the proportion of one electric to two gas may seem disappointing to the electrical industry. When it is remembered, however, that before the war the ratio of gas to electric cookers in use was approximately four to one it will be seen that there is every reason for satisfaction, though none for complacency, at the trend of events, especially during a period when domestic electrical development work has been at a standstill. Furthermore, the contracts for these initial installations have been placed solely on estimated requirements, and if more electric cookers are demanded future orders will be adjusted

accordingly. Since the gas-electric "truce" does not apply to new buildings it is up to E.D.A., the E.A.W., individual supply undertakings and anyone else concerned with the popularising of electrical methods to ensure a demand for electric cookers.

Equipping Portal Houses

THE subject of "freedom of choice" in services for new houses has been much discussed in recent issues of this journal. Now we hear that the Hull Housing and Town Planning Committee has been informed that there will be no choice as regards a hundred Portal houses which have been allocated to the city as a first instalment. The Committee, very sensibly, has therefore decided that electricity shall be supplied to the new houses. Dare we hope that a similar decision will be made for the further 2,250 houses which are contemplated?

Fuel Advisory Council

LAST week Major Lloyd George made known the names of the members of the Fuel and Power Advisory Council whose task is to advise the Minister on the development and use of the country's fuel and power resources in the national interest. It is strange that only one member, Sir John Greenly, appears to have any electrical connection and even that is indirect—boiler design and production. At the last E.D.A. annual luncheon the president, Lord Brabazon, said that he had detected a strong odour of gas in the passages of the Ministry of Fuel and Power. Clearly there is scope for an electric fan—or maybe an electric spark. In any event there should be a direct representative of electricity utilisation on the Council.

London's Growth

THE case for the dispersal of London offices and departments is regarded as overwhelming by the National Council of Social Service which recently published the results of a two-year inquiry. At the same time it finds that most evacuated office workers want to return to London. The suggested migration of "black-coated" workers is therefore likely to remain a conception of what is desirable. A primary cause of the abnormal growth of Greater London has been that in addition to fulfilling its role as an administrative hub it has had more than its share of new industries. Provincial towns are now taking a more active interest in fostering the setting up of such industries in their areas. Luton, for example, famous for its hats, is visualised by Mr. C. T. Melling as becoming an electrical manufacturing centre as well. Industries attract young people at an age when they are adaptable to changes in environment and this should do something to correct the flow of the population Londonwards.

Accurate Measurement

SUSTAINED correctness in a meter used on public supply systems has a value that is out of all proportion to its cost, size or any other feature. This fundamental requirement, together with ease of maintenance and testing, provided the keynote to Mr. G. E. Moore's I.E.E. paper last week. It may reasonably be asked whether at the present stage of development so much variety among single-phase meters is really necessary, and although his proposals went far beyond the bare essentials for securing interchangeability, the summary he gave of constructional details of an ideal type of house-service meter provided a useful indication of the lines of development that would be found acceptable to many supply engineers.

Standard Meters

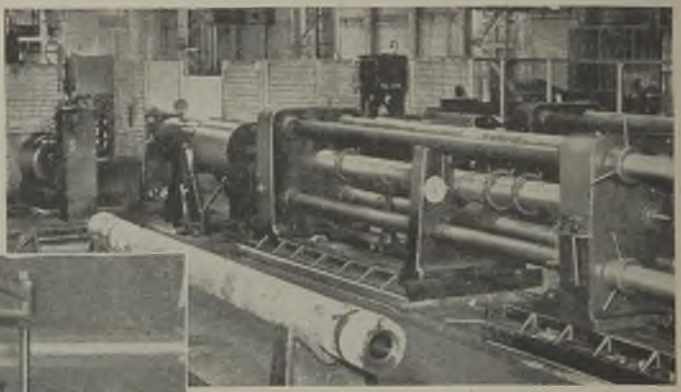
REALISING the inevitability of gradualness (apart from the question of using the millions of still serviceable meters now installed on consumers' premises) Mr. Moore allows that the ideal meter might not take shape in one stage. This concurs with the view expressed by Mr. C. W. Bridgen (*I.E.E. Journal*, December, 1943) from a manufacturer's standpoint, that standardisation of terminal arrangements, fixing centres, outline dimensions, bearings and rotor speeds is as much as would be desirable at present. Relief from too rigid standardisation, with scope for invention (which both authors wish to retain) might be found in Mr. Moore's expectation of a demand for instruments not constructed to comply with the Meters Act of 1936, *e.g.*, for export or for departmental checking of costs in factories, for which far more use could economically be made of inexpensive meters than is now general.

Heavy Gun Making—II

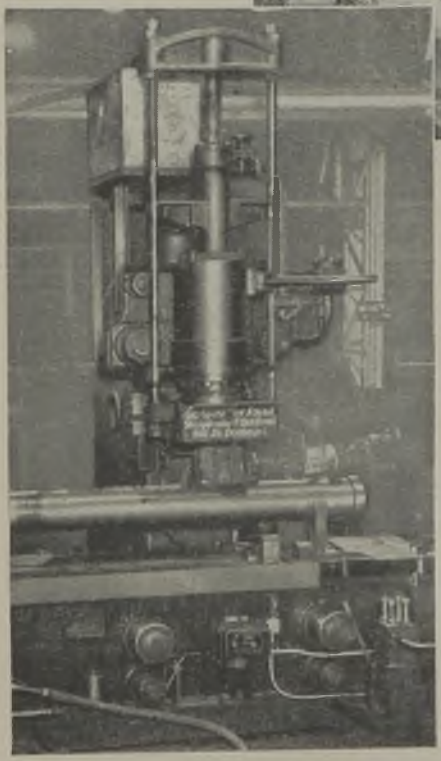
Special Electrical Applications

IN the *Electrical Review* of November 17th we described the electrical applications to the precision machining operations associated with the manufacture of a 5·5-inch howitzer in a modern gun factory in this country, which we recently visited by the courtesy of the Ministry of Supply. Although practically the whole of the major operations relate to specialised and somewhat normal machine-shop work, they do not entirely represent the major processes involved in heavy gun manufacture, and in this article we are dealing with the few special processes and equipment which can hardly be described as precision machining.

It was explained in the earlier article that after the second major operation of exterior rough turning on the barrel the bore is checked for truth, and if the barrel is found to be out of truth it is straightened on a Tangyes 200-ton hydraulic gun-straightening press. This press operates under hydraulic pressure of 2 tons per sq. in. and it has an 11½-in. diameter, 12-in. stroke main ram, a 3-in. diameter 15-in. stroke return ram, a 15-ft. by 3-ft. table which has a 6-ft. traverse each way, and a 24-in. square moving cross-head. The machine is self-contained with its own three-throw pump for the hydraulic service, which has an output of 2·78 gallons per minute at the operating pressure and is supplied from a 100-gal. overhead tank. This pump is driven by a Crompton Parkinson 10-HP, 710-RPM slip-ring motor which transmits to the pump crankshaft through single reduction gearing. A C.P. 5-HP motor serves the table traverse *via* worm reducing gear, and both motors are operated by push-button controlled contactors.



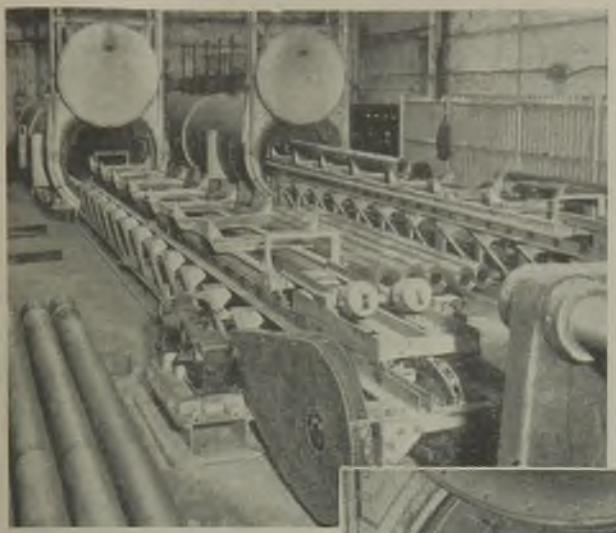
During the auto-frettage process the barrel is secured in a very heavy adjustable framework; auto-frettage motor-driven pump on left, and intensifier at end of frame



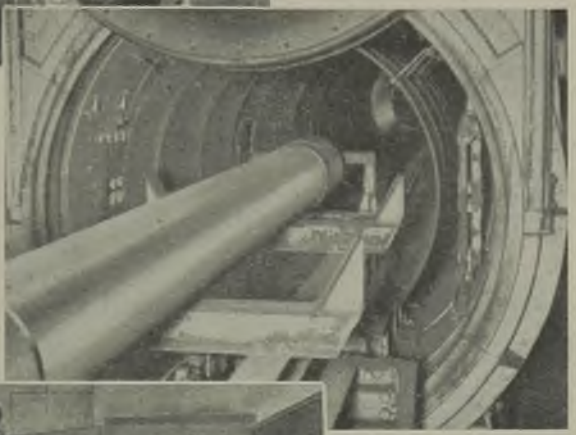
If the barrel is found out of truth it is straightened on a 200-ton hydraulic press

We also explained in the first article that after the sixth major operation on the barrel of honing the barrel interior, the first stage in the production of the barrel is completed and the barrel is ready for auto-frettage, *i.e.*, a process of strengthening the barrel, which replaces the earlier method of winding the barrel with wire, whereby the mechanical properties of the material are altered so as to reduce the tendency to expansion of the barrel during the firing of the explosive charge. This result is obtained by sealing the ends of the barrel and creating in the bore an internal

pressure of from 30 to 35 tons per sq. in., subjecting the barrel next to low-temperature heat-treatment, and finally machining it to the required size. Glycerine is the medium used for creating the pressure in the bore, and during the pumping process necessary for the creation of this pressure the barrel is secured in a very heavy adjustable framework. The pressure is created initially by an auto-frettage pump, and finally by an auto-frettage intensifier. The pump is a Vickers-Armstrong three-ram 4-in. stroke horizontal equipment, with an output of 1·75 gal. of glycerine per minute, at a maximum working pressure of 3·5 tons per sq. in. It is driven by a Lancashire Dynamo 15-HP variable-speed 350/1,050-RPM DC motor with transmission to the pump in the same base plate *via* a worm-gear reduction box with a ratio of 1,000 to 120. Laurence Scott control gear serves this motor. The auto-frettage intensifier is also a Vickers-Armstrong product which creates a maximum pressure of 45 tons per sq. in. and has a high-pressure cylinder capacity of 2 gal. of glycerine delivered at 45 tons per sq. in. in 15 min. The intensifier stroke is 32 in. and the bores and outside diameters, respectively, of the high-pressure and low-pressure cylinders are 5 and 10 in. and 18 and 25·5 in.



Special electric furnaces for the low-temperature heat-treatment processes associated with auto-frettage; each travelling loading table will accommodate three gun tubes



The zig-zag elements are arranged in three runs throughout the furnace, one at each of the opposite "sides" of the inner shell and one under the hearth; between the elements and the charge is an inner baffle lining

The four banks of heaters serving the heating zones of the furnace are separately controlled by indicating-type controllers, each of which is fitted with a scale for setting purposes only and is operated from a time-temperature programme controller

The special electric furnaces for the low-temperature heat-treatment associated with the auto-frettage processes are of the horizontal cylindrical muffle type, with inner and outer shells. They are provided with a system of forced-air circulation and are designed to heat-treat gun tubes up to 28 ft. long and 14 in. in diameter and weighing 2½ tons each. Each furnace will accommodate three gun tubes and will heat its charge from cold to 400 deg. C. in 8¼ hr. The inner and outer shells are of mild steel plate, the inner shell being ⅛ in. thick and the outer shell ¼ in. thick. Between the inner and the outer shells there is a 6-in. thickness of "Alfol" heat insulation. The furnace door is a vertical sliding device and is lagged with the same insulating material. The inner chamber measures 29 ft. 6 in. long and 4 ft. 2 in. in diameter, and it has a total loading of 180 kW which is arranged in four equal banks to supply, respectively, the four zones which are supplied individually as a balanced three-phase 400-V supply.

The resistor elements are of nickel-chromium material and are arranged throughout the length of the furnace in three runs, one run on each of the opposite "sides" of the furnace and one under the hearth. The nickel-chromium ribbon is built up in zigzag fashion and is mounted on suitable insulators secured to metal frames on the inner shell. Air is circulated throughout the heating chamber by means of a fan at the back, which is driven by a 7½-HP motor outside the furnace and is directly coupled to the motor *via* a shaft which runs in a water-cooled bearing in the furnace wall. The air circulation is assisted by an inner lining between the elements and the charge which is so arranged that the heated air is drawn through the charge. The four banks of heaters serving the heating zones of the furnace are separately controlled by Electroflo indicating-type controllers, each of which is fitted with a scale for setting purposes only and is operated from a time-temperature programme controller. The time-setting device comprises a motor-driven cam equipped with a cam follower, which adjusts the setting of the temperature regulators in accordance with a prescribed time-temperature graph.

Operating in conjunction with each controller there are chrome-alumel thermocouples, each 36 in. long and provided with a thin-walled heat-resisting alloy sheath. "Metrovick" contactor switchgear operates in conjunction with the temperature regulating equipment and, of course, directly controls the heating circuits. The furnace door is fitted with limit switches which ensure that the main control panel is operative only when the door is shut. Each furnace is served by a mechanical loading table equipped with suitable cradles to accommodate three gun tubes. This table runs on rollers on a suitable carriage and is hauled to and fro by a continuous chain underneath, to which the table is suitably anchored. The table is driven by a floor-mounted 5-HP motor which transmits first through an enclosed gear box and then by chain to a sprocket wheel on the same shaft as the end sprocket wheel of the table conveyor chain.

Bright Light Sources

IN a paper submitted to the Illuminating Engineering Society in London MR. J. N. ALDINGTON deals with two main classes of lamps designed for projection purposes.

While the discharge lamp has had more publicity recently, the author believes that the incandescent tungsten filament projector will be the more important for many years to come. The object of his paper is therefore to discuss how the latter type has been improved by increasing the stability of filaments and by design features directed towards the more effective utilisation of the emitted flux. Some consideration is given to the properties of straight tungsten filaments both in vacuo and in gas. The effect of electrode and cooling is discussed and the change in characteristics effected by an inert gas is illustrated by efficiency and brightness measurements.

The chief representatives of the straight single coil class are the exciter lamps in which a short single tungsten helix operates from a comparatively low voltage at a brightness of the order of 2,000 candles per sq. cm. Another example is the horizon lamp in which a straight filament coil 200 mm. long containing 2 metres of wire is sufficiently stable to exhibit little sag throughout a life of 200 hours.

Comparison of the average brightnesses of the flat grid filament and the biplane arrangement shows that the latter may have an average brightness of the order of twice that of the former. In discussing a range of coiled-coil filament projectors the effect of double coiling is illustrated as is also the means reducing the interfering effects of tungsten evaporation. The class of symmetrical sources, as distinct from directional light sources, is described by reference to bunch-filaments, lamps with a cruciform filament and one or two special types, but no attempt is made at an exhaustive survey of all the possibilities which have been examined.

The principles underlying the development of the multi-filament lamp are described in some detail and comparative figures are given for a range of multi-filament and coiled-coil lamps. It is shown that by utilising the so-called "solid source" principle a marked increase in the directional properties of low-voltage projector lamps can be achieved. The reasons are described and the effect of the decreased thermal losses and increased average brightness are illustrated graphically. Beam curves for some special lamps operating in a series of modern projector lanterns are given and the use of internal reflectors on the lamp bulb is illustrated.

Three-Phase Meters

Checking the Connections

By G. W. Stubbings,
B.Sc., A.M.I.E.E.

A THREE-PHASE, three-wire meter has two voltage and two current circuits, each of which has two terminals. As corresponding ends of the voltage circuits are made common, the effective number of meter terminals is seven. Correct registration of the meter in service depends not only on its inherent accuracy, but upon the correct association of current and voltage in the two elements, and each meter terminal must therefore be joined to the proper connecting lead.

Unlike a single-phase meter, the only wrong connection of which gives reverse registration, a three-phase meter can be incorrectly connected in many ways, some of which give not only registration in the right direction but also, at certain load power factors, at approximately the correct rate, which rate becomes inaccurate if the power factor changes. For this reason the correctness of the connection of a three-phase meter cannot be inferred from the direction of rotation of the moving element, and it is generally advisable, especially when large amounts of energy are to be measured, to verify the correctness of the connection by independent inspection and test.

Faulty connections of a three-phase meter may be classified under five heads: Open circuits in the leads connecting the meter to the supply or to associated instrument transformers; reverse polarity of the connection of one or both of the current or voltage circuits; a cyclic change of the connections of the voltage leads to the three effective voltage terminals; reversal of the phase sequence of the voltage-circuit connections; wrong phase sequence of the currents in the two elements so that the current in the leading or blue element is actually lagging on that in the lagging or red element.

Of these classes of wrong connections the last is of the least practical importance, and is due to an inherent defect in the meter itself. Provided the meter elements are connected in accordance with the two-wattmeter method, the error due to wrong phase sequence is very small in comparison with that which can arise from any other faulty connection. In regard to the first class of faulty connections, the integrity of the voltage circuit leads will be verified by a check with test lamps between each of the three pairs of voltage terminals, while the presence of current in the current windings on load can be inferred from the results of observations of the meter performance when one voltage circuit only is active.

With a correct three-phase voltage system applied to the meter and with current in each of its current circuits, the registration can be in the right direction and at an approximately correct rate with wrong connections. Thus if the load power factor is about 0·5 and the polarity of the connection to the current circuit of the lagging element is reversed, then, as this element will produce practically no torque, the effect of the reversal on the rate of registration will be small. A meter thus wrongly connected would stop if the load power factor rose to unity.

Again, if the phase sequence of the voltage-circuit connections is reversed and the polarity of one of the current-circuit connections is reversed also, the meter will be connected as a crossed-phase reactive meter and will register at a rate corresponding to $2/\sqrt{3}$ times the reactive VA in the load, so that if the power factor of this load is about 0·75 lagging the rate of registration will be about right. This kind of wrong connection would also give zero registration at unity power factor. To take a final example, suppose there is a cyclic change of the voltage-circuit connections and a reversal of polarity of both of the current-circuit connections, this will be equivalent to a 60-deg. phase shift of the voltages applied to the meter. If this effective phase shift is lagging and the load power factor is 0·87, the meter will register in the right direction and at the correct rate, with an effective meter power factor of 0·87 leading. If the circuit power factor rises to unity, the rate of registration will be one half of the correct value.

Methods of Procedure

There are two ways in which the connections of a three-phase meter may be checked for correctness: first, by actual tracing of the leads, and secondly by observations of the behaviour of the meter when passing load with the connections temporarily modified. Although a complete and conclusive check is possible with this latter method, the procedure is complicated if all possible mistakes are to be detected. There are some simple and easily made checks of this latter kind that will detect most of the possible mistakes in connection, but these checks should be additional and not alternative to the check made by tracing of the leads, which should never be omitted with meters measuring large amounts of energy and supplied by current transformers.

The simplest kind of check by observation of the meter while load is passing it is to

disconnect each of the connections to the three voltage terminals in turn. Assuming that the voltages on each pair of voltage-circuit terminals have been found approximately correct by test lamp and that the load passing the meter is known to be approximately balanced and of a power factor less than unity, then if the voltage leads to the leading and lagging elements are disconnected in turn, the lead to the common voltage terminal remaining undisturbed, the rate of registration with the leading element inactive should be less than that with the lagging element inactive.

If the lagging element gives the greater torque, the phase sequence of the current connections is incorrect. If the rates of registration of the single elements with a lagging power factor of the meter load are equal, the phase difference of the meter voltages from the common terminal is 120 deg. and the phase sequence of the voltage-circuit connections is reversed. With a load power factor of about 0·5 the torque given by the lagging element will be very small, but if with this element alone active the disc of the meter is quite stationary, there may be an open circuit in the current leads to this element. The correct direction of rotation with the lagging element active in this condition may be either forward or backward, and the correctness of the polarity of this element can be checked by disconnecting the lead to the common voltage terminal and restoring the other connections, so that half the line voltage between the red and blue lines entering the meter is impressed on each element. In this condition the direction of registration at all lagging power factors should be forward, and reverse rotation with a low lagging power factor indicates incorrect polarity of the lagging element.

The foregoing tests are not so conclusive if the circuit power factor is unity. In practice it will usually be possible to check a three-phase meter with a lagging load power factor, but a lagging power factor can be simulated by connecting lamps of the same wattage one in series with each voltage circuit.

If the correctness of the connections of a three-phase meter has been verified by tracing the leads, the tests described will give the correct results and will confirm the physical check. If these tests do not give the desired results, then, although it is possible to infer from these faulty results the nature of the wrong connection, it is usually best to discover this by systematically retracing the leads.

E.D.A. Reports Progress

Wide Variety of Activities

SOME idea of the many different directions in which the British Electrical Development Association is exercising its beneficial influence is given by an interim report (January-October) which it has just issued. This commences with references to a strengthening of the staff, the annual meeting and luncheon, the work of the area, informal meetings with Ministers, co-operation with the E.A.W. and the formation of a joint committee with the B.E.A.M.A., E.L.M.A. and the C.M.A.

Then the report gives very brief details of its contacts with " outside " interests including the medical profession (an advisory panel under the chairmanship of a distinguished physician has been set up), architects, Government Departments and the women's Services.

With regard to post-war housing E.D.A. collaborated with B.E.A.M.A. in electrically equipping the Northolt experimental houses and in producing booklets on kitchen planning and equipment together with full-scale and small models. A film on the subject is in hand. Another film " Too Easy " (inculcating the economical use of electricity) has been circulated widely by E.D.A. and the Ministries of Information and Fuel and Power. " Cooking for the Million," dealing with large-scale cookery, is also in service and four further films are being prepared.

National Press advertising is being actively pursued and improved and there has been greater activity in the exhibition field. Advice and assistance have been given to members and others on street lighting, large-scale catering and industrial heating.

In January last the Council adopted a preliminary report by the Proving House Committee recommending the establishment of a testing station. Consideration has been given to operating policy and a final report has been drafted. An immense amount of work, it is said, has been done by the Mid-East and North-West Area Committees in the design of a simplified standard service unit.

There has been active participation in the work of the Building Centre and the Electric Vehicle Association; the latter has produced a report on battery standardisation. Other activities have related to preliminary work in connection with the establishment of a Rural Advisory Committee; advice in connection with fuel and lighting services in a Ministry of Works prototype school; securing licences for electric baking ovens; and further report work on the equipment of training colleges for domestic science teachers.

This is the Association's silver jubilee year and steps are being taken in consultation with the President (Lord Brabazon) to celebrate it in a fitting manner.

Electrical Development

Bigger Revenue Needed for Expanded Publicity

By W. K. Fleming, M.I.E.E.,
Borough Electrical Engineer,
Scarborough

IN an editorial in August last the *Electrical Review* suggested a case for participation by the whole industry in electrical development. Post-war plans, it was said, were being prepared by the Electrical Development Association on the basis of a total annual revenue of something like £130,000; a much greater advance could be made if further funds could be secured. Little hope was entertained that electricity supply authorities generally would agree to the raising of their subscriptions, and " the rest of the electrical industry " was indicated as the most obvious alternative source of revenue.

An invitation for the views of those concerned, *i.e.*, E.D.A. and the trade associations, was followed later by an announcement that a joint committee representative of E.D.A., the B.E.A.M.A., the C.M.A. and E.L.M.A. had been established and was holding regular meetings. The purpose of the joint committee, it was stated, was " to discuss matters of common interest relating to the development and use of electricity for domestic purposes, and in particular, to promulgate among consumers facts and general data calculated to increase public interest in the use of electrical services." Joint consultations of this kind are much to be desired, but while the announcement referred to was generally welcomed, it falls short, nevertheless, of the original suggestion made by the *Electrical Review*, which envisaged collaboration with E.D.A. by other sections of the industry on a basis of financial contributions.

Are Supply Authorities Willing?

There will be general agreement with the necessity for a considerable expansion in annual revenue if E.D.A. is to play its proper part in development work after the war. The assumption, however, that electricity supply authorities would not agree to raise their subscriptions is open to question: the annual meeting of the Association in March of this year provided some pointers in this direction. In the first place, the chairman (Mr. E. E. Hoadley) said that the Association had spent more money during the year under review than in the previous year—an observation which was received with obvious approval by the members present. When he added that the Association had called up for the current year the maximum subscriptions from members, and that the response in favour had been immediate and unanimous, he made it clear that the electricity supply industry is alive to the need for progress in development work.

During the few years before the war, an appreciable change of view was evident on the part of some electricity supply authorities in connection with electrical development and publicity, and this was reflected in the increased financial provision made for such work. Certain authorities, of course, had for many years followed a progressive electrical development policy, but others had hesitated to spend money on publicity and to develop sales promotional schemes on adequate lines. It may be that the quickening of interest on the part of the latter was not unconnected with the publication of the McGowan Report and the considerable discussions which have taken place since with reference to the reorganisation of the industry. There is little doubt that supply authorities on the whole are now more fully conscious than ever before of the need for a broadening and intensification of the work of electrical development, and of their responsibility in the matter. It is at least due to the electricity supply industry, which has been the mainstay of E.D.A. since its inception, that it should be given the opportunity of saying how far it will afford additional support for the important work of the future by way of increased subscriptions.

In considering the necessity for more funds to enable E.D.A. to operate with increased usefulness and effect, it is of interest to examine some figures of expenditure by the Association in past years, and to give some idea of the place taken by electricity in one field of national publicity, namely, Press advertising. In 1943, E.D.A. spent £57,709 compared with £33,669 the previous year. The increase was due almost entirely to " prestige " advertising, so that for two years all the many activities were carried out at a cost of about £35,000. When one considers the extremely varied service and work performed by the Association for the electrical industry, this sum must be regarded as very moderate.

Comparative Expenditure

In the year before the war, the total expenditure of E.D.A. was £112,903, and of this amount £47,909 was spent on national Press advertising. It is interesting to compare the latter figure with the amounts spent on other commodities and services. The total expenditure on British Press advertising in 1938 has been estimated by the *Statistical Review* at £50,000,000, including food and drink, £5,447,000; medicinal, £3,800,000; motoring, £2,449,000; household equipment,

£2,820,000; toilet goods, £2,340,000; household stores, £1,811,000; smoking, £1,806,000; clothes, £1,525,000; and radio and music, £661,000.

Even when there is added to the modest figure of £47,909 spent by E.D.A. in 1938, the amounts spent separately by individual electricity supply undertakings and by a few electrical appliance manufacturers on Press advertising, the place taken by this public service in national advertising was relatively small. It is not to be expected, of course, that publicity for electricity supply, so far as Press advertising is concerned, can be compared equally from all points of view with that of branded products in the highly competitive markets mentioned.

Competition with Other Advertising

There are many questions involved in the economics (and, it may be added, the ethics) of advertising, but these lie outside the immediate scope of these notes. Consideration must be given, however, to the massive volume of general national Press advertising as a propaganda force striving to compel the attention of the consumer public, for to this extent it may be regarded as being in competition with our own publicity, which has the same end in view. It is clear, therefore, that if E.D.A. is to participate effectively in national Press advertising it will require to do so on a larger scale than hitherto, and for this purpose an increase in revenue will be needed. At the present time, of course, the volume of Press advertising is much less than it was before the war owing to restrictions on newsprint, and in consequence recent advertising by the Association has gained more prominence.

There are other purposes for which additional revenue will be required by E.D.A. in order that it may carry out properly the great tasks which lie ahead, and doubtless these are receiving the attention of the Council. One over-riding consideration, it is suggested, must dominate the future work of the Association. In every activity, large or small, which it undertakes, there should be one essential requirement—the highest possible standard of excellence. Our national advertising, for instance, must be raised to a degree of effectiveness, inspiration and distinction far above anything yet attained. Specialists engaged for various branches of executive and advisory work should have the highest technical skill and be pre-eminent in their particular spheres. In short, we must be prepared to pay for the best service and the best brains that money can buy.

The supply industry can well afford to provide additional funds for strengthening and improving the cause of electrical development. The majority of supply authorities, it is felt, are ready and willing to support wholeheartedly a more powerfully organised and equipped development association which will command nation-wide attention and respect as the chief instrument for publicising the important service of electricity and co-ordinating the commercial policy of the industry. It remains for all those concerned in the matter to act with boldness and imagination.

In the meantime, the suggestion is put forward that E.D.A. might consider a widening of its horizons. This is that the Association should establish liaison with appropriate organisations in the United States with a view to the regular interchange of experience and practice in all aspects of electricity utilisation. We know that in many ways our friends across the Atlantic are extremely progressive in this direction, and although some of their methods are suited only to the special circumstances of their own country, there is, nevertheless, considerable scope for the consideration by us of much of their original work in the sphere of electrical development.

When the time is opportune, there should be periodical visits to America by representatives of E.D.A. (both permanent staff and members) to establish goodwill and mutual understanding by means of personal relationships, and obtain that first-hand knowledge which is essential for a complete appreciation of the practice and conditions under review. After the war, as conditions improve, this liaison might well be extended to other countries abroad. There is little doubt that in the broad field of international practice relating to electricity utilisation, we should find much to stimulate and improve our own service.

Street Lighting Trends

THE Manchester Branch of the Illuminating Engineering Society held a meeting at the College of Technology on November 9th, which was attended by street lighting engineers from all parts of the Lancashire area.

The meeting was addressed by MR. J. M. WALDRAM who illustrated his lecture by lantern slides, sketches and models of housing estates and roads. By means of a tall cylinder filled with water through which a beam of light was projected from the bottom the absorption of the atmosphere was clearly demonstrated. The addition of a chemical created a slight cloudy effect and further additions of the chemical made the cloud denser with the result that the length of the light beam was gradually reduced until almost total absorption occurred, as in a fog. A new system of uni-directional lighting with the beams directed towards the traffic was shown and it was stated that this would make for economy without loss of efficiency. The use of new alloys for combating corrosion was one line of research that Mr. Waldram considered should prove of service to public authorities in the future.

At question time the subject of blended lighting for the main shopping streets of a city was mentioned as likely to be a pronounced trend in the street lighting of the post-war era.

New Generating Plant

Central Board's Programme for Post-War Power

THE Central Electricity Board has arranged for over three million kW of generating plant to be installed in selected stations, extended and new, for meeting the demand for electricity expected after the end of the war up to the winter of 1948, entailing an expenditure by selected station owners estimated to exceed £90,000,000. During the past nine months the Board has completed arrangements for meeting the load in the winter of 1946 and also arranged for some extensions in anticipation of the increased demands during the following two winters. General particulars of the work now in hand are given in the tables below.

Under the Electricity (Supply) Act, 1926, and with the approval of the Electricity Commissioners, the Board has directed the owners of existing selected stations to proceed with the installation of some 900,000 kW by the winter of 1946 and some further 340,000 kW by the winter of 1947. It has also arranged for the construction of three new selected stations, the first sections of which

TABLE 1.—EXTENSIONS FOR WHICH DIRECTIONS HAVE BEEN GIVEN

Scheme Area and Station	Owners	Generators Capacity in kW.	Boilers Capacity in lb.per hr.
Central Scotland—			
Bonnybridge	Scottish Central E.P. Co.	1–20,000	2–120,000
N.W. England & N. Wales—			
Bolton	Bolton	1–31,250	1–180,000
Hartshead	Stalybridge, etc., Board	1–31,250	3–150,000
Kearsley	Lancashire E.P. Co.	2–51,600	8–173,000
Ribble	Preston	2–31,500	4–190,000
Stuart St.	Manchester	1–61,500	2–400,000
Trafford	Stretford Bd.	1–30,000	2–180,000
Warrington	Warrington	1–20,000	1–200,000
Mid-East England—			
Blackburn Meadows	Sheffield	—	2–190,000
Ferrybridge	Yorks. E.P. Co.	1–45,000	4–150,000
Huddersfield	Huddersfield	1–20,000	2–120,000
Hull	Hull	1–30,000	2–190,000
Kirkstall	Leeds	2–30,000	3–250,000
Lincoln	Lincoln	2–20,000	4–120,000
Neepsend	Sheffield	1–50,000	3–190,000
Prince of Wales	Rotherham	—	1–200,000
Valley Road	Bradford	1–22,500	2–180,000
Central England—			
Freeman's Meadow	Leicester	1–31,500	2–175,000
Hams Hall	Birmingham	1–53,500	2–320,000
N. Wilford	Nottingham	2–30,000	4–175,000
Ocker Hill	West Midlands J.E.A.	2–30,000	5–150,000
Stourport	S.W. & S. Co.	1–60,000	1–525,000
S.E. & E. England—			
Deptford E.	London Power Co.	—	2–225,000
Fulham	Fulham	1–60,000	3–315,000
Littlebrook	Kent E.P. Co.	2–60,000	4–265,000
West Ham	West Ham	2–30,000	4–180,000
Woolwich	Woolwich	1–30,000 1–750	2–165,000
S.W. England & S. Wales—			
Hayle	Cornwall E.P. Co.	1–15,000	2–100,000
Newport	Newport	1–30,000	2–180,000
Portsmouth	Portsmouth	1–30,000	To suit

TABLE 2.—NEW STATIONS FOR WHICH ARRANGEMENTS HAVE BEEN MADE

Area and Station	Owners	Generators kW.	Boilers lb.per hr.
Central England—			
Meaford	N.W. Midlands J.E.A.	4–30,000	6–240,000
S.E. & E. England—			
Cliff Quay	Ipswich	2–45,000	3–365,000
Kingston	London J.E.A.	2–30,000 1–3,000	3–260,000

TABLE 3—EXTENSIONS FOR WHICH DIRECTIONS HAVE BEEN GIVEN SUBJECT TO FURTHER GOVERNMENT RELEASE

Area and Station	Owners	Generators kW.	Boilers lb. per hr.
N.W. England & N. Wales—			
Agecroft	Salford	2–50,000	To suit
Mid-East England—			
Prince of Wales	Rotherham	1–30,000	To suit
Thornhill	Yorks. E.P. Co.	1–45,000	4–180,000
Valley Road	Bradford	1–22,500	To suit
Central England—			
Hams Hall	Birmingham	2–53,500	To suit
N. Wilford	Nottingham	1–50,000	To suit
Walsall	N.W.Mid.J.E.A.	2–30,000	To suit
S.E. & E. England—			
Battersea	London P. Co.	1–100,000	To suit
Cliff Quay	Ipswich	2–45,000	To suit
S.W. England & S. Wales—			
Newton Abbot	Torquay	1–15,000	2–100,000
Portishead	Bristol	1–52,000	To suit

TABLE 4.—NEW STATIONS SUBJECT TO FURTHER GOVERNMENT RELEASE

Station	Owners	Generators kW.	Boilers lb. per hr
Mid-Durham	North-Eastern E.S. Co.	2–50,000	3–375,000
Croydon	Croydon	2–52,500	4–300,000

will have an aggregate capacity of some 270,000 kW by the winter of 1947. In addition, the Board has issued directions for the remainder of the extensions for the winter of 1947 and for some of those for 1948, subject to the receipt of further authority from the Government, but in order to avoid delay in proceeding with the work immediately that authority is given, the Board has arranged with the owners of the selected stations (including the two further new stations) to prepare at once the designs and specifications and provisionally to place the contracts. Discussions are proceeding regarding the arrangements for the remainder of the programme for 1948.

Radio Heating

Nature of the Process and its Scope

THE heating of materials by high-frequency AC methods is the subject of a paper prepared by DR. L. HARTSHORN (D.S.I.R., National Physical Laboratory) for the Royal Society of Arts.

He commences with the physical problem, briefly explaining that the energy most effectively utilised for this purpose is that of magnetic and electric fields created by high-frequency valve oscillators, familiar in radio-transmitters, whose essential feature is the repeated transformation of energy from one form to another. Both forms are employed —that of the magnetic field for the eddy-current heating of metals (outside the scope of the present paper) and that of the electric field for the treatment of dielectric materials, which the author considers in terms of molecular movement causing particle-charge displacement which forces the structure of the substance into a state of elastic vibration.

Explanation of Mechanism

Displacement of charges puts energy into the material, but when they " spring back into position " as the voltage falls to zero (alternating reversal) all the energy input is not returned to its source as it should be in the case of an ideal insulator. The fraction of 2 or 3 per cent. retained in the form of heat, due to something equivalent to internal friction or viscosity restraining the vibration of particle-charges, can be increased by raising the frequency of alternation. The heating effect is greater in materials of high dielectric constant and substances having a large power factor retain more of the energy imparted to them in this way, while the rate of heat generation is increased by raising the voltage.

This means of creating internal heat is expensive; the oscillators are not cheap and their efficiency seldom exceeds 50 per cent. But the advantages it offers fully justify its use in some cases, while certain operations would otherwise be quite impossible.

Examples of uniform and rapid heating mentioned by Dr. Hartshorn include the manufacture of laminated materials, plastic moulding and industrial drying. Examples of localised heating by this means are the seam " welding " of thermo-plastic materials and the spot glueing of complex wooden structures. Dielectric heating may also be applied to a mixture of two substances so as to elevate the temperature of one of them much more than that of the other: for instance, for the softening of plastic adhesive between the sheets of " safety " glass.

Accurate Application

An attractive convenience of this method is that it can be made to generate heat just where it is wanted and nowhere else, as in radio-therapy and possibly in the sterilisation of foodstuffs and biological materials by the destruction of organisms without materially heating the bulk, by suitable selection of frequency. It seems highly probable that the most effective factor is the general temperature level, rather than the frequency of alternation of the field, which appears to be of little importance, except that the greater it is the lower may the voltage be for a given heating effect, which is always preferable as a precaution against accidental spark discharges and shock.

But difficulties arise from the very features that make this process so attractive. For instance, the centre of a joint of meat will almost certainly become hotter than its outside and whether fat will heat more than lean, or the reverse, will depend on their relative moisture contents as well as the frequency chosen, so that a cook will need to be something of a radio engineer and bio-chemist to know what to do about it.

The process offers great possibilities for future development, but it is no maid-of-all-work and must be treated with respect.

Institution of Factory Managers

THE Council of the Institution of Factory Managers is now actively engaged upon improving its organisation and laying plans for a bold development programme in 1945, including the issue of a comprehensive brochure and other means of bringing the Institution to the notice of more executives. The Institution has recently moved its offices to 63, Gayton Road, Harrow, and has appointed Mr. Charles Brown as general secretary.

Transmission Line Supports

Use of Wood-Pole Construction for 110 kV

AN overhead transmission system which has recently been erected by W. T. Henley's Telegraph Works Co., Ltd., is claimed to be the first in the United Kingdom to incorporate wooden supports for so high a voltage as 110 kV.

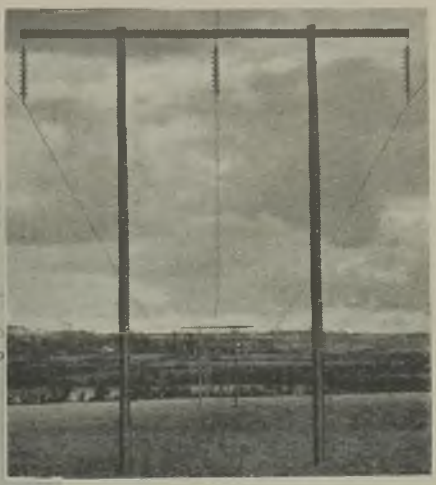
Throughout its route of 25 miles home-grown Scots fir or larch poles are used, varying in length from 30 to 60 ft.; the tallest are required for crossing 33-kV lines. Here the pole members of the 110-kV line are 15½ in. in diameter at 5 ft. from the butt.

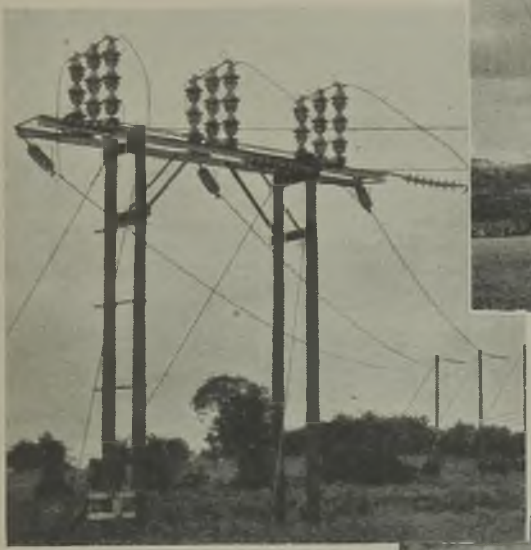
Straight-line structures are of the "H" portal type with members at 15-ft. centres and galvanised channel-iron cross-arms 30 ft. long. Angle and section supports are three-pole structures with the members at 7 ft. 6 in. centres supporting braced 30-ft. long angle-iron cross-arms.

Neither the straight-line nor the angle-pole structures are braced. The designed span length is 415 ft., but the nature of the route necessitated some spans exceeding 800 ft. Glass insulators are used on part of the line. The conductors are somewhat heavier than those ordinarily used for high-voltage lines, being composed of 19/·116 in., equivalent to 0·2 sq. in. hard-drawn copper.

Where the overload line is carried across marshy ground the type of bog shoe illustrated below is used for each pole member.

Acknowledgments are due to the consulting engineers, Messrs. Kennedy & Donkin, for permission to reproduce the photographs and to publish the above information.





Above: Straight-line 110-kV wood poles with glass insulators

Left: Isolating-switch structure

Below: Bog-shoe for pole members in soft ground

Replanning Plymouth

The Electrical Aspect of Restoration

By H. Midgley,
M.Sc.(Eng.), M.Inst.C.E., M.I.E.E.
City Electrical Engineer

IN the early part of 1941 Plymouth became a target for concentrated enemy air attack and, in addition to extensive damage in residential areas, the business and shopping centre of the city was literally demolished. Much of the damaged property in this area was old, and the streets were quite unsuitable for modern traffic needs. The City Council therefore commissioned the city engineer and surveyor, Mr. J. Paton Watson, with Professor Abercrombie as consultant, to report on replanning, particularly of the city centre. Their report, which was published a short time ago under the title of "A Plan for Plymouth," contains 136 pages of reading matter and numerous illustrations, diagrams and maps.

Plymouth is only one of the cities devastated by the enemy which have to face heavy reconstruction costs. In this article Mr. Midgley expresses his personal views on the electrical aspect of this matter, views which will interest his fellow engineers in other towns which have suffered in this way

As an understanding of the principles underlying the replanning is essential for adequate appreciation of the electrical engineer's problems, reference must be made to two important features of the Report. First, in a careful analysis of pre-war traffic problems, it is shown that "the density of the traffic in the centre of Plymouth was the highest in Southern England except for London itself." This was due, amongst other reasons, to the considerable amount of through traffic that traversed the city's shopping centre, the streets of which were extremely narrow. Their lay-out was also so irregular that to rebuild on the existing routes, even if they were widened in accordance with modern standards, would be no solution of the traffic problem, which by 1939 had become extremely serious. Rebuilding without radical replanning of the centre of the city would therefore be little short of criminal.

Secondly, the authors of the Report have adopted the "precinct" principle, which "envisages a road system which dissects the town into a series of pockets, or precincts as they are termed, surrounded by traffic roads, each precinct so designed that through traffic is either impossible or discouraged, thereby leaving the area free for the full use of its planned purpose. Such precincts could be formed for any desired use or combination of uses. Thus we recommend the creation of a special precinct for shops, another for the civic centre and others for special offices such as banks, insurance, culture and entertainment. With no through traffic the roads inside each precinct would be safe for pedestrians and there would be no noise from buses or heavy goods vehicles."

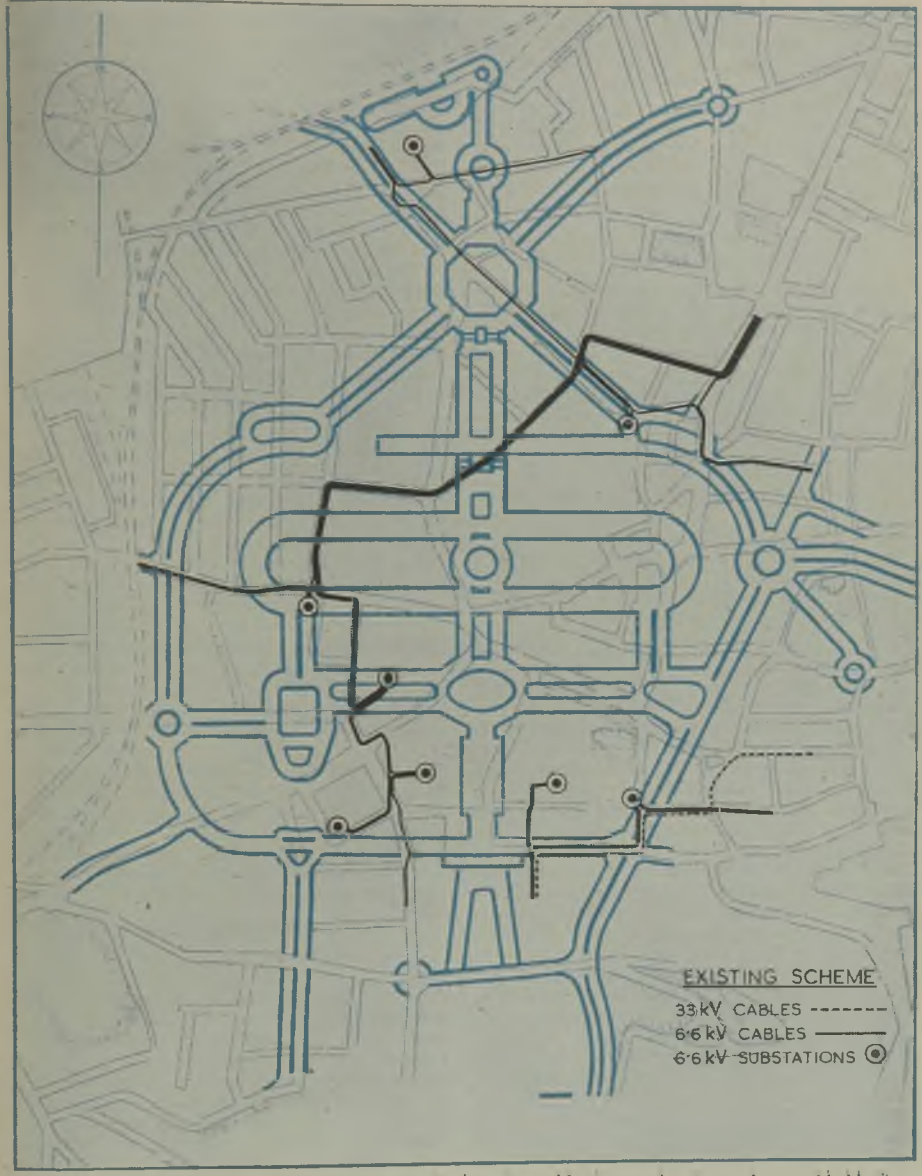
None of the existing substations or high- and medium-voltage cables can be used in their present positions, and an entirely new distribution system will have to be installed in this area, which covers about a quarter of a square mile.

The implementing of the plan will, of course, be contingent upon the passing of the anticipated legislation empowering the City Council to take over the sites owned, and before the "blitz" occupied, by various interests. In order that preliminary investigation may be put in hand it is assumed that such legislation will be forthcoming and the plan adopted without material alteration. The replanning of the distribution network may be considered under four headings, namely :—(1) Total load. (2) Distribution of load. (3) Programme of construction. (4) Financial problems.

The proposals of the Report are not limited to the central area ; a very thorough investigation is also made into the zoning

possibilities of the city as a whole together with its environs. This article, however, deals only with the central area, as this presents the most difficult electrical problems.

which replanning takes place and, in planning the distribution system for the new city centre, due regard has been paid to possible load developments elsewhere.



The main streets of central Plymouth are seen in the coloured background and superimposed in black is shown the existing distribution scheme in relation to the plan for reconstruction

The arguments developed under the four headings will apply to all parts of the city in

(1). *Total load.* Plymouth includes what were originally three separate townships,

namely, Plymouth, Devonport and Stonehouse, amalgamated by Act of Parliament in 1915. Devonport continued to have its own shopping centre until it was destroyed in 1941, but as the site of this will be required by the Admiralty for extensions to the Devonport Dockyard, the "Plan for Plymouth" proposes one large shopping centre for the whole city. This has an important electrical bearing, as the probable transfer of many of the businesses formerly established in Devonport will result in a load in the new centre much in excess of that which would have arisen from the natural development of the shopping and business establishments formerly situated in the replanned area.

Estimate of Load

It was decided that the only rational way in which to approach the problem was on the basis of the possible kW loading per unit area. After an analysis of the pre-war loading in Plymouth and consideration of data supplied by courtesy of E.D.A., the following table was prepared :—

Stage	Load in kW in replanned area, 0·235 sq. mile.	Equivalent loading, kW per sq. mile.
Pre-war	7,000	30,000
After replanning :		
Initial	12,000	51,000
Intermediate ..	19,000	81,000
Future	30,000	128,000
Ultimate	55,000	234,000

The load in the "initial" stage will probably have to be carried within the first few years following the commencement of rebuilding. The load in the "intermediate" stage is estimated to accrue when the majority of the rebuilding has been completed. It is proposed that the mains installed at the outset should be adequate for this load, but that substation plant additional to that installed in the "initial" stage will be required. The load in the "future" stage is the maximum which by present standards of electrical development can be anticipated. Further high-voltage cables and additional substation plant will be required for this load, but the ducts laid and the substation sites reserved at the outset are expected to be adequate.

The intensity of loading in the "ultimate" stage may appear improbable, but past history of electrical development having shown the folly of attempting to estimate saturation, the main trunk lines required for the "future" stage are laid out so as to form part of the general scheme which would be required if ever the "ultimate" loading were attained.

The 33-kV cables and substations serving the centre of the city will at the outset also feed the fringes of the surrounding area, but as the load increases beyond that of the "intermediate" stage and approaches that of the "future" stage, these cables and substations will be relieved of the fringe load which will then be dealt with by additional 33-kV equipment outside the central area.

(2). *Distribution of load.* Until the replanning scheme is more advanced, the layout of "future" loading shown in diagrammatic form must be regarded as tentative only. Whilst provision can be made in the preliminary scheme for the load of the whole of the replanned area, the distribution of this load, that is, the intensity of loading on a smaller unit area, will depend not only on the location of the various precincts but also on the designs of the buildings erected.

The loading in the "intermediate" stage, namely 81,000 kW per sq. mile, is equivalent to an average of 0·292 kW per 100 sq. ft. of ground area, or allowing 40 per cent. of the ground area as occupied by roads and open spaces, approximately 0·5 kW per 100 sq. ft. of building site area. Space does not permit of an analysis of the loading for various types of buildings, which may be summarised by stating that it will probably range from 0·3 to 2·5 kW per 100 sq. ft. of building site area. Governing factors include the purpose of the buildings, number of storeys and degree of electrical development.

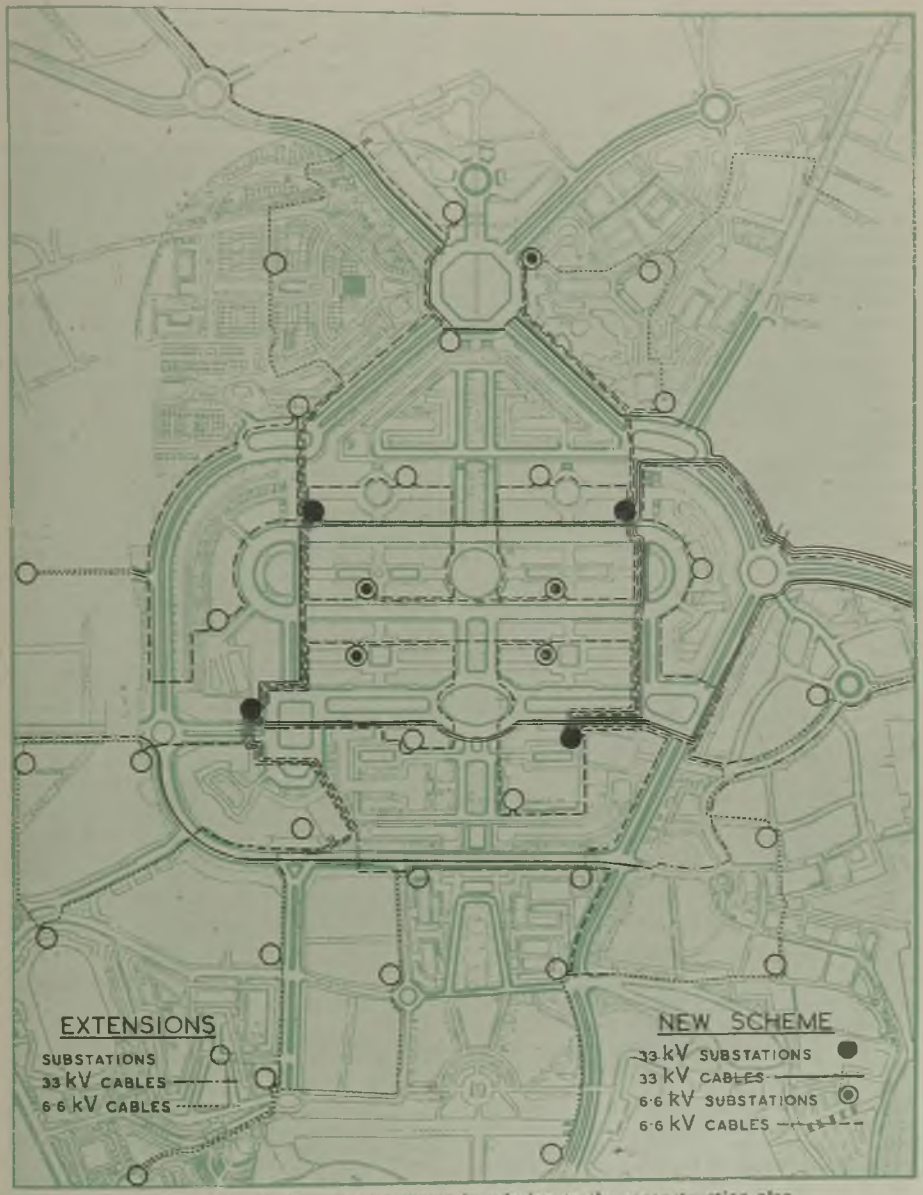
For the high-voltage system the preliminary proposals will probably approximate very closely to the final layout, but details of the medium-voltage feeders and distributors will depend upon the functional allocation in the area not only of streets but also of individual buildings.

(3). *Programme of construction.* The supply is almost entirely AC but unfortunately there are two voltages, 230 and 200 single-phase, with corresponding three-phase voltages of 400 and 346. Although considerable change-over from 200 to 230 V had been carried out before the war, the replanning area and a considerable area encircling it were still supplied at 200 V, but the rebuilt area will be supplied at 400–230 V.

Substation Sites

The programme of construction for the electricity undertaking will have to be very carefully co-ordinated with the general programme of reconstruction. As it is anticipated that the land will come under the control of the Corporation it is hoped that the provision of substation accommodation where necessary will be made a condition of letting of sites for business premises, the substation building in most cases being incorporated with the main building. Careful planning should therefore avoid the difficulty that has faced most electricity supply engineers in the past, namely the finding of substation sites to meet the steady growth of load in congested areas.

Plant will be installed in these substation buildings only as required, and the removal of existing substations and mains will depend upon the programme of reconstruction. If, as has been suggested, the first stage of rebuilding consists of the construction of roadways, then existing substations and high-voltage mains will have to be removed at a very early stage and temporary outdoor sub-station plant installed. The existing substation equipment will in most cases be suitable for use elsewhere and, subject to careful in-



The new distribution scheme shown in relation to the reconstruction plan

spection, high-voltage cables and some of the medium-voltage feeders may be available for relaying. Medium-voltage distributors will in general not be suitable for re-use because of the number of service tees, and will therefore have only scrap value.

(4). *Financial problems.* In very round figures, the cost of the substations, mains, etc., required for the " initial " stage of replanning will be £300,000. The original cost of the superseded equipment was approximately £120,000, and the scrap value will not be more than £20,000. The cost of some of this equipment has been paid off, but much of it is quite recent, and it is not unreasonable to assume that the outstanding debt is £60,000. To pay this off in, say, ten years would mean an annual charge of £7,000. Of the £300,000, at least £250,000 must be expended at the outset, so entailing an annual charge of £15,000. As such expenditure will not be remunerative for several years, this annual charge in addition to the above mentioned £7,000 per annum in respect of redundant equipment will be a heavy burden on the undertaking.

Plymouth and other target areas have, because of their strategic positions, borne the brunt of enemy air attack on behalf of the whole country. In common with other trading concerns the electricity undertaking has sustained its share of war damage and when the question of replacement arises after the war, it is very doubtful whether the whole cost would be covered by assistance from the War Damage Commission. The undertaking will also, as set out above, have to face the further burden thrown upon it by the rendering obsolete of much of its distribution system through replanning. Without some form of State aid the only way in which to meet this burden would be to increase prices. Such a procedure would bear very hardly on domestic consumers, many of whom have lost so much by air-raid damage, and also on traders and business men who have suffered serious disorganisation and will be faced with rebuilding at costs very much in excess of the 1939 values of the premises destroyed.

Assistance Needed

A financial burden consisting not only of the continuing annual charges in respect of the plant rendered redundant but also of the charges on the new plant required is a heavy strain on an undertaking badly crippled financially through loss of consumers following extensive enemy action. It is, therefore, submitted that in selected cases where the course of the war justifies it, Government assistance should be forthcoming on a basis to be agreed between the Government and the undertakings with a view to relieving the undertakings during the period of reconstruction of some part of their unremunerative expenditure, in respect not only of redundant plant but also of plant which must from technical considerations be installed in advance of immediate needs.

Without such relief, it is not the electricity undertaking which will have to pay, but the consumers. Although some idea of the extent of war damage may be obtained from a perusal of " Front Line, 1940–41," it is for security reasons not permissible to give statistics. Consequently, those who live in the less vulnerable areas may not appreciate the seriousness of the position, but the writer would strongly urge that public utilities who are faced with a similar problem to that of Plymouth have every reason to claim, as a matter of justice, financial assistance not less favourable than that outlined above.

* * *

Author's Footnote.—Since this article was written the Government's Town and Country Planning Bill has been discussed by both Houses of Parliament. While from this it would appear that the principle of financial assistance during unremunerative periods is accepted in respect of local authorities and also financial assistance to public utilities, the provisions are somewhat obscure. Therefore, pending more detailed explanations of the Government's proposals, opinion is reserved as to whether they will be satisfactory from the point of view of electricity undertakings.

Indian Notes

WHATEVER India's political future is to be, there is no doubt that it will become a very highly industrialised country. This view was expressed by Sir Arthur Hope, Governor of Madras, when he recently opened the Alagappa Chettiar College of Technology, University of Madras.

The College was founded with a donation of Rs 5 lakhs from Dr. R. M. Alagappa Chettiar, on whom the honorary degree of Doctor of Laws has been conferred. Speaking at the opening ceremony, he said that facilities for research were sadly lacking in India. That a great deal could be achieved in a very short period was shown by the example of Russia where during the last war conditions were, if anything, worse than in India to-day. Russia's expenditure on scientific research was over 1 per cent. of the national income.

Dr. D. R. Nanji, of Birmingham, left England in August to take over a professorship at the College.

Rapid expansion of the hydro-electric works in Travancore is provided for in a post-war reconstruction plan which has just been drafted. Similarly, the Kashmir Post-War Reconstruction Committee is considering a hydro-electric and irrigation scheme near Riasi (Jammu) which is estimated to cost Rs. 12,00,00,000. This project, in which the Punjab Government is also interested, envisages the building of a 700-ft. high dam to form a lake 40 to 50 miles long, whose waters would be utilised to supplement the flow of the River Chenab during the winter. In Madras and Orissa a proposed hydro-electric development at Machkand is being considered.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IT was announced last week that **Sir Ernest Fisk** has resigned from the position of chairman and managing director of Amalgamated Wireless (Australasia), Ltd., to become managing director of Electric & Musical Industries, Ltd. Originally a member of the Marconi Company, Sir Ernest was Marconi's principal assistant. In 1909 he joined a special mission to the Arctic and has become an acknowledged radio authority, particularly in the sphere of research. He has been a pioneer of radio in Australia and received the first direct wireless message from England in 1918. Six years later he made the first oral contact between the two countries when Marconi spoke to him from Cornwall. In 1940 he was appointed secretary of the Economic Cabinet in Australia and Director of Economic Co-ordination. Sir Ernest, who is fifty-six, is a past president of the Institution of Radio Engineers (Australia) and early this year was elected an honorary member of the Institution of Electrical Engineers. He was knighted in 1937. He will assume his new duties immediately on his arrival in this country early in the New Year. In the meantime Sir Alexander Aikman, the deputy chairman of the company, will continue to act as managing director.

Sir Ernest Fisk

The Dramatic Section of Callender's Cable and Construction Co. (Belvedere Works), continuing to surmount wartime difficulties, enhanced its reputation in giving two fine performances of "Glass Houses," a comedy by Walter Ellis, at Brook Street Schools, Erith, on November 4th. Local charities and the company's prisoners of war parcel fund will benefit appreciably as a result. It is intended to give further performances to troops in the district.

Mr. F. H. Westlake, boiler house superintendent at the Cardiff Corporation's Roath power station, is retiring after over forty years' service, twenty in his present position.

Alderman W. Walker has been re-elected chairman of the Manchester Electricity Committee.

Mr. A. G. Clark has been appointed chairman of the Plessey Co., Ltd., in the place of the late Mr. Henry Morgan. **Mr. J. A. Smith** has been elected to the board and will continue to act as secretary.

Mr. A. J. Fippard has been elected chairman of the Kalgoorlie Electric Power & Lighting Co., Ltd., to succeed the late Mr. A. R. Hoare.

When the question of appointment of a deputy borough electrical engineer was before Colchester Town Council Mr. E. H. Turner proposed that the matter be referred back. He said that they had no suitable candidate among their own staff and urged that those who were fighting for their country should be given a chance of securing the appointment. The urgency of the appointment was stressed by several members of the Council and eventually Mr. Turner withdrew his proposal.

Edinburgh Corporation on Thursday last week entertained at luncheon a number of members of the Council of the Incorporated Municipal Electrical Association attending a meeting in the city. **Councillor T. Sawers**, chairman of the Corporation Public Utilities Committee, presided. Alderman W. Walker (Manchester) proposed the toast of "The City of Edinburgh," to which Lord Provost J. I. Falconer replied, and Councillor Sawers reciprocated by proposing "The Association," to which Mr. W. P. Lilwall, president, responded.

Mr. Henry Robson, B.Sc., will take up his position as borough electrical engineer and manager of the Chepping Wycombe (High Wycombe) electricity undertaking on December 1st. He succeeds Mr. C. T. Westlake, who is retiring. Mr. Robson, who is thirty-eight, is a native of Carlisle and was educated at Carlisle Grammar School and at Manchester University. From 1929 to 1937 he served as technical assistant to the Carlisle electricity undertaking. He joined the Brentford and Chiswick Corporation in 1937 as chief technical assistant, being promoted to deputy borough electrical engineer in 1940. He is an associate member of the Institutions of Electrical and Mechanical Engineers.

Mr. H. Robson

The Brentford and Chiswick Council is advertising in this issue for a successor to Mr. Robson at a salary of £674.

Appointments Vacant.—Among the positions for which applications are invited in this issue are the following :—Power station superintendent (£654) and assistant power station superintendent (£554) for Bradford ; technical assistant (£642) for Edinburgh Electricity Department ; and shift charge engineer (£361) for the N.W. Midlands J.E.A.

Obituary

Sir Herbert Cozens.—His many former associates and friends in the electricity supply industry will be sorry to hear of the death, on November 17th, of Sir Herbert Henry Cozens. Herbert Cozens was born in 1877 and was educated at Taunton School, later being a pupil with C. Allen & Son, Taunton, and the Taunton Corporation Electricity Department, of which he was assistant engineer from 1896-98. He joined the Bristol Corporation Electricity Department in 1898 as engineer in charge,

subsequently becoming mains engineer and, in 1901, deputy city electrical engineer under the late Mr. H. Faraday Proctor. In 1909 he was engineer and manager at West Ham and three years later became "chief" at Hampstead.

He went to Canada in 1913 to take up the position of general manager of the Toronto Hydro-Electric System which he held for some years. Later he became associated with the Brazilian Traction, Light & Power Co. and succeeded the late Mr. Miller Lash as president in 1941. He was also a director of the City of Santos Improvements Co. and the Sao Paulo Electric Co. He was created a K.B.E. in 1937.

Mr. H. J. Greenwood.—We learn with regret of the death on November 15th of Mr. Harold S. Greenwood, M.I.E.E., in his fiftieth year. Mr. Greenwood was chief transformer designer with Lancashire Dynamo & Crypto, Ltd. He served his apprenticeship with this company and then became assistant designer to Bruce Peebles & Co., Ltd., later joining Laurence, Scott & Electromotors, Ltd., as chief AC designer.

Mr. Kenneth Gordon.—It is with regret that we have to record the death of Mr. Kenneth Gordon, aged sixty-four, who was for many years on the staff of Siemens Brothers Dynamo Works, Ltd., and subsequently of the English Electric Co., Ltd. Mr. Gordon was first engaged as an assistant at the Sheffield branch of Siemens and in 1909 was posted to the Bombay branch and later transferred to Calcutta. Early in 1915 he returned to this country and served in the Forces. After his war service he joined the staff of the English Electric Co., Ltd., and in 1920 returned to India, being appointed manager of the company's Madras branch, which position he held until 1936 when he returned to this country. He remained an active member of the export department until retiring in 1940.

Mr. J. P. Ellis.—We regret to record the death at the age of forty-four of Mr. J. P. Ellis, manager of the steel conduit works of the General Electric Co., Ltd., Witton, on November 1st. Mr. Ellis was apprenticed to the company in 1917, and afterwards joined the estimating department of the Witton works, proceeding later to take up the post of engineer at the Dublin branch. He returned to Witton after four years to become personal assistant to Sir Harry (then Dr.) Railing, who was at that time director and general manager of the works. Mr. Ellis became manager of the steel conduit works in 1940.

Mr. William Holmes, A.M.I.E.E., who before his retirement was employed by the Barking Borough Council, has died at Storgursey, Somerset, at the age of sixty-nine.

Mr. R. H. Bryans.—The death is announced (at Reading on November 16th) of Mr. Robert H. Bryans, M.I.E.E., at the age of eighty-two.

Mr. R. E. Milne.—We learn with regret of the death on November 12th of Robert Edward Milne, a director of Milne & Longbottom, Ltd., manufacturing electrical engineers, Rochdale.

Wills.—**Mr. Frank Dudley Docker,** chairman of the Electric & Railway Finance Corporation, Ltd., and founder and first president of the Federation of British Industries, left £887,692 (net £861,533).

Mr. Alfred Vaughan, a director of the Revo Electric Co., Ltd., left estate valued at £97,114 (net personalty £92,958.)

Forthcoming Events

Friday, November 24th.—*London.*—Institution of Mechanical Engineers, 5.30 p.m. Informal meeting. "Mechanical Engineering Problems of London Transport." by W. S. Graff-Baker.

London.—Room 19, Livingstone House, Broadway, S.W.1, 6.30 p.m. E.P.E.A. Southern Divisional Meter Engineers' Group. "Polyphase Meter Testing," by X. H. Balfre.

Saturday, November 25th.—*Glasgow.*—University (Natural Philosophy Building), 3 p.m. Scottish Branch of Institute of Physics. Symposium on "Industrial Physics in Scotland."

Barnsley.—Queen's Hotel, 3 p.m. Association of Mining Electrical and Mechanical Engineers (Yorks North-West Branch). Technicolour films showing power station "Oilfyre" extinguishing system.

Nottingham.—University College, Shakespeare Street, 3 p.m. Association of Mining Electrical and Mechanical Engineers (Midland Branch). "Water Treatment for Colliery Power Plant," by R. Jarrett.

Cardiff.—At Institute of Engineers, 3.15 p.m. Institution of Civil Engineers. "Planning of City Thoroughfares and Public Utilities," by R. N. Pegg.

London.—Bonnington Hotel, W.C.1, 2.45 p.m. Meeting of the Institution of Factory Managers, South Eastern (London) Branch.

Monday, November 27th.—*London.*—Institution of Electrical Engineers, 7 p.m. London Students' Section. "Some Hydro-electric Possibilities and Achievements," by W. A. Hatch.

London.—Northampton Polytechnic, E.C.1. Electrodepositors' Technical Society. "Silver Plating of Steel," by J. Sprague.

Newcastle-on-Tyne.—Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. "Electrostatic Precipitation of Dust from Boiler Plant Flue Gases," by J. Bruce.

Wednesday, November 29th.—*London.*—At Institution of Civil Engineers, 6 p.m. Institute of Welding. "Hard Surfacing by Welding," by M. Riddehough.

Birmingham.—At James Watt Institute, 7 p.m. I.E.E. South Midland Students' Section. Part II of Students' Lecture "The Cathode Ray Tube and its Applications," by Dr. W. Wilson.

Friday, December 1st.—*Nottingham.*—At Corporation Gas Showrooms, 5.30 p.m. Illuminating Engineering Society (Nottingham Centre). "Lighting: The Architect's Point of View." Speakers, P. J. Bartlett, T. C. Howitt and A. J. Thraves.

Chesterfield.—Station Hotel, 6.30 p.m. Association of Mining Electrical and Mechanical Engineers (Midland Branch). Papers by junior members.

Saturday, December 2nd.—*Manchester.*—Engineers' Club, Albert Square, 2.30 p.m. I.E.E. North-Western Centre. "Standardisation and Design of AC Turbo Type Generators," by G. A. Juhlin.

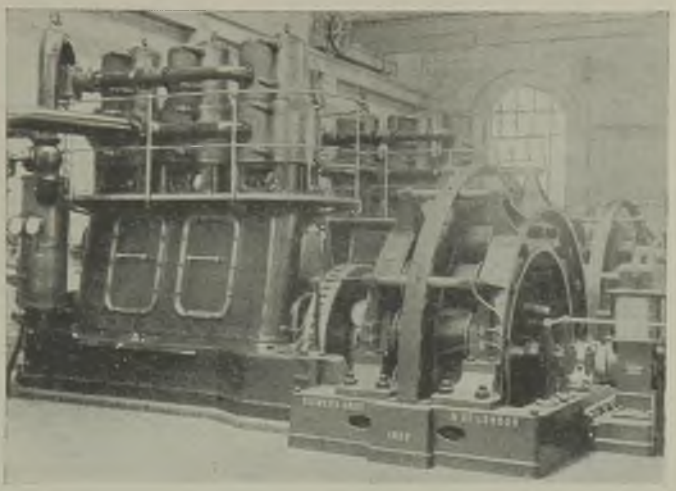
Monday, December 4th.—*Birmingham.*—At James Watt Institute, 6 p.m. I.E.E. South Midland Centre. "Standardisation and Design of AC Turbo Type Generators," by G. A. Juhlin.

Cardiff's Jubilee

The Original System and Later Developments

LAST Sunday marked the fiftieth anniversary of the first official connection of consumers to the Cardiff Corporation's electricity undertaking. Before that date there was a non-authorised supply at 2,000 V, DC to certain shopkeepers from steam-driven plant installed in Working Street by the Anglo-American Brush Company. The overhead mains were condemned by the Board of Trade in 1889 and, except for certain premises with private plant, no supply was available until the Corporation started up.

Cardiff obtained its first Act in 1891 and the erection of the generating station at Eldon Road was commenced. The plant comprised open type Davey Paxman vertical engines direct coupled to Siemens single-phase alternators generating at 2,400 V, 40 cycles. This was followed by Belliss & Morcom and Ferranti sets, and there were also two rectifiers supplying series arc lighting at 1,200 V. This station was closed down in 1924 and is now used as a mains depot and workshops.



Belliss & Morcom 300-kW sets at Eldon Road power station in 1899

The first h.v. mains were insulated with v.i.r. drawn into cast-iron pipes, and had a short life. In fact, they were changed twice in twelve months and eventually were replaced by lead-covered, paper-insulated cables. The l.v. mains were also v.i.r. insulated and drawn into cast-iron pipes. The distribution pressure was 100 V, but this was later changed to 200 V.

In 1903, the tramway system was commenced and DC became available from the new Roath power station. The town centre and docks areas were changed over to DC and a great part of these areas is still on that system. In 1905, three-phase generating plant was installed at Roath, and the 6·6-kV, three-phase, 50-cycle system gradually superseded the old single-phase system. A 33-kV transmission system was commenced in 1935 and a complete underground ring main has been laid around the city with three large substations stepping down to 6·6 kV.

Progress has been rapid during the past twenty years thanks to the far-seeing policy of the Department. Some years ago, the Electricity Committee authorised the laying of mains in every thoroughfare to encourage the demand for supplies. This was well justified and to-day there are very few properties not connected. Periodical reductions in tariffs have further accelerated the demand and Cardiff's charges are now among the very lowest in the kingdom. The domestic two-part tariff is a good example, having a standing charge of 10 per cent. of the rateable value, plus ½d. per kWh. Despite the low level of charges the Department has made very handsome profits and has contributed over £460,000 to the relief of rates.

The first borough electrical engineer was Mr. N. Applebee, who was succeeded by Mr. Arthur Ellis in 1900. Mr. C. G. Morley New was appointed in 1920 when Mr. Ellis resigned to take up private consulting work. On Mr. Morley New's appointment as an Electricity Commissioner in 1935, he was succeeded by the present engineer, Mr. Edward Jones.

Cereals as Fuel

BY the use of substitute "fuels"—cereals and oleaginous products—power production in Argentina has been maintained although recent imports of petroleum and coal have been cut by almost 80 per cent. Statistics published by the Asociación de Productores y Distribuidores de Electricidad show that consumption in June last reached the record amount of 209·2 million kWh. In 1943 total sales were 2,257·2 million kWh against 2,135·8 million in 1942.

CORRESPONDENCE

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

Single-Pole Fusing

IN your issue of November 17th Mr. P. Ridler quotes a "recent incident" and uses it as an argument against single-pole fusing. The trouble experienced was not due to single-pole fusing but to three very serious defects in the installation work and to the neglect of those responsible to make a test and to ensure that socket-outlets were correctly connected, that the conduit system in the neighbouring house was properly earthed and that it was clear of all gaspipes.

If people in your correspondent's district are to be allowed to continue to carry out installations in this shoddy manner then no system of protection can be considered safe. Why should we be asked to modify modern installation methods in order to pander to inefficient workmanship, as your correspondent evidently suggests. The real remedy is to enforce the I.E.E. Wiring Regulations, and to adopt compulsory registration of contractors and operatives.

London, N.W.1. W. E. STEWARD.

District Heating

MUCH is being said about district heating from electric power stations, but in a country where climatic conditions are not rigorous the fuel employed is more efficiently burned by direct heating. There are two problems to investigate, one thermo-dynamic (not merely thermal), the other financial, but the first must be solved before one can start to consider the second.

The kernel of the matter is contained in the complete answer to the question of why the thermal efficiency of an electric radiator is only about 22 per cent. while that of the ordinary household grate is about 25 per cent. It is, of course, the toll paid to convert heat into electricity by reason of losses in the condensers. The district heating apostle argues that these are the heat units that should be saved and that highly refined electricity, which is 100 per cent. available as dynamic energy, should never be degraded back to heat. On the other hand the thermo-dynamic process which entailed the loss is reversed at the consumer's end, making the efficiency in use 100 per cent. by direct electric heating.

It is constantly stated that the efficiency of a heat-electric station is much higher than that of a simple condensing station, one writer at least claiming an overall efficiency approaching boiler efficiency. Nevertheless, the purpose of a power station is what its name implies and not for purveying heat. What the district heaters are after is rejected heat. They can have it and state it in what terms they please. Power engineering, however, is concerned with available power and its value should be stated in terms of thermo-dynamic efficiency, otherwise we have the paradox of finding that our most efficient station is that in which the power production has been squeezed out altogether.

Newport, Mon. B. LLOYD PRICE.

Social Security

WE have received a letter signed by Messrs. H. Senior Fothergill, secretary, Electrical Industries Benevolent Association; W. K. Brasher, hon. secretary, I.E.E. Benevolent Fund; W. A. Jones, secretary, Electrical Power Engineers' Association; and A. Brammer, secretary, Association of Supervising Electrical Engineers, in the following terms:—

Those who have not gained first-hand experience of social service work may be wondering whether the Government's proposals for social insurance, if implemented, would mean that there would be no call for the work of the various benevolent funds and social service bodies which is such a creditable feature of English life.

Closer reflection, however, should indicate that, valuable as are the proposals of the White Paper, a widow with three young children cannot live on 39s. a week even if it were possible to exist on that sum, and that 20s. a week for an old widow, whose husband died a few years after retiring, only partially solves her problems. It will be seen, therefore, that there will still be a need for benevolent funds to give considerable financial help in many deserving cases.

It is equally important to realise that properly established benevolent organisations are doing an immense amount of social service work which would abundantly justify their continued existence even if the distribution of grants were not a part of their functions. It is this kind of work which it is so difficult for the general public to appreciate, but if those who have had experience of the domestic problems of a family of four or five will consider the magnitude of the work of dealing with "families" running into hundreds, scattered over the length and breadth of the land and involving many different temperaments and backgrounds, it will be clear not only that social service bodies deserve continued support but that, with the readjustments and complexities which will come in the next few years, they will need even greater support.

American Notes

Post-War Power Sales Prospects

EARLY post-war conditions in the United States electric power industry are forecast in a recent report issued by the Commercial Planning Committee of the Edison Electric Institute. The Committee considers that during the period of readjustment there will be no great amount of idle power plant capacity. There will be competition of the keenest type but electrical utility companies, confident of the value of the service they offer, expect to load up the relatively small margin of unused capacity in a few years after the war is over. The fact that new generating equipment is now being ordered by some companies is the best possible indication to support the validity of this forecast.

Sales of electricity to domestic consumers by 1950 are estimated to reach a figure approximately 50 per cent. greater on a country-wide average than in the peak year of 1943, although estimates for sales by individual companies vary from a minimum increase of 25 per cent. to a maximum of 100 per cent. Industrial power sales for the immediate post-war years are expected to return to the level of 1939, and subsequently increase with full-scale resumption of normal civilian production. Total sales in all classifications, however, are expected to hold at about 35 per cent. above the level existing when the European war broke out.

The report further points out that despite heavy war demands for electricity, which in every instance have been met, no abnormal installations of generating capacity have been necessary. From 1937 to the end of 1944, the report says, the business-managed companies will have increased their installed capacity by about 7,500,000 kW or about 24 per cent. This amounts to about 3 per cent. per annum compounded and does not exceed the long-term rate of growth of load under normal peacetime conditions.

Shasta Dam

Two of the five 75,000-kW hydro-electric generating sets to be installed in the Shasta Dam power station on the Sacramento River have recently been put into commission. This station is part of the California Central Valley Project, which is being constructed by the United States Bureau of Reclamation at a cost of $333 million. The main purpose is irrigation, flood control and aid to navigation.

The dam, 602 ft. high, impounds 4·5 million acre-ft. of water and contains 6 million cu. yd. of concrete. It is stated in *Electrical West* that the main turbines are rated at 103,000 HP, 138·5 RPM ,with full gate at 330 ft. head, requiring 3,200 sec. ft. of water. A maximum efficiency of 91 per cent. is expected.

Auxiliaries are supplied at 440 V from two 2,500-kW 2,300-V house generators through duplicate transformers or from a 2,500-kVA 13,800/440-V transformer connected to either of the main alternators. As control cables between the power station and switch house on the opposite side of the river are 2,000 ft. long, the burden on the current transformer secondaries is only one ampere.

The alternators are connected without the interposition of switchgear to a bank of three 25,000-kVA, 13·8/132·8/230-kV transformers from which runs a 230-kV single wood-pole overhead line, 100 miles in route length, to feed into the transmission system of the Pacific Gas & Electric Co.

A few miles further down stream at Keswick is a secondary dam, 148 ft. high, for regulating the river flow in order to permit more latitude in the use of water for power generation at Shasta Dam. Three 25,000-kW generating sets are to be installed there.

Hydro-Electric Rating

Relief for Scottish Undertakings

A BILL to relieve hydro-electric undertakings in Scotland of part of the heavy local rates which they bear at present was introduced on November 14th in the House of Commons by the Secretary of State for Scotland. Lord Cooper's Committee on Hydro-Electric Development in Scotland was satisfied that there was a discrepancy between the valuation of steam and hydro-electric undertakings which imposed a real handicap upon the development of hydro-electric generation. The Committee therefore recommended that hydro-electric undertakings in Scotland should be permanently relieved of part of the heavy burden of local rates which they bear under the present valuation and rating system. The method which has been adopted, with the general approval of the local authorities, provides for an adjustment of the valuation of the generating works in accordance with the proportion which £30 bears to the actual constructional cost per kW installed at the generating station. The effect of this in the case of all new hydro-electric generating works is to disregard the constructional cost in excess of £30 per kilowatt of installed capacity in arriving at the valuation. This concession will materially assist the North of Scotland Hydro-Electric Board in the development of its area.

So far as existing generating works are concerned, the concession does not operate in any major rating area until new rateable value has been created equivalent to the amount of the relief, either by the same or another hydro-electric undertaking. Otherwise, loss of rateable value to local authorities and the consequential loss of revenue would create serious difficulties in some areas. It is anticipated that it will not be long before the North of Scotland Board will create in the areas of existing undertakings new valuation more than sufficient to secure that these undertakings shall receive the full amount of the relief.

The concession, which is to be reviewed after ten years, will not apply to generating works forming part of any industrial undertaking and entitled to derating, nor to generating works forming part of an undertaking which enjoys a reduction in valuation under the provisions of a local Act, *e.g.*, the Galloway Water Power Company, whose existing concession is at least as favourable.

Undertakers other than the North of Scotland Board must use any relief received under the Bill for the development of their distribution system or the benefit of their consumers. The North of Scotland Board is, of course, a non-profit earning undertaking, and the benefits given by the Bill will automatically accrue to the benefit of customers. The Bill, the Hydro-Electric Undertakings (Valuation for Rating) (Scotland) Bill, is on sale at H.M. Stationery Office, price 1d.

COMMERCE and INDUSTRY

Services for Portal Houses. Improving Patent Procedure.

Electricity for Hull Houses

THE Hull Housing and Town Planning Committee last week accepted the first allocation of a hundred bungalows of the Portal type, to be erected in Hopewell Road. A further 2,250 are to be allocated to the city.

The Committee discussed the question of services. It was suggested that some of the dwellings should have gas and some electricity, but the deputy town clerk stated that the Ministry would not allow this. It was therefore agreed that the houses should be supplied with electricity only.

A model kitchen based on the recommendations set out by the Ministry of Health Design and Dwellings Committee has recently been on view at the Hull electricity showrooms. Intended for a three-bedroomed house with a combined living room and dining recess, the kitchen includes in its compact layout provision for an electric cooker with thermostatic control, refrigerator, wash boiler and other electrical features. Special attention is paid to ensuring that all apparatus is at the correct working height to avoid stooping.

Signals Training School

Technical Press representatives were recently given an opportunity of seeing the work of the School of Signals, Catterick, which is responsible for the higher technical training of officers and men of the Royal Corps of Signals; it also provides courses for instructors in other units of the Army. In all the courses practical demonstration by the instructors is combined with experiment and manipulation of the actual apparatus by the students, eight thousand of whom passed through the school last year.

An example of the practical nature of the instruction is offered by a layout of a superhet receiver. In this the components and wiring are arranged to correspond with the conventional wiring diagram and it is used to demonstrate components, to exercise students in circuit reading and to show the effects of faults and maladjustments. There is a well-equipped laboratory for radio work and in another room various types of aerial are demonstrated in a very ingenious fashion.

Patent Law Reform

A memorandum of evidence given by the Chartered Institute of Patent Agents before the Board of Trade Committee on Patent Law Reform shows that the Institute considers that there has been very little suppression of patents to retard competitive developments. Any abuses of this kind could be checked under the existing law with relatively minor amendments. The Council of the Institute does not favour the proposal to endorse all patents "Licences of Rights" which would be likely to restrict enterprise and research. The position with regard to the allocation of judicial functions to the Comptroller-General and his assistants is considered satisfactory, but beyond this it is suggested that a special tribunal should be set up. The Institute does not favour the idea that the Comptroller-General should be empowered to refuse a patent on the grounds of lack of invention, prior user or lack of utility, but there should be an improvement in practice in relation to search, ambiguity, sufficiency and clearness of description. Recommendations are made for the lessening of the cost of litigation, including the establishment of the specialised tribunal mentioned above. Evidence is also given on several other points.

Packing Delicate Instruments

Manufacturers of precision instruments in particular will be interested in a new transparent packaging material produced by the Goodyear Tyre & Rubber Co. This material ("Pliofilm") is water-, vapour- and air-proof, and is unaffected by oil, grease, weak acids and alkalis. Being a derivative of natural rubber, it is tough and elastic and is produced in sheets from 0·001 to 0·00225in. in thickness. Due to its thermoplastic properties perfect jointing and sealing can be effected by means of the "hot iron over welding" process, while, being pliable and extensible, it will readily conform to the shape of irregular surfaces over which it may be wrapped. By heating to 350 deg. F. it can be stretched to several times its original area, producing a skintight wrap with economy of material. At present the active output of the material is reserved exclusively for the packing of aircraft components.

South African Engineering Project

The establishment after the war of a £1,500,000 Industrial Engineering Corporation is planned by Dr. H. J. Van der Bijl, director general of supplies and chairman of the Electricity Supply Commission and the Iron & Steel Corporation. Arrangements were already in hand, he said, for the training of the necessary skilled labour, and among the trainees would be discharged soldiers. Altogether at least 3,000 would be needed. He believed that South Africa had sufficient reserves of skilled labour, but Government post-war projects might mean importing some labour of the highest skilled type. The Corporation would manufacture tools and industrial plant of various kinds. The Electricity Supply Commission too would have to be expanded to meet the contemplated expansion of mining and other industries.—*Reuter.*

Retail Trading Without Licence

A summons against Mr. Frank Cooper, of Tottenhall Road, Palmers Green, for selling electrical and other goods without a Board of Trade licence was dismissed on payment of 42s. costs at the Wood Green Magistrates' Court on November 10th. For the prosecution it was stated that when in July, 1942, the Board of Trade learned that defendant was carrying on business in Green Lanes a copy of the Order was sent to him. Defendant wrote that his business consisted of cycle and radio repairs, but in September, 1943, he applied for a licence to sell small electrical goods. This was refused, and when defendant asked why two other shops

were granted licences it was pointed out that licences were only granted where there was a need for a retailer of the goods in question. Subsequently an official of the Board visited the shop and bought an electric light bulb.

On behalf of defendant it was stated that he had a large family to support and had been struggling to make a living. He started selling when his application for a licence was refused.

Accidental Lighting of Street Lamps

At St. Augustine's Sessions, Canterbury, on November 15th, a fine of £10 with 2s. 4d. costs was imposed on the Whitstable Electric Co., Ltd., for permitting lights during the black-out. It was stated that during the early hours of October 7th street lights in the town went on twice in the Canterbury Road district, including lamps with 300-W bulbs. An employee, Mr. H. Shaw, said that a vent pipe, owned by the local Council and to which some cables were attached, broke off, and in its fall it had struck some electrical connection and had put on the lights. For the defence Mr. C. A. Gardner submitted that a company could not be charged with this type of offence. He was over-ruled.

Fined for Installing Discharge Lamps

Mr. J. B. Mellor, heating engineer, was fined 20s. at Warrington Magistrates' Court last week for a breach of the Discharge Lamp Lighting (Control) No. 1 Order, 1943, by the installation of fluorescent tube lighting without a Ministry of Works licence. Defendant said that had he known of the restriction he might have bought the equipment, but would not have fixed it without a licence.

North American Aid for Brazil

Sr. H. de Araujo Goes, Brazilian Director of Public Works in Brazil, said in a statement last week that North American capital and technical aid were absolutely necessary to ensure the successful completion of the vast electrification project now under way in the state of Rio Grande do Sul. Sr. Goes has just completed a tour of the United States during which he visited the Tennessee Valley and similar developments. — *Reuter's Trade Service* (Rio de Janeiro).

Colliery Distribution

The main transformers referred to in the article under the above heading (*Electrical Review*, October 27th) which described the electrical distribution system at the Treeton Colliery of the Rother Vale Collieries Branch of the United Steel Companies, Ltd., were supplied by the English Electric Co., Ltd.

E.A.W. Activities

At the headquarters of the Electrical Association for Women on Monday last an instructional course for regional officers of the W.V.S. was opened by Miss Caroline Haslett, director of the Association. The course was arranged by the Ministry of Fuel and Power on the efficent use of electricity and the maintenance of electrical appliances. Addresses were given by Lady Hillingdon (vice-chairman, W.V.S.) and Mr. Nott-Bower (Ministry of Fuel and Power) and these were followed by talks on installations and appliances by Mrs. E. E. Edwards, Miss V. Norvick and Mrs. Bingham (Central London Electricity).

On November 14th there was a pre-view of a bust of Miss Amy Johnson and a presentation to Miss Haslett for the Women's Engineering Society of a gold medal awarded to Miss Johnson, a former president of the W.E.S., by the Society of Engineers.

The E.A.W. has presented to the W.A.A.F. a photographic exhibition, "Electricity for Everywoman" similar to those given to the A.T.S. and W.R.N.S.

The G.E.C. War Effort

The suggestion behind four displays on the front of Magnet House, Kingsway, London, is that "One Day the Story can be Told" of the contribution to the war effort made by the

One of the G.E.C. displays at Magnet House, Kingsway

thousands of G.E.C. employees. The displays also imply that one day the experience of the company's extensive organisation will be turned to more peaceful needs.

Large Single-shaft Turbine

Described as the largest turbo-alternator to be placed in service since Pearl Harbour and, possibly, to be installed anywhere as a single-shaft unit, the new 147,000-kW, 1,800-RPM, tandem-compound set at Fisk power station, Chicago, operates with steam conditions of 1,250 lb. per sq. in. and 925 deg. F. The turbine heat rate at full load is given in the *Electrical World* (September 30th) as 8,750 BThU per kWh gross and auxiliary power as 7,000 kW, so that with a boiler-house efficiency of 87 per cent. the net heat rate becomes 11,000 BThU per hr. (31 per cent. thermal efficiency). Bleeding is at five points. The 12·6-kV alternator has two electrically independent stator windings, connected to different busbar sections. Steam at 1,325 lb. per sq. in. and 935 deg. F. is supplied by two

750,000 lb. per hr. B. & W. high-head boilers, equipped for pulverised fuel firing. Three methods of control are provided, *viz.*, full automatic, boiler manual from a single point and independent hand regulation.

Building Standards

The publication is announced of a 317-page "Handbook for Building Materials and Components" in which are included essential technical data extracted from 164 B.S. specifications. The book is intended to be a supplement to the "Housing Manual" recently issued by the Government and it will be used as a basic standard guide to post-war building for architects, engineers, municipal officers, builders and their merchants, as well as the manufacturers of the great variety of materials and components employed in the building trade. The handbook is obtainable for 12s. 6d. post free from the British Standards Institution, 28, Victoria Street, London, S.W.1.

Electric Vehicle Construction in Spain

Three Spanish-built electric vehicles were, according to *Metalurgia y Electricidad*, a prominent feature of the recent Sample Fair held at Barcelona. They were built by a concern known as the Sociedad Vehiculos Electricos Autarquia, of that city, the display including a 30-seater single-deck coach designed for a speed of about 22 MPH and fitted with a battery capable of running it for a distance of 37 miles on one charge, and a 3-ton electric lorry intended for a maximum speed of 19 MPH and a run of 40 miles on a single charge.

North-Eastern Industrial Development

The North-East Engineering Bureau, an organisation formed to help small engineering concerns in research work and to expand the engineering industry generally, is expected to begin its operations on January 1st. Fifty-one firms have agreed to subscribe to the bureau's funds, and it is expected that it will cost £5,000 per annum to run, and member-firms will subscribe according to the number of their employees.

Calendar

An artist's impression of Lincoln's historical buildings appears on each of the pages of Ruston & Hornsby's calendar for 1945. A limited number of these calendars is available on application to the company's publicity division, Sheaf Ironworks, Lincoln. A penny stamp must accompany the request.

Screw-thread Standardisation

Conferences between American, Canadian and British engineers last year and in August and September last have resulted in certain measures of agreement with regard to the standardisation of screw threads and limits and fits for engineering. Among other things, it was agreed that the B.S.I. should publish an amendment to B.S.84 with a view to providing British industry with adequate information regarding the truncated form of Whitworth thread used in the United States.

Among other subjects studied were cylindrical fits, high-duty studs, pipe threads, Acme threads and instrument threads and upon most of these it was agreed that the B.S.I. should take appropriate action.

On the general subject of unification of screw threads, after much discussion British proposals for a programme of research on the strengths of threads of varying angles and proportions were accepted. The conclusions will form the basis of further consideration of the matter by the three countries.

Copies of the report, published by the Combined Production and Resources Board, are obtainable from the Director-General of Machine Tools, Ministry of Production, Dept. D.G.M.I., Caxton House East, Tothill Street, S.W.1.

Trade Publications

Geo. Salter & Co., Ltd., West Bromwich, Staffs. — Illustrated technical brochure on spring selection and design.

Cooke & Ferguson, Ltd., Victoria Street, Openshaw, Manchester, 11. — Coloured brochure (S.34) descriptively illustrating type-UD air-insulated switchgear rated up to 350 MVA at 11 kV.

Bona fide trade applicants can obtain copies from the companies concerned.

Catalogues Required

J. W. Perkins & Son, Alcester Road, Studley, ask for manufacturers' and wholesalers' lists and catalogues.

Change of Name

The name of Burchnell's Battery Service, Ltd., has been changed to Burchnells, Ltd.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within one month from November 15th :—

FENCEMASTER. No. B626,035, Class 9. Electro-magnetic induction apparatus for electrifying wire fences.—Cooper-Stewart Engineering Co., Ltd., 136-7, Long Acre, W.C.2.

CLANG. No. 627,273, Class 9. Electric instruments and apparatus not included in other classes, photographic and optical instruments and apparatus and parts (not included in other classes) of such goods; but not including cinematograph films and projectors or instruments, apparatus or devices for producing sound.—Clang, Ltd., Crown Yard, Cricklewood, N.W.2.

OROPHON and OROGRAPH. Nos. 629,736-7, Class 9. Supersonic apparatus for detecting flaws in metal.—Henry Hughes & Son, Ltd., 107, Fenchurch Street, E.C.3.

PHILISTAT. No. 628,460, Class 10. Ultra-violet and infra-red ray apparatus and lamps for use therein, electro-therapeutic instruments and apparatus, electric instruments and apparatus, all being goods for surgical, medical, dental or veterinary purposes.—Philips Lamps, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

BATTLESHIP (design). No. 625,703, Class 11. Electric immersion heaters.—P. G. Caldwell, trading as Caldwell Heaters, 448, Barking Road, E.6.

Electricity Meter Design

Some Suggested Improvements

A METER engineer's hopes and disappointments and his conception of what the future meter should be like are related by MR. G. E. MOORE (Sunderland Corporation) in a paper read on November 17th before the I.E.E. Measurements Section.

Uniformity could simplify and improve as well as cheapen the ubiquitous induction watt-hour meter. It will be irrational to tolerate further the growing variety of types and constituent parts ; indeed the effect of so much diversity is to aid disparagement of the instrument as a mere measurer of electricity, or as a means of determining the revenue-value of the energy supplied through it. Why, it is asked, cannot a meter be made for a few shillings; need small errors, which cannot be of much account, cause so much concern when tests of large batches of used meters often show a satisfactory *average* accuracy? Such arguments do not dispose of actualities do not help to explain queried accounts.

"National" Form

The author proposes, in terms chosen to be general rather than particularised statements, that future service meters should be of one recognisably similar *national* form. The British Standards Institution's present requirements should be broadened and made more definite for the purpose. Clauses in BS.37 which the author would alter and additions he would attach thereto are indicated in the paper. Ten-yearly revision should suffice and there might be a less onerous document for low-quality instruments to be sold abroad and for use in this country outside the ambit of the Electricity Supply (Meters) Act, 1936.

The author condemns short-term assessments and urges that the life-cost factor should receive more consideration. Uninformed price cutting should not be countenanced. It will be surprising if meters are not affected by the higher general price levels expected after the war. But advances in manufacturing methods and concentration of production may actually result in economic benefits, although the author does not envisage a single manufacturing organisation.

In stating general requirements, special emphasis is laid upon the necessity for stability in its most thorough sense. Dimensional regularisation is also considered, the author's summarised specification indicating that while some parts would be exactly standard (interchangeability of all makes) other components need be only approximately standard. A first step towards eventual uniformity of size and shape should be the bringing of all makers' cases into substantial, though not precise, accord. A strong transparent cover of standard form has many advantages, but a common system of fixing holes is not a pressing need. The expense of any plug-in arrangement would be better directed to the provision of safer and neater supply-service conditions. Any immediate need for a standard terminal block is doubtful, but a common extended terminal cover would be a great convenience.

Accepting the fact that it is not yet practicable for the internal "works" of all makes to accord wholly, then the parts which soon can or ought to be made uniform are few. But the top and bottom rotor bearings should each be of a common form and uniform braking magnets are advantageous. The last mentioned components are of great importance and their quality should be notably improved by concentration of their production.

This paper perforce tends to deal in terms of the single-phase meter for a 50 c/s, four-wire system, at 400 V phase-to-phase and 230 V phase-to-neutral. Instruments suited to other conditions would be non-standard and should not share in any benefits resulting from adherence to the basic national model.

The two or three elements of polyphase types should be accommodated in a larger reproduction of the single-phase case, say a 16 cm. cube including base and glass cover, which implies the adoption of a one-disc rotor, certain components being specified in a larger size and the remainder utilised without alteration.

Meter-controlled and associated demand-indicating devices should be physically separate, couplings preferably being non-mechanical. Many of the acutest prepayment meter difficulties are due to the tariff makers and cannot be resolved by the meter industry. If prepayment is necessary, there should be an agreed maximum mounting area. If the instrument is to remain one piece of apparatus, the lower portion should be the national standard meter; an upper portion of similar size and shape could contain the prepayment gear. Thus the mounting board space could be about 24 cm. high by 12 cm. wide. All forms of money-collecting devices should preferably be separate physically.

Discussion

Opening the subsequent discussion, MR. E. FAWSSETT remarked that Mr. Moore had criticised B.S. 37. That was not surprising, but it was not entirely the fault of the committee that prepared that specification; at that time no specification could go beyond the performance of the "weaker brethren"

in the industry. He hoped to see it drastically altered in the future, but whether the 600 or so users in the home market would accept all Mr. Moore's suggestions was open to grave doubt, unless some measure of compulsion was applied. A joint committee of all the makers and most of the users had got so far as to agree tentatively upon the dimensions for the fixing holes and the terminal centres and their relation to each other, and also the maximum size of the meter in three dimensions. He was pleased the author had put forward the m.c.v. basis of rating, which, at the present stage, was the unanimous view of the joint committee.

There seemed to be a considerable body of opinion in favour of a wider accuracy range than the author's suggested 40 : 1. The Americans attained 80 : 1 and certain makers in this country were prepared to offer 60 : 1. It happened that the latter corresponded with the range over which the small house meter had to work, from 2½ kW down to 40 W. It was thought that 80 A was about the maximum desirable for a straight-connected meter. Then one intermediate size was all that was needed and it should fit in for series-coil ampere-turns with the other two. This, at present, was *sub judice*, although his personal preference was for making it 40 A, corresponding with the very popular 20-A L.R., giving a minimum overlap of 15 : 1, which should be ample. Before long he hoped it would be possible to call the members of the B.S. Committee together to draft an entirely new specification for the "national electricity meter" with certain vital dimensions standardised, as well as improved performance. It would embody many, but perhaps not all, of the author's suggestions. Mr. Fawssett said that the author's suggestion that magnets should stay two years "in bond" and then be submitted to an equally lengthy "approval" test had drawbacks. With their combined knowledge and experience the best magnet makers should be able to evolve a stability test in much less time.

Uniform Manufacture Suggested

MR. A. FELTON (N.P.L.) thought it eminently reasonable that a national standard meter should be evolved and suggested that some system of manufacture, such as was used by the Post Office for telephone apparatus, might be adopted so that apparatus made by one firm was indistinguishable from that made by another. Type approval had never professed to do more than ensure that meters were capable of being adjusted to perform within specified limits. Approval of a type was never a substitute for care on the part of the manufacturer or for discrimination on the part of the user. He urged that the 5-A L.R. margin should be got rid of.

MR. S. H. RICHARDS (Electricity Commission) thought that certification could not guarantee stability. It was only possible to test what was sent to be tested and if the author's ideas were put into practice they would mean a large and costly staff. During the past seven years there had been an increase in accuracy of meters generally of at least 50 per cent., but there was still a lack in many places of appreciation of the value of accuracy to the supply industry.

MR. C. W. HUGHES (London J.E.A.) said that the loss if meters were 5 per cent. slow was a very considerable sum in the case of a large undertaking. He disagreed with the suggested scrapping of meters after a relatively few years and maintained that the only method of deciding when to do so was by testing the meters as they were brought in from the consumers. He suggested that meters should be referred to on the basis of the kW they would carry continuously at 230 V.

Forty Years' Development

MR. L. J. MATTHEWS (Electrical Apparatus Co., Ltd.), referring to the author's criticisms of manufacturers, said that the major part of the development of AC meters had taken place over the last forty years, including ten war years; that was not a very long period. Although first cost was not now so important as it formerly was, manufacturers looked to standardisation to reduce cost; if the author's proposals were adopted they would result in an increased cost. Special requirements had been one of the manufacturers' chief troubles for many years.

MR. J. E. FOSTER (South Wales E.P. Co.) said the author seemed to favour a meter of comparatively small dimensions with glass cover and extended terminal cover, yet with a clear view of all the adjustments. He (Mr. Foster) had a strong detestation of the "wrist-watch" type of meter. On the whole, however, he supported the author's views.

MR. E. W. HILL (Aron Electricity Meter, Ltd.), while welcoming the author's proposals because they would prevent stagnation, said he would not like to see one type of meter made by all manufacturers. The storage of magnets for two years would be a serious matter, and he did not think the author's ideas with regard to ratings were likely to be adopted because there were other proposals which he considered even better.

MR. L. B. S. GOLDS (Edmundsons) considered that it was necessary to get rid of wrong thinking on the part of responsible officials in the electricity supply industry. Consumer goodwill and revenue depended entirely upon an efficient meter and an efficient meter department. It was really up to the user to say what meter and what standard of performance he required. Standardisation or regularisation of the

internal design would be unwise at the present time, but excellent work had been done by the joint committee in standardising the case and terminal block. He thought meters should come out after their sixth year. He preferred the 80 : 1 meter as used in America; certainly they ought to go up to at least 60 : 1. The manufacture of meters for export should be considered from the post-war point of view.

MR. J. PRINCE (Ferranti, Ltd.) said that we were still in the midst of the most intensive research period of all time and that would have a profound effect on electrical measuring devices of the future. The export policy of this country was an important factor not to be overlooked. Standardisation was an extremely debatable matter. If this country, which had done so well in the past by producing new things, was to change its policy and go in for rigid standardisation, it might well lose its industrial position after the war.

MR. F. H. BATT (Measurement, Ltd.) said that in general the stability of the present types of meters was proportional to their works cost, labour and material, and that was often seriously influenced by special ideas formulated by supply engineers. He doubted whether more than three types of meters would be required in the future. The tendency towards too much standardisation was a great danger.

MR. G. S. CLARKE (Wessex Electricity Co.) said that one of the troubles of the meter engineer was that meters were not regarded as obtaining direct revenue. Their maintenance was regarded more as a running cost and therefore the endeavour was made to do it as economically as possible. In an undertaking having an annual revenue of £2,500,000, if the meters were on the average 1 per cent. slow, there would be a loss of revenue of £25,000.

Importance of Stability

MR. J. PIKE (Electricity Commission) thought that the important thing now was not so much technical performance, which already was very high, but stability. Meters should be taken out after, say, ten years for re-approval. Did the author suggest that a poorer type of meter should be supplied to consumers who were served by non-statutory undertakings, as compared with those served by statutory undertakings?

MR. MOORE, in the course of his reply, said that his sole purpose was to assist in getting down to ideas which could be put into practice. He did not regard any of his proposals as fixed in any way. One of the difficulties with regard to N.P.L. tests was that the meter sent for test was very often not the meter that went into production. He did not know of one meter maker who had not, at some time or other, fallen down very seriously with regard to the stability of the materials employed. Perhaps the N.P.L. could take steps to make the approval tests more strict, although that might not influence the position from the production point of view. A ten-year rating basis had been suggested, but in his own undertaking the meters were changed between eight and twelve years depending on the circumstances. A good meter should last much longer than the six years that had been mentioned. The sizes of meters suggested were those which, had been found suitable for all-electric houses whether small, medium or large.

There could be no suggestion of one meter being made by all manufacturers. He saw no reason why a 20-year meter should not be possible, but it should be tested periodically. He emphatically did not suggest that a poorer meter should be supplied to non-statutory undertakings.

Western Australia

Electricity Supply and Transport

IN its report for the year ended June 30th, 1943, the Western Australian Government Electricity Supply Department comments on the satisfactory operation of the "B" power station where the thermal efficiency reached 28·2 per cent. against 27·4 per cent. in the preceding year. Of the total output of 145 million kWh 81 per cent. was generated in this station. Overall fuel consumption for both stations was 1·99 lb. of coal per kWh generated (against 2·07 lb). The boilers in the "A" station are being overhauled gradually, but it is necessary to keep as much plant as possible in service as standby to the "B" station. To meet the expanding requirements of the Perth metropolitan area the early provision of additional generating facilities is necessary and plans are in hand for a new power station; the Department is now inviting tenders for the plant required (*Electrical Review*, October 27th). Total revenue in 1942-43 was £483,349, an increase of £22,254, but working expenses rose by £34,283 to £374,738 and the net profit decreased from £22,484 to £10,485. The selling price per kWh sold averaged 0·86d. and the cost 0·85d. Proposals were submitted for a review of charges, but the Government was averse to increasing them.

The Government Tramways report includes a table giving the operating results of the trolley-buses during five years. This shows that revenue has risen from £56,005 in 1938-39 to £104,968 in 1942-43 and the net profit from £162 to £26,915. The report states that the vehicles have given very satisfactory service and are popular with the travelling public. Bodies have been constructed for 18 chassis imported from England and at the date of the report the fleet of trolley-buses in service had been increased from 22 to 34; this compares with 121 trams and 19 motor-buses. During the year there was heavy traffic on all services with a total of 48 million passenger-journeys as against 41 million in the previous year, passengers per car-mile increasing from 9·27 to 9·95. The system was operated economically, with 2·91 kWh used per car-mile against 3·06 kWh in 1941-42 and a decrease in the total traction kWh from 13·2 million to 12·9 million.

NEW BOOKS

AC Theory and Calculations. Quality Control.

The Simple Calculation of Electrical Transients. By G. W. Carter, M.A., A.M.I.E.E. Pp. viii + 120, figs. 74. Cambridge University Press, 200, Euston Road, N.W.1. Price 8s. 6d.

This useful book is based on lectures given to engineers of the British Thomson-Houston Co., Ltd. It aims "to supply a link between the algebra and calculus of our youth and the circuit problems of our working life," and the reader is therefore expected to have a certain amount of mathematical knowledge, some o which is given in appendices.

The circuits dealt with are all such that it is possible to consider equivalent lumped linear elements. The method of deriving the differential equations is explained and this leads automatically to Heaviside's operator and the "p-equations." If necessary, the "p-expression" is then split into partial fractions and the required solution, in terms of the time, is obtained by referring to a list of standard forms given in an appendix. This procedure is an alternative to the use of Heaviside's Expansion Theorem to which it is mathematically equivalent. The author states that the Expansion Theorem is less convenient in practice, although in the reviewer's experience it seems that there are cases where the opposite holds, especially, of course, if a list of standard forms is not at hand.

Clear explanations are given of the unit function, the principle of superposition and Duhamel's integral, and the "hammer-blow" shock. By means of impedance and admittance operators it is shown how the "p-expression" can be obtained more directly than by starting with differential equations. Methods are presented of allowing for a circuit which is not initially dead. A procedure for dealing with switching operations is given which is similar to the use of Thévenin's theorem; in this connection the impression is given that the voltage source "must" be treated as having zero impedance, but there is apparently no absolute necessity for this as it is quite easy to allow for the supply impedance. There is a chapter on resonance, damping and stability. Interesting practical examples include calculations relating to the valve oscillator, voltage regulator, Petersen coil, surges on a cable and alternator winding and a six-phase rectifier.—A.J.G.

Alternating Currents. By G. W. Stubbings. Pp. 203; figs. 92. E. & F. N. Spon, Ltd., 57, Haymarket, London, S.W.1. Price 12s. 6d.

The basis of elementary AC theory is presented here well and precisely, and in terms that a student can understand whose knowledge of mathematics and physics is quite elementary. The ground covered includes sinusoidal currents and voltages as well as harmonics, the power in circuits carrying non-sinusoidal currents, and the RMS value of such currents. The general principles of the alternator and the transformer are given very briefly.

Vectors are treated graphically in sufficient detail to make clear the diagrams of the transformer and the alternator and of various circuits and measuring instruments, as well as circle diagrams and those of balanced and unbalanced three-phase systems. The vector algebra that employs complex quantities is not given. Transients are considered very briefly, and only just enough to explain what they are, and to convey the meaning of doubling effect. A section is concerned with electrical measurements in single-phase and three-phase circuits.

The sub-title declares the book to be a non-mathematical textbook on the rudiments of AC theory; the description is accurate. The book will therefore serve as a useful introduction to those who are unable to follow more advanced textbooks. The limitation imposed by omission of even the simplest mathematics obliges the author to treat much of his material superficially and in quantitative rather than qualitative terms.

For many purposes such superficial knowledge is sufficient. One sometimes needs only to understand roughly what happens in a circuit and why; it suffices only to answer questions beginning with "How much?" One may, for instance, be content to know what doubling effect is without being able to calculate it. For such occasions rudimentary knowledge is adequate and for those who cannot go beyond it the book serves a useful purpose. But its use may not be limited to these. It will also be of interest and service to more advanced students. A conclusion that has been expressed only in highly mathematical terms is often only half understood. Every teacher knows by experience how illuminating it may be to translate the same conclusions into non-mathematical language. This is what Mr. Stubbings has achieved in a peculiarly telling manner.—R.O.K.

Quality Control-Chart Technique. By B. P. Dudding and W. J. Jennett. 74 pp.; 12 fig. General Electric Co., Ltd., Research Laboratories, Wembley. 2s. 6d.

This handbook may be described as a detailed development of the principles set out in B.S. 600 R (1942), though it is not intended to provide a substitute for the latter. While it deals mainly with the machining of articles to dimensional tolerances, much of the information presented should be useful to those interested in other types of manufacture.

Dr. Dudding's pioneer work in introducing statistical methods of inspection into British industry and his lectures on the subject have done much to reduce waste of labour and material in war industries, and the demonstration here provided of the adaptation of control-chart technique to manufacture to a predetermined specification is based on first-hand experience of an exceptional nature.

The work is divided into two parts. The first relates to quantitative data, or the utilisation of results of measurement, and the second to qualitative data, such as the classification of the products into defective or effective categories. Rules for the construction and interpretation of control charts for various processes and different tolerances are given, with numerous examples drawn from practice. Five appendices include definitions, tables and comments on sampling.—C.O.B.

Wartime Leases

Provisions of Validation Act

By F. E. Sugden, A.C.I.S., Barrister-at-Law

THE recent ruling of the Court of Appeal that leases "for the duration of the war" were what is termed in law "void for uncertainty" and therefore were unenforceable was followed by the passing of the Validation of War Time Leases Act, 1944. This Act is small in size but, as well-known legal luminaries have stated, it is difficult to elucidate and I only propose to give my personal interpretation of it from a lawyer's viewpoint.

Briefly, the Act lays down that any agreement executed before or after the passing of this Act (dated August 3rd, 1944) which grants a tenancy for the duration of the war shall deem to be for a period of ten years, subject to the following proviso: that the landlord or the tenant shall have the right to determine the tenancy (if the war ends before the expiration of the ten years) by the landlord giving to the tenant, or *vice versa*, at least one month's notice in writing after the end of the war. If the agreement provides for the termination of the tenancy by notice *before* the end of the war this notice still holds good and will therefore be a valid one. If the agreement provides for the termination of the tenancy by notice *after* the end of the war, this shall be substituted for the provisions relating to the termination of the tenancy *after* the end of the war.

"Duration of the War" Defined

The term "duration of the war" is used in many wartime agreements, consequently the Act defines its meaning once and for all as a period which, on the proper construction of the words used in the agreement, ends with or within a specified time after one of the following events: (a) the end of the war or hostilities as respects all the States (*e.g.*, Germany, Japan, etc.) with which this country is at war, and *all theatres* of war; (b) end of the war or hostilities as respects any particular State or States or any particular theatre or theatres of war; (c) end of the emergency mentioned in the Emergency Powers (Defence) Act, 1939, or for the period this Act or Regulation was in force; or (d) end of any emergency, etc., brought about broadly by the war.

Naturally the question will be asked: Does the term "agreement," referred to in the Act, apply in my particular case? The Act lays down that the agreement for the "duration of the war" shall have reference to an agreement for the grant of (a) tenancy for a specified term or for the duration of the war; whichever is the *shorter*; (b) a tenancy for a specified term or for the duration of the war whichever is the *longer*; or (c) a tenancy which is continued until determined by notice subject to the condition that the notice is not to be given by the landlord or tenant before the end of the war.

The term agreement in the Act also refers to an agreement between the vendor and purchaser of land that the vendor is to be entitled to retain possession of the land for the duration of the war.

The further effect of this Act is to grant a tenancy for less than the ten years.

There is an important proviso in regard to sub-tenancies, namely, where at the date of any agreement for ten years (or duration of war) and the landlord is himself a tenant who has less than ten years to run, the effect on such tenancy will be that the lease will run for the remainder of the ten years *less one day*. The term agreement includes a lease.

Evidence as to Intention

Where such terms as "war," "hostilities" or "emergency" are used without indicating whether the war of all States or of any particular State is referred to, the Act provides that the interpretation shall be those States with which this country was at war at the date when the agreement was made. If the matter of the interpretation or enforcement of the agreement is referred to a Court, it is entitled to admit any evidence which may throw light of the intention of the parties (landlord and tenant) as to the meaning of the expression.

The Act lays down that His Majesty by Order in Council may declare what is the date of the end of the war and of hostilities in regard to all States and all theatres of war, etc., and of the emergency (if not defined by Act of Parliament). This also refers to any particular State or emergency of one particular State. Of course, the above is over-ruled if the context of the agreement under consideration shows a contrary intention.

There are some agreements to which this Act does not apply, namely, where the landlord and tenant relationship has come to an end on or before June 13th, 1944. This, of course, does not apply where the landlord has terminated the tenancy by giving the tenant notice or *vice versa*, or where a similar notice of termination has been given which would have terminated the tenancy but for the passing of this Validation of War Time Leases Act, 1944. This Act does not apply where there was a mutual agreement between

the landlord and the tenant to terminate the tenancy before the passing of the Act.

As to the termination of tenancies, many cases have been lost through giving a bad notice to quit or not giving any notice to quit at all. This new Act lays down that where a tenant retains possession of premises because of the protection afforded to him under the Rent Restrictions Act, 1920–1939, *e.g.*, house-shop covered by this Act, the relation of landlord and tenant shall be deemed to have been terminated and this so-called bad notice or no notice at all will not afford the tenant protection under this new Act. I also ought to make it clear that the provisions of this statute will not affect any notice given or proceedings in the course of being heard or about to be heard, with regard to any agreement to which the Act, particularly Section I, would apply.

Portuguese Imports

Continued Expansion in 1943

IN 1943 the electrical import trade of Portugal continued to expand in spite of difficulties in the countries which have normally supplied her. The share of the United Kingdom and the United States declined further, while that of Sweden and Switzerland increased notably. Spain showed activity in the accumulator and light cable trade, while Germany's participation was maintained, particularly in the radio business which as a whole increased in value by over one-third. There was also advance generally in the accumulator, power plant and armoured cable trade. The only substantial decrease was in lamp imports. The accompanying table shows the value in 1943 of the principal electrical imports, by countries of origin, with a note of increase or decrease compared with 1942. (Escudo = 100 to the £.)

Class of Goods	1943 Escudos Thous.	Inc. or dec. on 1942 Escudos Thous.
Accumulators and condensers weighing per cell less than 8 kg.	3,130	+ 1,805
From Germany	984	+ 674
,, United States	201	— 52
,, United Kingdom	246	— 213
,, Spain	1,446	+ 1,440
,, Switzerland	187	+ 46
Other electric accumulators and condensers and parts	2,610	+ 1,450
From Germany	422	+ 325
,, United States	32	— 148
,, United Kingdom	103	— 213
Batteries, dry	748	+ 228
From United States	135	+ 65
,, United Kingdom	3	— 157
,, Germany	231	+ 21
,, Sweden	214	+ 139
Batteries, other	77	+ 29
From United Kindom	27	+ 5
Loudspeakers	248	+ 72
From United States	132	+ 48
,, United Kingdom	4	— 56
Radio apparatus	16,570	+ 4,630
From Germany	11,963	+ 7,013
,, United States	417	— 903
,, United Kingdom	361	— 2,479
,, Sweden	2,170	+ 1,458
,, Switzerland	953	+ 423
Telephone apparatus	2,340	— 440
From Germany	204	— 116
,, United Kingdom	1,000	+ 196
,, Sweden	1,037	— 599
Telegraph apparatus	334	*
From Germany	240	
,, United Kingdom	69	
Generators, motors, transformers and parts weighing up to 100 kg.	9,730	+ 1,975
From Germany	4,520	+ 1,426
,, United States	190	— 140
,, United Kingdom	752	— 48
,, Switzerland	2,642	+ 152
,, Sweden	1,053	+ 293
Ditto, weighing 100 to 500 kg.	6,879	+ 3,229
From Germany	1,578	+ 527
,, Sweden	820	+ 378
,, United Kingdom	384	+ 44
,, Switzerland	3,286	+ 1,576
Complete installations for telephone exchanges (not including telephones, accumulators or dynamos)	3,170	— 310
From United Kingdom	385	— 275
,, Sweden	1,104	+ 114
,, Germany	1,680	— 575
Insulators, not porcelain (mainly from Germany)	35	+ 25
Insulating materials and porcelain insulators	4,304	+ 1 144
From Germany	2,407	+ 627
,, United States	549	+ 359
,, United Kingdom	254	— 242
,, Sweden	663	+ 133
,, Switzerland	370	+ 276
Vacuum cleaners	2,179	+ 879
From Sweden	1,998	+ 848
,, Germany	180	+ 50
Refrigerators	507	*
From Switzerland	167	
,, Sweden	297	
Insulated wire or cable, textile-covered, weighing up to 120 grammes per metre	2,210	— 70
From United Kingdom	434	— 171
,, United States	37	+ 37
,, Sweden	187	— 333
,, Spain	1,033	+ 393
Ditto, weighing over 120 grammes per metre	462	— 408
From Germany	150	+ 141
,, United Kingdom	174	— 676
Ditto, with other insulation and metal-protected	5,018	+ 3,258
From United Kingdom	2,894	+ 2,094
,, United States	59	— 391
,, Germany	882	+ 432
Ditto, with rubber	61	— 529
From United States	3	— 87
,, United Kingdom	7	— 463
Lamps, for lighting or heating	7,486	— 5,804
From Germany	2,394	— 3,326
,, United Kingdom	87	— 2,003
,, Hungary	4,211	— 429
Lamps, other electric	4,798	+ 538
From Germany	1,762	+ 472
,, United States	383	— 197
,, United Kingdom	673	+ 173
,, Hungary	1,449	— 21

* Comparative figures not available

ELECTRICITY SUPPLY

Glasgow Charges Revised. Improved Lighting in London.

Campbeltown.—ACCIDENT AT POWER STATION.—A crankcase exploding at the power station of the Campbeltown & Mid-Argyll Electric Supply Co., Ltd., caused damage to the building and an outbreak of fire. The concussion lifted a 40 ft. by 20 ft. timber roof sheeted with asbestos, blew out windows and dislodged concrete coping. A switchboard attendant, Mr. N. Thomson, was blown some distance against a desk, but he and three other employees fortunately escaped injury. The fire, caused by the ignition of a considerable quantity of lubricating oil which spread over the inside of the building, was extinguished by the staff. The accident caused an interruption of the electricity supply in the central part of the town lasting for several hours.

Chesterfield.—TRUNK ROAD LIGHTING.—The Lighting Committee has asked the General Electric Co., Ltd., to quote for the lighting of the trunk road.

Cowdenbeath (Fife).—TENDERS FOR LIGHTING.—The Council has received quotations for street lighting from the Fife Electric Power Co.of £1,400 per annum for 375 street lamps and from the gas company £1,902 per annum. The Council agreed to carry out its own lighting, and is considering the provision of new generating plant.

Glasgow.—REVISION OF CHARGES.—The first increase in charges since the beginning of the war is made by the Electricity Department in a revision of the tariff schedule which has just been published. The principal new rates are as follows :—

Residential tariff: Primary rate (40 kWh for the first apartment and 20 for each additional apartment per survey year), 3d. per kWh; secondary rate No. 1 (nine times the primary kWh), 0·6d. per kWh; secondary rate No. 2 (all additional consumption), 0·3d. per kWh.

Commercial tariff for lighting: Primary rate (based on 400 hours' use of installed lighting per survey year and not less than for 1943-44, minimum 60 kWh), 3d. per kWh; secondary rate No. 1, 0·65d. per kWh; secondary rate No. 2, 0·35d. per kWh.

Commercial service tariff for approved supplies: Annual fixed charge of £5 10s. per kW of installed lighting (minimum £100 and not less than for 1943-44); running charge 0·525d. per kWh with ± 0·005d. per kWh for each 6d. variation in the average price of coal above or below 36s. 6d. per ton. Power up to 20 per cent. of total consumption at same rates. Power supply tariff: For the first 40,000 kWh per survey year, 1·125d. per kWh and thereafter at 0·75d.

Industrial power: Annual fixed charge per kVA of £3 (e.h.v.) and £3 5s. (l.v.) up to 100 kVA, scaling down to £2 12s. 6d. and £2 15s. respectively for over 1,000 kVA; running charge per kWh of 0·395d. (e.h.v.) and 0·415d. (l.v.) subject to coal clause.

The Corporation has been informed that in view of explanation and assurances given by its epresentatives the Minister of Fuel and Power ees no reason to intervene with regard to the evision.

Lanarkshire.—HOUSES TO BE ALL-ELECTRIC.—The Clyde Valley Electrical Power Co. recently asked that sixteen houses being built at Eddlewood should be all-electric. A sub-committee of the County Council recommended that gas should be used for cooking and electricity for lighting, but the Council at its last meeting approved the "all-electric" scheme by 24 votes to 19.

Leyton.—MODEL KITCHEN.—The Electricity Committee is proceeding with the construction of an all-electric model kitchen.

London.—LIGHTING IN SOME AREAS.—Fulham is reported to be the first London borough to switch on lighting to the full extent permitted throughout its area, with 2,300 lamps lighted in 65 miles of streets.

An offer by the County of London Electric Supply Co., Ltd., and its associated companies, to defray the cost of the special fittings to provide the new lighting has been accepted by three councils, Lewisham, Romford, . and Coulsdon and Purley, for their main roads. The offer which has been made to the 17 boroughs in the London region where the companies supply the energy for 21,000 lamps, is under consideration by other authorities, the chief problem being that of labour.

In Finsbury 400 "starlight" fittings have now been altered, while in the City "moonlighting" was switched on this week in Fleet Street and is being extended along all streets. A large area of the West End, including Trafalgar Square and Piccadilly, has improved lighting.

In Wandsworth, where the system is mostly gas, the Borough Council has decided not to take any action. Paddington, another borough with gas lamps, is unlighted, and Kensington also has practically no lighting.

In the outer zone, re-lighting has proceeded rapidly in many districts.

North Wales. — FARM SUPPLIES. — The Electricity Distribution of North Wales & District, Ltd., is to provide supply to Booth Hall Farm, Dairy House Farm, Grove Farm and Radnor Bank Farm, Somerford.

Old Kilpatrick (Dumbartonshire). — STREET LIGHTING.—The Council has asked the lighting inspector to report on a proposal to install electric lighting in Hardgate.

Torquay. — LOANS. — The Electricity Committee is seeking sanction to borrow £2,500 for meters and £2,000 for electrical apparatus.

Warwickshire.—ELECTRICITY FOR SMALL HOLDINGS.—The County Agricultural Committee has authorised electric lighting installations at small holdings at Tysoe and Cherington at a cost of £523.

Workington.—OVERHEAD LINE.—The Corporation has decided not to oppose an application by the Mid Cumberland Electricity Co., Ltd., for the erection of an overhead line extension to Harrington Park.

SUPPLY TO COLLIERY.—The Electricity Committee has arranged terms for the provision of supply to the United Steel Companies, Ltd., at Solway Colliery.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Ferranti, Ltd., announce that their net profit for the year ended June 30th last was £96,237, as compared with £71,285 in 1942-43. Contingency reserve account receives £60,000 (against £35,000) and the ordinary dividend is maintained at 6 per cent. free of tax. A balance of £76,471 (against £75,734) is carried forward.

The Associated Equipment Co., Ltd., reports a net profit for the year ended September 30th (subject to audit) of £227,500; this is the same as the profit for the previous year. It is proposed to pay a final dividend of 5 per cent. free of income tax, making 7½ per cent. for the year (equal to 15 per cent. with tax at 10s. in the £). Last year's dividend was the same but in addition a tax free bonus of 5 per cent. was paid.

Aron Electricity Meter, Ltd., reports a profit for 1943-44, after meeting taxation, of £19,064 (against £20,222). General reserve again receives £5,000 ; the dividend is maintained at 15 per cent. ; and £17,379 (against £14,710) is carried forward.

The Paterson Engineering Co., Ltd., reports a net profit before taxation, amounting to £39,114 for the year ended April 30th last, as compared with £48,428 in the previous year. A dividend of 10 per cent. and a bonus of 2½ per cent. are again to be paid.

Newman Industries, Ltd., has declared an interim dividend of 7½ per cent. No interim distribution was made last year; the year's dividend was 20 per cent.

The Broadcast Relay Service, Ltd., is maintaining its interim dividend at 3½ per cent., tax free.

The Delhi Electric Supply & Traction Co., Ltd., is maintaining its interim dividend at 4 per cent., tax free.

New Companies

Doran & Co. (Bridlington), Ltd.—Private company. Registered November 7th. Capital, £8,000. Objects: To acquire the business of a marine, motor and general engineer carried on by John P. A. L. Doran at Bridlington, as Doran & Co., and to carry on the business of electrical and wireless engineers, etc. Directors: J. P. A. L. Doran, 39, Hamilton Road, Bridlington, and G. W. Hainsworth, West Witton, Leyburn, Yorks. Registered office: Langdales Wharf, Bridlington, Yorks.

H. B. Electrical Services, Ltd.—Private company. Registered November 8th. Capital, £1,000. Objects: To carry on the business of motor and electrical engineers, battery manufacturers and repairers, etc. Permanent directors: Adelaide A. Bell, 16, Sunbury Court Road, Sunbury-on-Thames; and W. H. Hackett, 61, Charlton Road, Shepperton. Registered office: 29-31, Euston Road, N.W.1.

Star Domestic Appliances, Ltd.—Private company. Registered November 13th. Capital, £2,000. Objects: To carry on the business of manufacturers of, and dealers in, lighting apparatus, electrical plant, wireless and television sets and components, refrigerators, vacuum cleaners, washing machines, etc. Directors: H. Fisher and Florence M. Fisher, both of 30, Tandle Hill Road, Royton, both directors of H. Fisher (Oldham), Ltd. Registered office: Star Works, Edge Lane Street, Royton, Lancs.

Refrigerator Equipment Co. (London), Ltd.—Private company. Registered September 26th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, refrigerators and cold storage appliances, etc. C. Kliman, 58, The Drive, E.17, is the first director. Registered office: 58, The Drive, Walthamstow, E.17.

F. J. Crutchley & Co., Ltd.—Private company. Registered October 30th. Capital, £2,000. Objects: To adopt an agreement with F. J. Crutchley, and to carry on the business of electrical, refrigeration, air conditioning, general engineers, etc. Directors: F. J. Crutchley, 28, Castleton Avenue, Lostock, Stretford; and P. R. Crowther and Chas. H. Ellis, both of 22, Mayfield Road, Manchester. Registered office: 304, Deansgate, Manchester, 3.

Walter Harding, Ltd.—Private company. Registered November 6th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, and repairers of, electrical and mechanical apparatus and accessories, wireless sets, valves, etc. Directors: G. D. Stewart, Warren Farm, Nightingale Lane, and W. C. Harding, 2, Warren Farm Cottages, both Chalfont St. Giles. Registered office: 8, Stone Buildings, Lincolns Inn, W.C.2.

Gardners Refrigerators, Ltd.—Private company. Registered November 3rd. Capital, £1,000. Objects: To carry on the business of manufacturers, factors and designers of, and dealers in, refrigerators and refrigerating machinery, electrical and general engineers, etc. First directors: E. Gardner, 81, Liverpool Road, Birkdale and Kathleen V. Finucane, 8, Seabank Road, Southport. Registered office: 6, Fazakerley Street, Liverpool.

Companies to be Struck off Register

The following companies will be struck off the Register at the expiration of three months from the dates given unless cause is shown to the contrary:—November 10th : Bye Radio, Ltd.; Cable Accessories Co., Ltd.; and Powersales, Ltd. November 17th : Ray Electric, Ltd.

Companies' Returns

Statements of Capital

Martindale Electric Co., Ltd.—Capital, £200 in £1 shares. Return dated March 21st (filed October 9th). All shares taken up. £200 paid. Mortgages and charges: Nil.

Flinders (Wholesale), Ltd.—Capital, £7,250 in 3,000 non-cumulative preference and 4,000

"A" ordinary shares of £1 each and 5,000 "B" ordinary shares of 1s. each. Return dated July 26th. 3,000 preference, 3,000 "A" ordinary and 3,025 "B" ordinary shares taken up. £6,151 5s. paid. Mortgages and charges: £16,295.

British Resistor Co., Ltd.—Capital, £16,000 in 15,000 6 per cent. cumulative preference shares of £1 each and 20,000 ordinary shares of 1s. each. Return dated August 14th. 3,000 preference and 2,222 ordinary shares taken up. £3,111 2s. paid. Mortgages and charges: Nil.

Alklum Storage Batteries, Ltd.—Capital, £7,000 in 7,000 ordinary shares of £1 each. Return dated June 6th. 5,600 shares taken up. £5,600 paid. Mortgages and charges: Nil.

Seaton & District Electric Light Co., Ltd.—Capital, £50,000 in £1 shares. Return dated July 5th. All shares taken up. £50,000 paid. Mortgages and charges: Nil.

Ozonair, Ltd.—Capital, £40,000 in 2s. shares (77,600 preference and 322,400 ordinary). Return dated June 9th. 77,600 preference and 80,520 ordinary shares taken up. £4,252 paid. £11,560 considered as paid. Mortgages and charges: Nil.

Shoreham & District Electric Lighting & Power Co., Ltd.—Capital, £200,000 in £1 shares (all ordinary). Return dated July 12th. 140,000 shares taken up. £133,500 paid. £6,500 considered as paid. Mortgages and charges: Nil.

Yorkshire Traction Co., Ltd.—Capital, £500,000 in £1 shares (50,000 preference and 450,000 ordinary). Return dated May 17th (filed July 28th). 24,350 preference and 437,500 ordinary shares taken up. £148,315 paid. £313,535 considered as paid. Mortgages and charges: Nil.

R. F. Winder, Ltd.—Capital, £12,000 in £1 shares. Return dated August 4th. 10,300 shares taken up. £10,300 paid. Mortgages and charges: Nil.

Increases of Capital

General Accessories Co., Ltd.—The nominal capital has been increased by the addition of £12,000 in £1 ordinary shares beyond the registered capital of £3,000.

A. Crabtree & Co., Ltd. (Keighley).—The nominal capital has been increased by the addition of £9,000 in £1 shares beyond the registered capital of £1,000.

Mortgages and Charges

Lightfoot Refrigeration Co., Ltd.—Satisfaction to the extent of (a) £20,000 on November 1st, 1943, (b) £23,000 on January 1st, and (c) £111,000 (final payment) on September 30th, 1944, of trust deed dated December 31st, 1928, and registered January 4th, 1929, securing £200,000 debentures.

Grierson, Ltd.—Satisfaction in full on October 28th, of mortgage or charge dated June 29th, 1942, and registered July 7th, 1942, securing all moneys due or to become due from the company to Westminster Bank, Ltd.

Harvey (Electrical Engineers), Ltd.—Satisfaction in full on September 27th of (a) Land Registry Charge dated December 6th, 1934, and (b) Land Registry Charge dated September 6th, 1938, and registered August 13th, 1938 and September 15th, 1938, securing £3,000 and £2,000 respectively.

Bylock Electric, Ltd.—Satisfaction in full on September 5th, of debentures authorised by resolutions of January 9th, 1936, April 17th, 1940, and January 8th, 1941, and registered January 13th, 1936, April 25th, 1940, and January 18th, 1941, respectively, securing £9,500.

Correx Communications Equipment, Ltd.—Charge dated October 26th to secure all moneys due or to become due from the company to Barclays Bank, Ltd., charged on contract moneys.

Liquidations

Claybury Electrical Supplies, Ltd.—Under a compulsory winding-up order made on October 16th upon the petition of a trade creditor the first meeting of creditors and contributories of this company which carried on business at Claybury Broadway, Woodford Avenue, Ilford, were held on November 14th at 1, Columbia House, Aldwych, W.C. Mr. H. P. Naunton, Senior Official Receiver, reported that the company was incorporated in April, 1944, with an issued capital of £500 to carry on business as electrical engineers. It had been stated by Mr. George Burfield, a director, that he started an electrical equipment business in the preceding January. The venture was a success for three months when it was decided to form this company. The latter's trading was also successful until the flying bomb attacks started in June, but then it fell away very much; any recovery seemed very doubtful and in September last the stock, fittings and goodwill were sold for £350. That transaction would have to be closely investigated, added the Senior Official Receiver. The liabilities were estimated at £393 against assets valued at £82, including a War Damage claim of £78. The failure of the company was attributed to enemy action. A resolution was passed for Mr. Carl Fine to wind up the company as liquidator.

Industrial Electroplant, Ltd. — Meeting December 14th at 81, Cannon Street, London, E.C.4, to receive an account of the winding up by the liquidator, Mr. A. F. Christlieb.

Bankruptcies

J. H. Etherington, electrical and wireless dealer, lately carrying on business at 6, South Road, Newhaven, Sussex.—Application for discharge to be heard on January 8th at the County Hall, Lewes.

J. Harrison, electrical engineer, 93, Princes Street, Southend-on-Sea.—Proofs for dividend by November 28th to the trustee, Mr. A. H. Ward, 42, Tavistock Square, W.C.1.

A. R. Carter, electrical contractor, 2, Priory Avenue, Mile End, Bridgend, Glam.—First dividend of 3s. 3d. in the £ payable November 28th at the Official Receiver's Office, Government Buildings, 10, St. Mary's Square, Swansea.

H. Savory, electrical engineer, 7a, Hill Street, Shaw, Lancs.—Application for discharge to be heard on December 7th at the Court House, Church Lane, Oldham.

STOCKS AND SHARES

TUESDAY EVENING.

THE general condition of Stock Exchange markets continues to be favourable. Prices maintain their levels and business, though it may come spasmodically, is tolerably well-spread. The new issue of 1¾ per cent. Exchequer Bonds is, perhaps, something of a competitor in the gilt-edged market. Nevertheless, prices of existing securities in that class, comparing advantageously as they do with the newcomer, attract a certain amount of capital and public interest, the supply of stock being barely sufficient to keep up with the demand. Ordinary shares in companies connected with electrical equipment and manufacturing, show some improvement on balance.

Twenty per Cent. Trio

British Insulated, Callender's and Henley's have all been in demand and again show rises in their quotations. In the present market position, with pronounced scarcity of stock, it would be rash to prophesy that the prices have even yet reached their zenith. Callender's 7½ per cent. "B" preference hardened to 35s. 9d. Stock Exchange members who have followed for years past the progress of the companies and the prices of their shares are fain to admit that to-day's quotations look extremely high, in the light of the yield available at the present rate of 20 per cent. dividend paid by each of the three companies. There is, however, a continual demand for the shares, and investment which places safety first, looking at the same time to post-war potentialities, insists upon accumulating these shares in spite of the high levels now ruling.

Enfield Cables are 1s. up. Ericssons rose 2s. 6d. to 53s. 9d. Crabtrees hold their price at 41s. Automatic Telephones at 67s. are a florin higher, and the "B" shares have risen to 63s. Newman Industries have declared an interim dividend of 7½ per cent. against nil a year ago. The company paid a final of 20 per cent. The price of the shares is firm at 7s. 3d.

Transport Issues

Home Railway stocks have their moments of spasmodic animation. There is still a vague impression that the Government may offer to modify, in the railways' favour, the agreement made with the companies five years ago. Gilt-edged securities are steady: Southern Railway 5 per cent. preference is a point up at 117½. London Passenger Transport 4½ per cent. "A" is similarly better at 121½. The 5 per cent. "B" stock, although officially quoted at 121½, can be sold at 122 or better. Buyers would probably have to pay at least 123—if they could buy it at all. Transport stocks and shares are mostly firm, British Electric Traction deferred being an exception with a fall of 10 to 1205. Calcutta Trams, after abrupt fluctuations, turned better on the announcement that the Calcutta Corporation had decided to buy the whole of the tramway undertaking.

Price Fluctuations

Lively dealings in Philco shares left the price 1s. 3d. up at 14s. 3d. and E. K. Cole at 34s. 6d. have gained 1s. E.M.I. have been a quieter market after their spurt of last week, and the price is unchanged at 36s. 9d. Cossors eased off to 25s. British Vacuum Cleaners came into demand: at 31s. 6d. the price is 2s. higher, while British Aluminiums at 46s. are down by 1s. 6d. Aron Meters at 61s. have recovered the dividend deducted from the price. Murex at 5⅛ are ⅛ better. Thorn Electrics put on 1s. to 28s. 6d. and Hopkinsons 9d. to 71s. 9d. Allen West, Ward & Goldstone, Brush Electrical Engineering, and Veritys are amongst others to show small improvements. No changes have occurred in Home electricity supply shares.

General Cable

The General Cable Manufacturing Co. has called a meeting for December 7th to consider resolutions increasing the capital from £150,000, the present amount, to £250,000, as notified in last week's issue. The intention is to create 400,000 additional ordinary shares of 5s. each. To-day's capital is divided into £75,000 in 10s. preference shares and £75,000 in ordinary shares of 5s. The company has paid annual dividends of 15 per cent. on the ordinary from 1940 inclusive, raising the dividend from the 12 per cent. paid in each of the two preceding years. The distributions are made on a conservative basis, earnings being considerably more than the dividends. The company is controlled by F. McNeill & Co., and carries on, amongst other things, the business of wire, cable and general electrical manufacturers. The 5s. shares stand at 15s., giving a yield on the 15 per cent. dividend basis of 5 per cent. Variation in the price seldom occurs; the highest quotation last year was 15s. 6d., and the lowest of recent years 7s.

Associated Equipment

Amongst the ordinary shares which have been popular this year, those of the Associated Equipment Co. stand out prominently. The company was formed some thirty years ago to manufacture and operate omnibuses and every other kind of vehicle or conveyance for public or private use. An agreement was entered into in December, 1933, with the London Passenger Transport Board for supplying chassis and spare parts for a

(*Continued on page* 758)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Nov. 21	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Ordinary					
Bournemouth and Poole	12½	12½	62/6	..	4 0 0
British Power and Light	7	7	33/–	..	4 4 10
City of London	7	5½	30/–	..	3 12 4
Clyde Valley	8	8	42/–	..	3 16 0
County of London	8	8	43/–	..	3 14 5
Edmundsons	6	6	31/–	..	3 17 5
Elec.Dis.Yorkshire	9	9	45/6	..	3 19 6
Elec. Fin. and Securities	12½	13½	60/6	..	4 9 0
Elec. Supply Corporation	10	10	49/–	..	4 1 8
Lancs. Light and Power	7½	7½	37/–	..	4 1 1
Llanelly Elec.	6	6	26/6	..	4 10 7
Lond.Assoc.Electric	3	4	26/–	..	3 1 6
London Electric	6	6	30/6	..	3 18 8
Metropolitan E.S.	8	8	43/–	..	3 14 5
Midland Counties	8	8	41/6	..	3 17 0
Mid. Elec. Power	9	9	44/–	..	4 1 10
Newcastle Elec.	7	7	32/–	..	4 7 6
North Eastern Elec.	7	7	34/6	..	4 1 2
Northampton	10	10	50/–	..	4 0 0
Northmet Power	7	7	41/–	..	3 8 4
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	40/6	..	3 19 0
Southern Areas	5	5	23/–	..	4 7 0
South London	7	7	29/6	..	4 15 0
West Devon	5	5	24/–	..	4 3 4
West Glos.	4½	3½	25/–	..	2 16 0
Yorkshire Elec.	8	8	43/–	..	3 14 5
Public Boards					
Central Electricity :					
1955–75	5	5	114⅛	..	4 7 4
1951–73	4½	4½	107	..	4 4 1
1963–93	3½	3½	104	..	3 7 4
1974–94	3½	3½	100	..	3 5 0
London Elec. Trans.	2½	2½	98½	..	2 10 9
London & Home Counties 1955–75	4½	4½	112	..	4 0 4
Lond.Pass.Trans.Bd.					
A	4½	4½	121½	+1	3 14 10
B	5	5	121½	..	4 2 4
O	3	3½	68	..	4 15 7
WestMidlandsJ.E.A. 1948–68	5	5	106½	..	4 14 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	7/3	..	—
Calcutta Elec.	6*	6*	45/6	..	2 12 9
Cawnpore Elec.	10	7	39/9xd	+3d.	3 10 4
East African Power	7	7	34/6	..	4 1 4
Jerusalem Elec.	7	5	29/–	..	3 9 0
Kalgoorlie (10/–)	5	5	11/6	..	4 7 0
Madras Elec.	Nil	4	29/–	..	2 15 4
Montreal Power	1½	1½	23	–¼	—
Nigerian Elec.	8	10	33/6	..	5 19 5
PalestineElec."A"	5*	5*	39/–	..	2 11 3
Perak Hydro elec.	6	7	13/6	..	—
Tokyo Elec. 6%	6	6	28	..	—
VictoriaFallsPower	15	15	86/3	..	3 9 7
WhitehallInv.Pref.	—	6	26/–	..	4 12 4

Company	Dividend Previous	Dividend Last	Middle Price Nov. 21	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord.	15	15	61/–xd	+1/6	4 18 4
Assoc. Brit. Eng.	6	7	57/6	..	2 8 9
Assoc. Elec. :					
Ord.	10	10	56/–	+2/–	3 11 5
Pref.	8	8	39/6	..	4 1 0
Automatic Tel.&El.	12½	12½	67/–	+2/–	3 14 7
Babcock & Wilcox	11	11	53/–	+6d.	4 3 0
British Aluminium	10	10	46/–	–1/6	4 7 0
British Insul. Ord.	20	20	5⅛	+⅛	3 11 0
British Thermostat (5/–)	18⅛	18½	20/–	..	4 12 6
British Vac. Cleaner (5/–)	30	30	31/6	+2/–	4 15 3
Brush Ord. (5/–)	8	9	11/–	+3d.	4 1 9
Burco (5/–)	15	17½	17/–	..	5 3 0
Callender's	15	20	5⅛	+⅛	3 12 9
ChlorideElec.Storage	15	15	85/–	..	3 10 7
Christy Bros.	12½	17½	75/–	..	4 13 4
Cole, E. K. (5/–)	10	15	34/6	+1/–	2 3 6
Consolidated Signal	24	27½	6⅛	..	4 3 6
Cossor, A. C. (5/–)	7½*	10*	25/–	–6d.	2 0 0
Crabtree (10/–)	17½	17½	41/–	..	4 5 4
Crompton Parkinson Ord. (5/–)	20	22½	32/–	..	3 7 3
De La Rue	35	40	9⅛	..	4 1 8
E.M.I. (10/–)	6	8	36/9	..	2 3 6
Elec. Construction	10	12½	57/–	..	4 7 9
Enfield Cable Ord.	12½	12½	63/–	+1/–	3 19 4
English Electric	10	10	53/6	+1/–	3 14 8
Ensign Lamps (5/–)	25	15	21/3	..	3 10 8
Ericsson Tel. (5/–)	22*	20*	53/9	+⅛	1 17 8
Ever Ready (5/–)	40	40	41/6	..	4 16 7
Falk Stadelmann	7½	7½	34/6	..	4 7 0
Ferranti Pref.	7	7	31/3	..	4 9 7
G.E.C. :					
Pref.	6½	6½	33/3	..	3 18 4
Ord.	17½	17½	94/9	+9d.	3 13 6
General Cable (5/–)	15	15	15/–	..	5 0 0
Greenwood&Batley	15	15	45/9	..	6 11 0
HallTelephone(10/–)	12½	12½	31/6	..	3 19 4
Henley's (5/–)	20	20	26/6	+3d.	3 15 6
4½% Pref.	4½	4½	24/–	..	3 15 0
Hopkinsons	15	17½	71/9	+6d.	4 17 9
India Rubber Pref.	5½	5½	23/–	..	4 15 3
Intl. Combustion	30	30	6½	..	4 12 4
Johnson & Phillips	15	15	74/6xd	..	4 0 8
Lancashire Dynamo	22½	22½	100/–	..	4 10 0
Laurence, Scott(5/–)	12½	12½	13/–	..	4 16 2
London Elec. Wire	7½	7½	37/6	..	4 0 0
Mather & Platt	10	10	55/–	..	3 12 9
Metal Industries (B)	8	8½	50/6	..	3 7 6
Met. Elec.CablePref.	5½	5½	21/3	..	5 3 6
Mid. Elec. Mfg.	25	25	7½	..	3 10 3
Murex	20	20	5⅛	+⅛	3 18 2
Newman Ind. (2/–)	20	20	7/3	..	5 10 0
Philco (2/–)	—	—	14/3	+⅛	—
Power Securities	6	6	29/–	..	4 2 9
Pye Deferred (5/–)	25	25	32/6	..	3 17 0
Ransome & Marles	20	20	87/6	..	4 11 4
Revo (10/–)	17½	17½	43/–	+6d.	4 1 4
Reyrolle	12½	12½	69/3	..	3 10 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Nov. 21	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing (*Continued*)					
Siemens Ord. ..	7½	7½	36/3	..	4 2 9
Strand Elec. (5/–)	10	12½	12/–	..	5 4 2
Switchgear & Cowans (5/–) ..	20	20	18/6	..	5 8 1
T.O.C. (10/–) ..	5	7½	23/9	..	3 3 2
T.O. & M. ..	10	10	56/–	..	3 11 6
TelephoneMfg.(5/–)	9	9	12/–	..	3 15 0
Thorn Elec. (5/–)	20	20	28/6	+1/–	3 10 0
Tube Investments	20	22½	5xd	..	4 10 0
Vactric (5/–) ..	Nil	22½	17/6	..	6 8 6
Veritys (5/–) ..	7½	7½	8/3	+3d.	4 11 0
Walsall Conduits(4/–)	55	55	50/6	..	4 7 0
Ward & Goldstone (5/–)	20	20	30/6	+6d.	3 5 8
WestinghouseBrake	12½	14	75/–	..	3 14 8
West, Allen (5/–)	7½	7½	8/–	+6d.	4 13 9
Traction and Transport					
Anglo-Arg. Trans.:					
First Pref. (£5)	Nil	Nil	2/6	..	—
4% Inc. ..	Nil	Nil	7½	..	—
Brit. Elec. Traction :					
Def. Ord. ..	45	45	1205	−10	3 14 8
Pref. Ord. ..	8	8	180	..	4 9 0
Bristol Trams ..	10	10	57/–	..	3 10 2
Brazil Traction..	1¾	2	27½	..	7 9 7
Calcutta Trams	6½	7½	74/6	+1/–	2 0 4
Cape Elec. Trams	5	6	26/–	..	4 12 4
Lancs. Transport	10	10	47/6	..	4 4 3
Southern Rly. :					
5% Prefd. ..	5	5	76½	..	6 10 9
5% Pref. ..	5	5	117½	+1	4 5 1
T. Tilling ..	10	10	61/–	..	3 5 6
West Riding ..	10	10	46/–	..	4 7 0
Telegraph and Telephone					
Anglo-Am. Tel. :					
Pref.	6	6	123	..	4 17 7
Def.	1½	1½	30	..	5 0 0
Anglo-Portuguese	8	8	27/6	..	5 16 6
Cable & Wireless :					
5½% Pref. ..	5½	5½	116	+½	4 14 10
Ord.	4	4	82	+½	4 17 7
CanadianMarconi$1	Nil		4cts.	9/–	.. —
Globe Tel. & Tel. :					
Ord.	8½*	5*	39/6	..	2 10 8
Pref.	6	6	31/–	..	3 17 5
Great Northern Tel. (£10)	Nil	Nil	28	..	—
Inter. Tel. & Tel.	Nil	Nil	19	−1	—
Marconi-Marine..	7½	7½	36/6	..	4 2 4
Oriental Tel. Ord.	16	10	49/6	..	—
Telephone Props.	Nil	6	21/3	..	5 13 0
Tele. Rentals (5/–)	10	10	12/6	+6d.	4 0 0

* Dividends are paid free of Income Tax

Stocks and Shares (*Continued from page* 756)

period of ten years. The company has paid dividends of 7½ per cent., tax free, for eight consecutive years, 1936 to 1943 inclusive, with an additional bonus of 5 per cent. last year. The year ends with September and the dividend for the twelvemonth recently closed is again 5 per cent., tax free, making 7½ per cent., tax free, for the full year, without a bonus. The price has been over 82s. this year and now stands at 77s. 6d. which, by the way, compares with 22s. 6d. in 1940. The company occupies a strong position financially and its shares take rank as a sound investment.

The Question of Reserves

Arising out of the uncertainty that prevails in regard to the Government's post-war intentions in relation to industry, there is the question of what financial policy should guide directors of industrial companies in the matter of payment of dividends. Should a company aim at building up reserves which normally might be regarded as excessive, or should it adopt a generous line in the division of its profits amongst the shareholders? Proprietors see their companies making very substantial profits in spite of the pressure of taxation, but much of the additional money goes to augment reserve accounts which may or may not be required after the war. That intense competition lies ahead is acknowledged; that the transition from war to peace may present difficulties is undeniable. The conservative directors, looking ahead, visualise the necessity for being in the strongest position possible as regards finance, and to this end they consistently increase reserves in one way or another. The shareholder who enters a protest against the policy is told, reasonably enough, that he will receive his reward in days to come.

Prices and Premiums

Objection is sometimes taken to the payment of a substantial premium over the issue price, *e.g.*, 30s. for a £1 preference share, on the ground that if the company were to be voluntarily wound up, the preference might receive no more than the nominal amount of the share. It is hardly likely, however, that a reputable company would nowadays propose a voluntary winding up simply for the sake of reducing the annual charge for the dividend on the preference shares. On the other hand, there is more to be said for the predilection that many people show for shares standing not too high above the nominal value. Such buyers would rather give 24s. for a 4½ per cent. preference share, than pay 30s. for a 6 per cent. preference, although the yield in the former case would be 5s. per cent. less than that which the sixes would return. The higher-priced share, this argument contends, offers greater vulnerability to depreciation if the money market turned harder. Of that, there is not the slightest indication at the present time.

NEW PATENTS

Electrical Specifications Recently Published

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

AKTIEBOLAGET Elektrolux.—"Absorption refrigerating apparatus." 7187/43. May 8th, 1942. (565227.)

Allmänna Svenska Elektriska Aktiebolaget.—"Polyphase transformers for current convertors." 6935/43. May 6th, 1942. (565247.)

J. B. Andrews and E. Katz.—"Thermally operated electric cut-outs." 19408. November 19th, 1943. (565322.)

British Insulated Cables, Ltd., J. C. Quayle and H. B. Chapman.—"Electric cable." 7590. May 12th, 1943. (565228.)

British Thermostat Co., Ltd., and J. E. Sherlock.—"Devices for indicating and/or controlling a predetermined level of liquid in a container." 7630. May 13th, 1943. (565309.)

British Thomson-Houston Co., Ltd.—"Electric protective switches." 15454/43. September 26th, 1942. (565295.) "Starting switches for electric discharge devices." 5284/43. April 4th, 1942. (565302.) "Automatic protection of electric impedance networks." 19545/43. November 23rd, 1942. (565324.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Electric impulse counting circuits." 4772. March 24th, 1943. (565283.) "Insulated electric conductors." 19751. November 26th, 1943. (565325.)

N. E. Brookes (General Control Co.).—"Electric switches suitable for telephone systems." 16645. October 11th, 1943. (565297.)

Dubilier Condenser Co. (1925), Ltd., and P. R. Coursey.—"Electrical condensers." 6794. April 29th, 1943. (565243.)

D. C. Gall.—"Movements of electrical instruments such as galvanometers." 10744. July 2nd, 1943. (565312.)

General Electric Co., Ltd., R. L. Breadner and C. H. Simms.—"Manufacture of vitreous foot tubes." 6234. May 8th, 1942. (565270.)

O. H. Goulstone.—"Snap-action mechanism applicable for making and breaking electric contracts." 8862. June 2nd, 1943. (565252.)

Holophane, Ltd. (Holophane Co., Inc.).—"Luminaires." 9268. June 9th, 1943. (565254.)

H. W. K. Jennings (B. F. Sturtevant Co.).—"Centrifugal separators." 17198. October 19th, 1943. (565298.)

O. K. Kolb.—"Alternating electric current rectifiers of the selenium type." 19524. November 22nd, 1943. (565323.)

Marconi's Wireless Telegraph Co., Ltd.—"Apparatus for producing electrical energy of stabilised frequency." 11454/43. July 14th, 1942. (565266.) "Envelopes for electric discharge devices and contacts for sealing to such envelopes." 913/43. January 16th, 1942. (565274.)

H. Martin and Murex Welding Processes, Ltd.—"Electric arc welding." 3629. March 8th, 1943. (565219.)

Masteradio, Ltd., R. Pollock and S. L. Robinson.—"Electrical vibrators." 10879. July 5th, 1943. (565202.)

Okonite-Callender Cable Co., Inc.—"Electrical insulated wire." 18865/43. December 30th, 1942. (565319.)

Pulsometer Engineering Co., Ltd., and B. H. Gibbs.—"Pumps." 13638. September 29th, 1942. (565271.)

Revo Electric Co., Ltd., and F. H. Reeves.—"Tubular fluorescent electric lamp fittings." 8278. May 25th, 1943. (565310.)

Sangamo-Weston, Ltd., and H. J. Lovegrove.—"Electric measuring instruments." 10818. July 3rd, 1943. (565201.)

Sangamo-Weston, Ltd., and M. S. Snell.—"Instrument type relays." 11204. July 10th, 1943. (565203.)

A. W. Say & Plessey Co., Ltd.—"Rotary pumps." 10617. June 30th, 1943. (565263.)

G. R. Shepherd (Westinghouse Electric International Co.).—"Turbine blading." 11618. July 16th, 1943. (565292.)

Siemens & General Electric Railway Signal Co., Ltd., and H. J. N. Riddle.—"Selective electric signal receivers." (Cognate applications 11630/43 and 21407/43.) July 16th, 1943. (565267.)

Standard Telephones & Cables, Ltd.—"Antenna systems." 5297/43. April 4th, 1942. (565287.) "Electron tube oscillators with crystal control of frequency." 6853/43. May 4th, 1942. (565304.) "Manufacture of selenium electric rectifiers." 19378-9/43. November 21st, 1942. (565320-1.)

F. L. Steghart.—"Electrical measuring of temperature." 1549. January 29th, 1943. (565215.)

L. A. Thompson.—"Apparatus for transmitting pictures between spaced points." 15814. December 8th, 1941. (565206.)

A. C. Timmis.—"Fault locators for telephone or like transmission lines." 11746. July 19th, 1943. (565293.)

Western Electric Co., Inc.—"Electric signalling systems." 13593/43. October 9th, 1942. (565314.)

Woods of Colchester, Ltd., and R. H. Holbeche.—"Ventilating and air conditioning." 11905/44. July 16th, 1942. (Divided out of 562266.) (565237.)

Coal Saving Developments

IN this year's "Fuel Economy Review" (the twenty-third of the series), published by the Federation of British Industries at 2s. 6d., the adaptation of plant to burn inferior fuels figures prominently, in addition to examples of modernised steam-raising plant and the use of superheated and exhaust steam in industry. Methods adopted for limiting maximum demand on supply systems are described. Underground gasification of coal forms the subject of an article in which experience in the U.S.S.R. is summarised; it is concluded that the potentialities of the process in Great Britain cannot be accurately assessed until further information is available. Some notes are included on the taxation and rating position in regard to expenditure on plant installed to save fuel.

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.—VICTORIA.—April 26th, 1945. Melbourne City Council. Supply and erection of electrostatic flue gas dust collecting equipment. Spec. from City Electrical Engineer's Office (£1 1s.).

Blackpool. — November 27th. Borough Council. Supply and installation of three vertical-spindle axial-flow pumps of 20 c.f.s. capacity each, together with electric motors, starting gear and accessories. Forms of tender from the borough surveyor, Municipal Offices, Talbot Square (deposit, £3 3s.).

Linlithgow. — Town Council. Contractors desirous of tendering for the completion of 20 partially built houses (electrical work, etc.) are invited to send their names to the Town Clerk. Plans at office of Johnson & Bennet, architects, 100, High Street, Linlithgow.

Manchester.—November 30th. Electricity Department. Lamp columns and fittings. (November 17th.)

December 8th. Electric cranes with trolley wires and switchgear. (See this issue.)

North-West Midlands.—November 27th. Joint Electricity Authority. Outdoor transformers. (November 10th.)

Tredegar.—November 30th. Urban District Council. Two kiosks, complete with e.h.v. and l.v. control gear, transformers and accessories; e.h.v. 3-core and l.v. cable. (November 3rd.)

Orders Placed

Cheshire.—Health Committee. Accepted. Electrical installation at Bostock Farm (£96).—Feneley & Co.

Glasgow.—Corporation Electricity Committee· Recommended. Six 400-kVA transformers (£2,286).—Bruce Peebles. Four 200-kVA transformers (£940).—British Elec. Transformer Co.

Contracts in Prospect

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

Altrincham.—Houses (55) on selected sites; E. M. Slater, borough surveyor, Town Hall.

Askam-in-Furness.—Extensions to brickworks; Furness Brick & Tile Co., Ltd.

Bingley. — Conversion of Cottingley Hall into school, for R.C. authorities; Rev. Fr. McCarthy, P.P., Shipley.

Brougham Moor (Cumberland).—Houses (30). for the North-Eastern Housing Association; P. L. Browne, Son & Harding, architects, Pearl Buildings, Newcastle-on-Tyne.

Cheshire.—Extensions to nurses' home, Warford Lodge for Cheshire Health Committee. Also post-war scheme for hospital at Macclesfield; E. M. Parkes, county architect, The Castle, Chester.

Cumberland.—Canteen kitchen at the Borrowdale Voluntary School; county architect, 4, Alfred Street North, Carlisle.

Durham.—Central kitchen at Billingham North School; county architect, 34, Old Elvet.

East Riding.—Adaptations at St. Mary's Manor, Beverley, for new Council offices; L. A. Reynolds, county architect, County Hall, Beverley.

Glasgow.—Cooking centre at Penilee for Education Department; city engineer.

Herefordshire.—Headquarters for Hereford Sea Cadet Corps (£3,000); county architect, Bath Street, Hereford.

Kent.—Improvements and additions to schools (£32,000) and at County Hospital, Orpington (£20,000), also two farm institutes and horticultural institute; county architect, Maidstone.

Kidderminster.—Bus station, Cattle Market site; J. Hawcroft, borough surveyor, Mill Street.

Lancashire.—Central kitchen, Blackrod Senior School; Baxendale Bros. (Chorley), Ltd., builders, Victoria Saw Mills, Chorley.

Morley.—Central bus station, Wordsworth Square; F. Turner, borough surveyor, Town Hall.

Newcastle-on-Tyne.—Bakery extensions, City Road, for Embleton & Son; Marshall Tweedy & Bourn, architects, Grainger House, Blackett Street.

Rotherham.—Workshops, Coke Hill; H. & M. Bower, Ltd., rug manufacturers, Westgate.

Sheffield.—Extensions to research station; secretary, Safety in Mines Research Board, 1, Portobello Street, Sheffield, 1.

Stockport.—Extensions (30 beds) at Poise House, Hazel Grove; H. G. Price, superintendent and secretary, Stockport Infirmary, Great Moor, Stockport.

Stretford.—School dining rooms at Lostock and Trafford Park Council Schools; Smith & Briggs, Ltd., building contractors, Chester Road, Manchester, 16.

Sunderland.—Conversion of premises in Suffolk Street into school meals depot (£4,000); Education Works Dept.

Surrey.—Sanatorium at Shabden Park (joint scheme with Croydon); county architect, County Hall, Kingston-on-Thames.

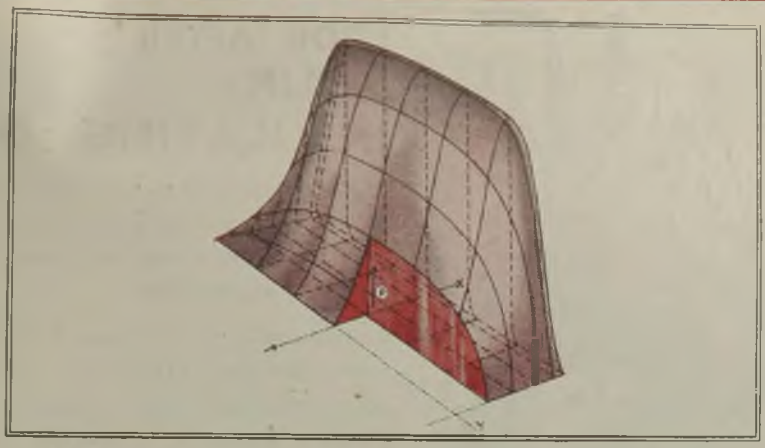
Warwickshire.—Farm institute for War Agricultural Committee; A. C. Bunch, county architect, Shirehall, Warwick.

West Hartlepool.—Wholesale dairy, Hart Lane, for Usher's Wholesale Dairies; Bell & Bell, architects, Whitby Street, West Hartlepool.

Mill office for the South Durham Steel & Iron Co., Ltd.; own architects.

Wisbech.—New hospital buildings proposed; clerk to the Wisbech Joint Isolation Hospital Board.

Worcestershire.—Dining centre at Sytchampton School, Droitwich; G. Pardoe & Sons, builders, 27, Waterworks Road, Worcester.



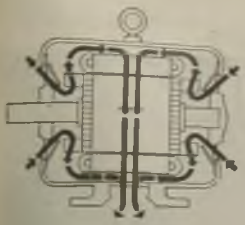
The theory of bearing lubrication

THE diagrammatic model illustrated above represents the three dimensional picture of the oil pressure wedge developed by a rotating shaft in a bearing in accordance with the Hydro-dynamic theory of Lubrication. When OSBORNE REYNOLDS proved by mathematics that, given certain conditions, the rotational effect of a shaft in a bearing will generate an oil film that will support the shaft he gave Engineers a positive clue for bearing design. Practice shows that the oil film can be developed in accordance with the Theory, but the maintenance and continuity of this film depends mainly upon the method employed to feed fresh lubricant to the bearing surfaces. POWDER METALLURGY approaches this problem by making it possible to construct a strong bronze bearing with porous walls through which the lubricant can be fed direct to every part of the bearing surface including the point of maximum load. The 'COMPO' oil-retaining bronze bearing made by the Powdered Metal process possesses a micro-porous structure which is charged with lubricant. Thus the oil supply is retained in exactly the right place to generate, not only the required oil film but to ensure also the maintenance and continuity of it, since the film is superimposed upon, and forms an integral part of the oil reservoir in the body of the bearing. This constitutes a highly efficient method of lubrication. 'COMPO' solves innumberable bearing problems from slow intermittent or oscillatory motion to high speed rotary motion

COMPO

Bound Brook Bearings (G.B.) Ltd. Birch Road, Witton, Birmingham, 6

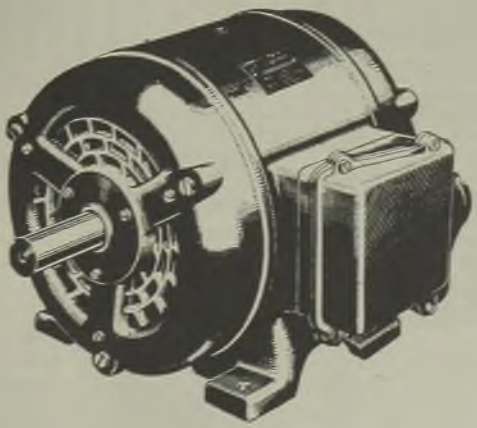
(A Birfield Company)



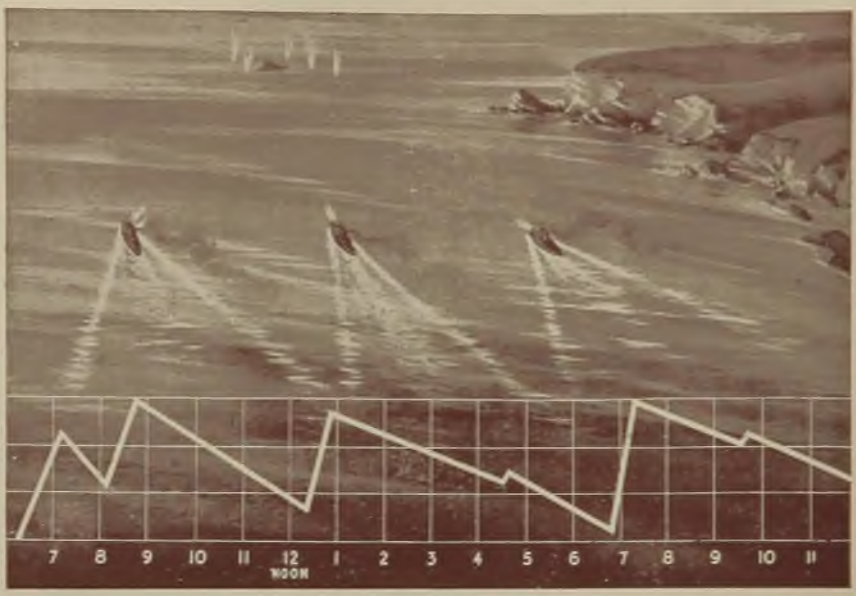
Balanced Ventilation in Parkinson A.C. Motors means even cooling of vital parts, reduced insulation stresses and elimination of hot spots. So efficient that no extra fan needed in screen-protected motors.

★ ***Write for List of Motors in Stock***

Electra House, Victoria Embankment, W.C.2



CROMPTON PARKINSON LIMITED



Peaks of Power

A typical multi-facility Control Panel

War has made heavy demands upon the Electrical Industry, the most important of which has been the need for generating energy to serve military requirements and armament production.

Load diversion has had to be applied, but where applied arbitrarily to penalise geographical blocks of consumers has invariably been unsatisfactory. The solution to the problem is selective control of load for the "peak" and "off peak" periods.

RYTHMATIC — "The Master Switch" can accomplish this selective control through the medium of switches installed remotely at the points of consumption. Extensively used for the control of street lighting prior to the war, RYTHMATIC has since been applied to Civil Defence Signalling where its characteristics of speed and reliability have proved invaluable. Now that Victory for the Allied cause is assured, supply authorities can again consider RYTHMATIC for the requirements of the Peace. At present RYTHMATIC is available only for War priority purposes.

RYTHMATIC CONTROL EQUIPMENT

AUTOMATIC TELEPHONE & ELECTRIC CO LTD

London & Liverpool

CLASSIFIED ADVERTISEMENTS

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

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

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

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

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES TENDERS, ETC.

CITY OF MANCHESTER

Electricity Department

TENDERS are invited for the supply, delivery and erection of:—

2 5½ tons and 1-100-tons electrically-driven travelling cranes, with trolley wires and switchgear.

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

Tenders to be delivered by 10 o'clock a.m. on Friday, 8th December, 1944.

PHILLIP B. DINGLE,
Town Clerk.

Town Hall,
Manchester.
17th November, 1944. 1026

SITUATIONS VACANT

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

BOROUGH OF DOVER

Electricity Undertaking

Appointment of Secretary

APPLICATIONS are invited for the above permanent appointment from persons not over 45 years of age, at a basic salary of £450 per annum rising by annual increments of £25 to £500 per annum.

Applicants must be members of either the Chartered Institute of Secretaries or of one of the professional Institutes of Accountants, and be experienced in the keeping and preparation of the financial accounts of an Electricity Undertaking.

The person appointed will have charge of and be responsible to the Electricity Committee for the whole of the financial side of the Undertaking up to the final accounts, the control of the clerical and meter reading staff and such other analogous duties as the Committee may require.

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

Applications, stating age, experence, qualifications and position under National Service Acts, accompanied by copies of not more than three recent testimonials, must be delivered to the undersigned not later than the 2nd December next.

Canvassing of any description will disqualify.

S. R. H. LOXTON,
Town Clerk.

Town Clerk's Office,
Brook House,
Dover.
10th November, 1944. 985

CITY OF BRADFORD ELECTRICITY DEPARTMENT

Appointment of Power Station Superintendent and Assistant Power Station Superintendent

APPLICATIONS are invited for the positions of Power Station Superintendent and Assistant Power Station Superintendent at the Valley Power Station, Bradford, from persons, preferably not more than 45 years of age, qualified to carry out the duties of the respective posts, and having had a sound technical and practical training in all branches of engineering associated with large Electric Power Stations.

Applicants must be Corporate Members of the Institution of Mechanical Engineers and/or the Institution of Electrical Engineers.

The salaries for the positions will be those attached to the following class and grades of the National Joint Board Schedule of Salaries for Technical Engineers—

Power Station Superintendent—Class H, Grade 3 (at present £654, rising to £694 per annum).

Assistant Power Station Superintendent—Class H, Grade 5 (at present £554, rising to £574 per annum).

The selected candidates will be required to pass a medical examination, and to contribute to a Superannuation Scheme under the provisions of the Local Government Superannuation Act, 1937.

Applications, to be made on forms which can be obtained from the undersigned, are to be forwarded to him, accompanied by copies of not more than three recent testimonials, and endorsed "Power Station Superintendent" or "Assistant Power Station Superintendent," as the case may be, in time to reach him not later than Tuesday, 12th December, 1944.

Canvassing, either directly or indirectly, will disqualify.

T. H. CARR,
Electrical Engineer and Manager.

27 Bolton Road,
Bradford. 1017

CITY AND ROYAL BURGH OF EDINBURGH

Electricity Department

Technical Assistant

APPLICATIONS are invited for the above position from persons available now or immediately after the war in the West.

Preferred qualifications: Honours degree or the equivalent in electrical or mechanical engineering; apprenticeship with one of the larger electrical manufacturing companies, one of the main-line railway companies, or one of the large-scale chemical or petroleum industries. The applicant's subsequent experience should have been concerned with the development of electric power generation and distribution in these industries or in the electric power supply industry.

Salary according to National Joint Board Schedule, Class J, Grade 4 (£642-£657-£673 p.a.).

Applicants should mention names of professional engineer referees under whom they have worked. Testimonials may also be submitted if avaliable.

J. F. FIELD,
Engineer and Manager.

1 Dewar Place,
Edinburgh, 3.
17th November, 1944. 1021

BOROUGH OF BRENTFORD AND CHISWICK

Electricity Department

Appointment of Deputy Borough Electrical Engineer

APPLICATIONS are invited from suitably qualified and experienced candidates for the post of DEPUTY BOROUGH ELECTRICAL ENGINEER at a salary in accordance with Grade 1, Class D, of the N.J.B. Schedule of Salaries, which at the present time is £674, rising to £703 per annum.

Candidates, not exceeding 45 years of age, should possess an Engineering Degree or its equivalent and must be Corporate Members of the Institution of Electrical Engineers. Extensive experience with a modern and progressive undertaking with sales development and commercial experience is also essential.

The appointment will be subject to the provisions of the Local Government and Other Officers Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination and reside within the Borough.

Applications, stating age, details of training and experience, present position regarding liability for service with H.M. Forces, and accompanied by copies of not more than three recent testimonials, must be delivered not later than Monday, the 11th December, 1944, to A. E. Jeans, Esq., M.I.E.E., Borough Electrical Engineer, Electricity Showrooms and Offices, 197/199, Chiswick High Road, London, W.4.

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

JOHN SKINNER,
Town Clerk.

Town Hall,
Chiswick, W.4.
15th November, 1944. 1016

NORTH WEST MIDLANDS JOINT ELECTRICITY AUTHORITY

Shift Charge Engineer

APPLICATIONS are invited for the position of Shift Charge Engineer, as a war-time appointment, at the Stafford Generating Station.

Candidates must have had a good practical and technical training in mechanical and electrical engineering and experience in the operation of boiler and turbo-alternator plants.

The salary and conditions of service will be in accordance with the N.J.B. Schedule, Class E, Grade 8, at present rising from £361—£378 per annum.

Applications, stating age and giving full particulars of experience and training, accompanied by not more than three testimonials, are to be endorsed "Shift Charge Engineer," and sent to the undersigned.

F. FAVELL, Esq., M.I.E.E., M.I.Mech.E.,
Chief Engineer & Manager,
North West Midlands Joint Electricity Authority.

York Chambers,
Kingsway,
Stoke-on-Trent.
8th November, 1944. 989

AFTER the restrictions controlling the engagement of personnel are removed, old-established electrical and mechanical engineering firm of standing would consider the post-war engagement of a Mechanical Designer with sound academic and practical qualifications, including knowledge thermo-dynamics, hydraulics and mechanics. Must possess good personality, initiative and creative ability. The post would be of a permanent nature with salary according qualifications. Write, stating age, qualifications, etc., to—Box 921, c/o The Electrical Review.

AFTER the restrictions controlling the engagement of personnel are removed, old-established manufacturers electrical equipment for transport services require Illumination Engineer for post-war engagement, capable designing fittings, with sufficient electrical knowledge undertake design miscellaneous associated accessories. Applicant must have experience and possess initiative. Permanent post suitable man. Salary according qualifications and experience. Write, stating age, experience, etc., to—Box 920, c/o The Electrical Review.

AGRICULTURAL Equipment: The advertisers wish to contact an experienced Sales Representative for the post-war development of electrical equipment for agricultural applications. Please send particulars of qualifications to—Box 1014, c/o The Electrical Review.

CABLE Makers require energetic Sales Representative for Kent area with active connection amongst electrical undertakings and contractors. Some technical knowledge preferred. Successful applicant would be required to reside in Canterbury. Application in first instance to—Box 1008, c/o The Electrical Review.

COUNTY Borough of Eastbourne Electricity Department: Chief Draughtsman and Constructional Assistant. Applicants must have had training and practical experience in the design, preparation of estimates and specifications, and the supervision of the erection of substations and other buildings associated with an electricity undertaking and be capable of supervising building repairs, etc. The candidate would also be required to take charge of the mains drawing office, and must be fully conversant with modern methods of preparing and keeping mains records. The salary will be in accordance with Class F, Grade 8A, of the N.J.B. Schedule (at present £361 p.a.). The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination. Applicants should write, quoting D.976XA, to the Ministry of Labour and National Service, Room 432, Alexandra House, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 5th December, 1944. 992

CRAIG & Derricott Ltd. have immediate vacancy for Works Superintendent capable of training labour for the assembly of electric control gear, accessories and household equipment. All correspondence should be addressed to—Managing Director, Craig & Derricott Ltd., Teddesley Works, Walsall. 996

ELECTRICAL contractors, with head office in London, require Area Manager for Birmingham with knowledge of all classes of power and lighting installations, preferably with a connection in the district. Details of experience, age and remuneration in confidence to—Box 916, c/o The Electrical Review.

ESTIMATING Engineers required by large electrical engineering firm (S.W. London area) for post-war positions. Applications are now invited. Employment subject to Ministry of Labour restrictions.—Box No. 899, L.P.E., 110, St. Martin's Lane, London, W.C.2. 949

F.H.P. Sales Engineers required by large firm of electrical equipment manufacturers for London, Midlands, Yorkshire and Scotland. Positions will be permanent and progressive and vacancies are available now and post-war. All applications will be considered in confidence and should state, qualifications, age, experience and present salary.—Box 963, c/o The Electrical Review.

JUNIOR Shift for small station. Diesel and bulk supply, A.C. and D.C. switchgear. Salary, N.J.B. schedule. Class B, Grade 8b, at present £267 p.a. The appointment will be of a temporary nature to replace man serving with H.M. Forces, and will be terminable by one month's notice on either side. Travelling and other reasonable expenses will be paid, but in the case of the successful candidate these expenses will be paid upon taking up the duties. Applications, with full particulars of experience, reference and age, to—The Clerk, Horsham Urban District Council, Council Offices, Horsham Park, Horsham, Sussex. Mark the envelope "Junior Shift." 1006

LEADING firm of industrial fittings manufacturers require Sales Engineer for London area, one used to calling on wholesalers, contractors, factories, etc. Write, stating age, experience and salary required, to—Box 999, c/o The Electrical Review.

LIFT Engineers. Old-established firm requires experienced man as General Manager. Salary and participation in profits. Applications, accompanied by details of experience, will be considered in confidence.—Box 824, c/o The Electrical Review.

MECHANICAL Engineers required for the Government of Nigeria Public Works Department for one tour of 12 to 24 months in the first instance. Salary between £600 and £1,000 a year according to qualifications and experience. On salary of £600 separation allowance is payable to married men between £36 and £156 a year according to number of children. Free passages and quarters. Candidates should have a university degree in engineering or be A.M.I.Mech.E., and must have had a subsequent practical experience either with power station plant, such as Babcock boilers, steam turbines, reciprocating internal combustion engines and gas producer plant, or public works machinery, such as road and building construction plant, pumping machinery and motor vehicle overhaul and maintenance. Applicants should write, quoting C.V.2361A, to the Ministry of Labour and National Service, Central (T. & S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 5th December, 1944. 1019

SALES and Wiring Superintendent required by an electrical supply undertaking in the Midlands. Applicants must have had practical experience in industrial power and domestic installations. Applications should state age, particulars of training and experience, salary required, and be accompanied by three recent testimonials addressed to—Box 856, c/o The Electrical Review.

SALES Manager required by Transformer Company manufacturing special types of great importance for industry, as well as standard H.V. and L.V. transformers up to 1,000 kVA. Applicant must have good connections to consumers and supply companies and should be capable of developing sales throughout the country from head office, and also visiting and instructing representatives.—Box 1025, c/o The Electrical Review.

SALES Representative required for post-war development by manufacturers of lighting fittings, London area. State age, experience and salary required to—Box 936, c/o The Electrical Review.

SALES Representative required to work in the Home Counties. The objective will be the preparation of an area in readiness for the establishment of a new branch: this appointment affords an opportunity for initiative. Please apply by letter addressed to—The Managing Director, Alliance Wholesale Ltd., 82, 83, Great Russell Street, London, W.C.1.

SHIFT Engineers wanted for power station. Permanent position. Salary in accordance with Grade 8, Class F, of N.J.B. Schedule. Reply, giving age and technical training and experience, to West Gloucestershire Power Company, Limited, 136, London Road, Gloucester, endorsing envelope "Shift Engineer." 3045

STOREKEEPER required for the Luton branch of Alliance Wholesale Ltd. The situation available is a permanency for the right man. Please apply by letter to—Alliance Wholesale Ltd., 82, 83, Russell St., London, W.C.1. 3002

STORES Clerk required by electrical wholesalers. Good knowledge of electrical material essential. Apply—London Electrical Company, 82, Shaftesbury Rd., S.E.1. 35

VACANCY occurs for a Shift Charge Engineer in industrial power station. Salary according to E.P.E.A. schedule, Class E, Grade 5. Write—Box 988, c/o The Electrical Review.

WORKS Manager, London area, required for production of fractional horse-power motors and small electrical assemblies. Reply stating salary required and experience.—Box 1027, c/o The Electrical Review.

APPOINTMENTS FILLED

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

SITUATIONS WANTED

A Mains Engineer (32), A.M.I.E.E., pub. sch. and univ., ency. and municipal experience all voltages up to 33 kV., seeks appointment as technical representative.—Box 6457, c/o The Electrical Review.

A Sales Engineer, for large manufacturing co., age 48, at present acting outside sales engineer (North England area), handling all classes switchgear, motors, etc., desires post as Branch Manager.—Box 6499, c/o The Electrical Review.

ADVERTISER (30) desires change. 14 years employed by supply undertaking operating in rural area, conversant with hire, H.P., maintenance, showroom, contracting and change-over. Employed at present as sales foreman.—Box 6494, c/o The Electrical Review.

A.M.I.E.E., B.Sc., A.C.G.I. (34), with 13 yrs.' exp. design, development and production of telecommunications equipment and allied audio and elect. apparatus, desires post-war position with wide possibilities. Would prefer position involving travel or location abroad. Present salary £650.—Box 6493, c/o The Electrical Review.

AN Electrical Engineer, Graduate I.E.E., 15 years' experience, technically and administratively in large installations, control gear, and engineering advisory duties, desires position with responsibility.—Box 6511, c/o The Electrical Review.

ELECTRICAL Engineer desires position, experience including electric furnace design, nickel chromium and molybdenum element types.—Box 6505, c/o The Electrical Review.

ELECTRICAL Instructor (32), 16 years' electrical experience on aircraft and automobiles, requires change. Position acceptable offering post-war possibilities. Sales organisation, production, staff control or training.—Box 6502, c/o The Electrical Review.

ELECTRICAL Engineer, Diploma of Faraday House, Scottish, single, age 32, seeks appointment with prospects. Several years' experience electricity supply industry, principally on the distribution side. Extensive experience installation, operation and maintenance of underground cables, overhead lines, substations and their equipment, consumers' services and installations, also contracting experience. Salary not less than £600 per annum.—W. Mitchell, 31, Graham Road, Weston-super-Mare, Somerset. 6510

ELECTRICAL Engineer (38), seeks post-war job as Installation Inspector. Eight years with Supply Co. on similar, including change-over D.C.-A.C., war post 4 years supervising and maintaining large government installations (member A.S.E.E.).—Box 6508, c/o The Electrical Review.

ELECTRICAL Engineer (42), 23 years with leading lamp manufacturers in a technical capacity, requires executive position in a lamp makers' business. Modest capital available.—Box 6503, c/o The Electrical Review.

GENERAL Manager (41), with 20 years' experience in light electrical, mechanical and radio products, now available to join company in executive capacity. Specialist in all phases of factory organisation and administration, production, costing, purchasing and material control.—Box 6468, c/o The Electrical Review.

PURCHASING Official requires post of responsibility in provinces. Twenty years' experience with important group electricity supply and transport undertakings. Thorough knowledge of these markets and highly experienced in organisation and control of central purchasing department with large turnover and staff.—Box 6492, c/o The Electrical Review.

YOUNG Man (21), taking Grad. Nat. Cert. Elec. Engine., seeks progressive situation in radio engineering.—Box 6471, c/o The Electrical Review.

FOR SALE

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

CITY OF BRADFORD

Turbo-Alternator for Disposal

THE Electricity Committee of the Bradford Corporation invite tenders for the purchase and removal of: ONE 15,000-kW (M.C.R.) PARSONS TURBO-ALTERNATOR, exclusive of Condensing Plant.

The alternator is of the 3-phase type, suitable for 6,600 volts between phases, 50 cycles per second.

The set is in running condition, and, by appointment, can be seen in operation at the Valley Power Station.

Form of tender and further particulars may be had on application to Mr. T. H. Carr, A.M.Inst.C.E., M.I.Mech.E., M.I.E.E., Electrical Engineer and Manager, 27, Bolton Road, Bradford, to whom all enquiries respecting the set should be addressed.

Tenders, on the forms provided, must be delivered to the undersigned not later than 10 a.m. on Wednesday, the 13th December, 1944, and no tender will be received unless enclosed in a plain, sealed envelope bearing the words "Tender for purchase, &c., of Turbo-Alternator," but not bearing any mark or name indicating the sender.

The highest or any tender will not necessarily be accepted.

N. L. FLEMING, Town Clerk.

Town Hall, Bradford.
November, 1944. 993

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

ECONOMISERS IN STOCK

TWO Green's Economisers, 208 tubes, 250 lbs. W.P.

Guaranteed re-insurable and first-class condition only, low prices. Quotations per return. Installations delivered and erected complete.

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