ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXV. No. 3481 AUGUST 11, 1944 9d. WEEKLY

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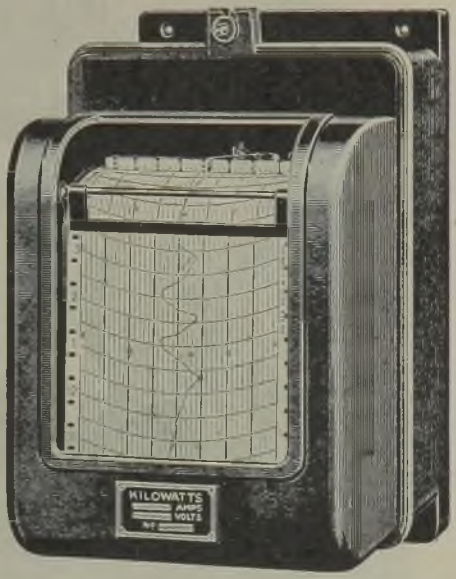

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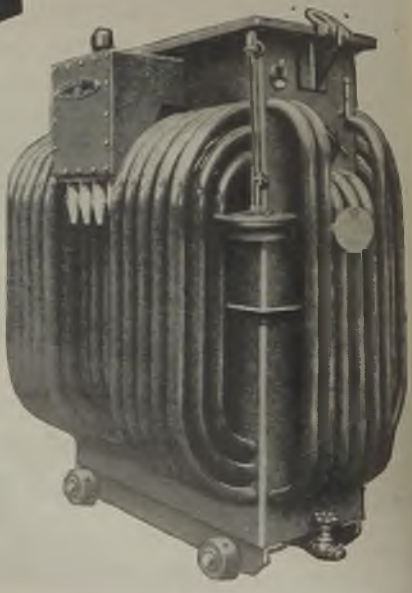

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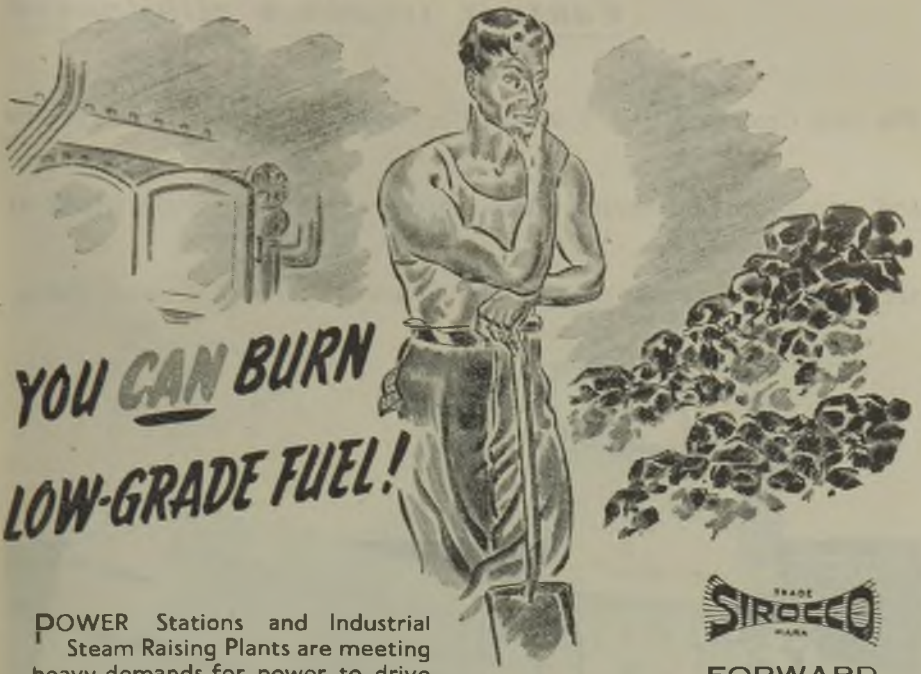

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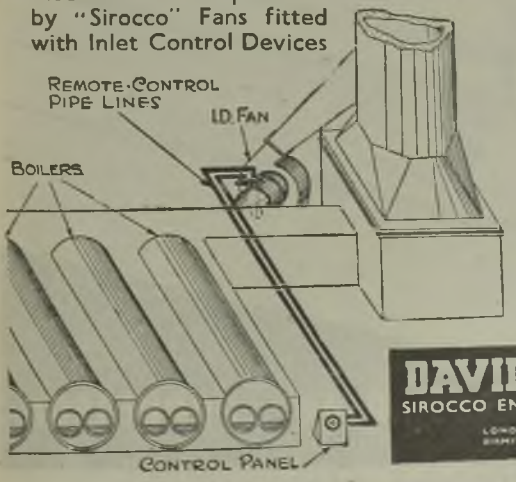

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FORWARD BLADED FANS

RADIAL BLADED FANS

BACKWARD BLADED FANS

The illustration shows a method of remote control illustrated diagrammatically as applied to an Induced Draught Fan serving a battery of Lancashire Boilers

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ELECTRICAL REVIEW

August 11, 1944

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXV. No. 3481. AUGUST 11, 1944 9d. WEEKLY

Electrical Development

Participation of the Whole Industry

ABOUT eleven years ago there was a fundamental change in the constitution of the British Electrical Development Association; new articles of association were adopted in which it was stipulated that " qualification for membership shall consist in being an authorised undertaker." This somewhat funereal provision excluded from membership the manufacturers, electrical contractors and wholesalers who had supported the Association from its earliest days. That is not to say that there was any bad blood between the parties. The parting was quite amicably arranged and it was agreed that although no longer members the manufacturers and others would still assist the Association in all possible ways.

Central Board's Contribution

The change arose out of recommendations by the National Consultative Committee set up by the Central Electricity Board for a number of purposes, under the chairmanship of Mr. C. D. Taite (Lancashire Electric Power Co.) and was linked up with the desire of the Central Board to contribute to E.D.A. funds and strengthen the Association. This it did by agreeing to contribute £1 for each £1 subscribed by the other members up to a prescribed annual maximum. At the same time subscriptions were raised and the result was a very considerable rise in revenue.

In 1932 the income was £41,614 of which supply undertakings provided £31,452, manufacturers £7,150, contractors £839 and wholesalers £110. The total for the following year was £85,970, including £42,261 contributed by the Central Board. The last report showed that income from British undertakings in 1943 was £57,115, including £22,000 from the Board; this represented only 44 per cent. of normal subscriptions which would have thus amounted to about £129,800.

Post-war plans are being prepared with something like this last figure in mind but a much greater advance could be made if further funds could be secured. It is unlikely that electricity supply authorities generally would agree to the raising of their subscriptions. What other alternatives are there? The most obvious source is the rest of the electrical industry which is at the present time enjoying the fruits of E.D.A.'s work without payment. It might be thought that the non-supply sections are well content that this should be so, but is this certain? Would not some of them prefer to be active participants in the work of electrical development instead of passive receivers of unpaid-for benefits?

Strengthening Existing Relations

It may be contended that it is not wise to mix " trade " and public service (indeed that was apparently one idea behind the reorganisation), but there is already collaboration of a kind and it seems to us that a financial interest would provide a much stronger and effective link. As an example of what has been done already, it may be mentioned that in connection with the special lighting campaigns conducted by the Association very substantial financial assistance has been provided by E.L.M.A. Then there is the Electric

Vehicle Association, very closely associated with E.D.A., which conducts and finances its separate campaigns. These, of course, are well defined branches of the industry; in some other directions definition is not so clear. Consequently, there seems to be a need for a closer general collaboration with the Association by the manufacturers as a whole. It should be made clear that we put this forward on our own responsibility as a matter for consideration by both E.D.A. on the one hand and the trade associations on the other. The views of those concerned would be welcomed.

Signs and Portents

LAST week we expressed the opinion that the sign of the Electrical Contractors' Association was as well known to the public as that of the National Register of Electrical Installation Contractors and we added "which perhaps is not saying much." A note in the *Electrical Contractor* for August reminds us that if the E.C.A. sign is not sufficiently known it is not the Association's fault. Some years ago it tried to persuade members to use window signs and outside illuminated signs which it had had made. "But," says our contemporary, relapsing into the common tongue, "the thing was a flop . . . and the balance of a considerable stock of these devices had to be disposed of as so much scrap." It is very hard to convince some people that the building up of goodwill for their associations enhances the value of membership. This is one of the things that appears to be better ordered in the United States.

Planned Kitchens

THAT the kitchen is the workshop of the home is a trite enough saying, but it does not appear to be generally appreciated that its electrical installation lends itself to standardisation of layout at least as readily as do corresponding arrangements in the average factory. In this issue Mr. R. Illingworth examines the considerations that have influenced him in the design of his kitchen equipment as a mass-produced unit for meeting the needs of Poplar post-war housing. Attention may here be directed to two features that are of general application. One is that extensions will not interfere with the original installation: the other is that the work to be done on site is reduced to a minimum.

Rural Electricity

IN an article in this issue, Mr. F. Bent, the borough electrical engineer of Aylesbury, confirms from practical experience in his own area the need to overcome several obstacles which stand in the way of complete rural electrification. He is in favour of State aid (as afforded in the case of water supplies) rather than development at the expense of the urban consumer and he quotes the recent decision of the Irish Government in this connection. He agrees with most other writers on the subject that a considerable simplification of wayleave procedure is essential. This is purely a rural problem which rural communities should assist in solving. Another matter which Mr. Bent mentions is the rating of distribution systems, which is extremely anomalous, but with it he revives the question of the de-rating of electricity undertakings which is another, and very complicated, story.

Electric Ploughing

IN discussions on rural electrification there has been little, if any, reference to electric ploughing. The general opinion seems to have been that the possibilities are small, having regard to the undoubted convenience and efficiency of the self-contained oil-driven tractor plough. Electric ploughing experiments in this country have been restricted by the considerable expense involved and advocates can claim that the system has not had a really fair trial. Experience elsewhere, no doubt gained under the same limitation, seems not to have been sufficient to justify a conclusive verdict, although in New Zealand a certain measure of success appears to have been achieved. It is this New Zealand method which is suggested as a basis for experiments in a report prepared for the Electrical Research Association by Mr. C. A. Cameron Brown which is reviewed in this issue.

Expensive Experiments

IT is illustrative of the expensive nature of electric ploughing experiments that Mr. Cameron Brown says that E.R.A. must be prepared to spend up to £10,000 upon tests to be carried out, over three to five years, on large arable areas, with a further £3,000 for experiments in the electrical tilling of market gardens. He contends that the introduction of

electric ploughing would provide a very substantial load for electricity supply authorities. They are therefore primarily interested in the success of the experiments and might be expected to contribute to the cost. It is suggested that the potential return would justify considerable extensions of rural distribution systems and that this should have a beneficial effect upon rural electrification generally.

American Imports

AN announcement by the Westinghouse Electric International Co. reveals an appreciation of the basis of international trade which is not general in the United States. The company has set up an *import* department as its share in furthering reciprocal trade among nations. In the words of the company's president, Mr. John W. White :—" Instead of the old ' one way street,' we propose to open a wide two-way highway for future foreign trade." Nevertheless, British manufacturers should not build too great hopes upon this departure for it is made clear that most of the company's imports will be raw materials; few manufactured articles will be taken and only those which do not compete with American industry. All the same this is a welcome acceptance of the fact that Americans must be paid for their goods in gold (of which the country has a surfeit) or in goods and services if their foreign trade is to be properly balanced.

More Enlightenment

SIMILAR views were expressed recently by Mr. William L. Batt, vice-chairman of the United States War Production Board and head of a well-known international business firm. As reported in the *Chamber of Commerce Journal*, Mr. Batt said that in the United States they were prone to place too much emphasis on selling goods to other countries and not thinking sufficiently about buying from them. They could not sell large quantities abroad without buying large quantities. He advocated a revision of recent tariff policy to accomplish this end.

Rectified Current

WHEN small DC motors having low mechanical inertia are fed from only one or two rectifier valves, the current-wave form may introduce problems of heating, voltage stresses and torque pulsations with consequent noise. In a paper presented before the American I.E.E. recently Mr. V. Siegfried suggests that these may make it necessary to increase motor ratings in some cases and that vibrations may be objectionable in grinding and in leaving chatter marks on finished surfaces. No general design factor seems at present to be applicable, however, and each motor duty has to be considered on its merits.

Standard Outlets

THE spate of discussion upon the future of the domestic plug and socket is more or less brought to a head in the separate report on the subject issued by the Electrical Installations Study Committee of the Ministry of Works convened by the I.E.E. It is seen from this that the Committee had decided that 10 A would probably be sufficient for the new standard which was considered necessary, when, as the result of the interrogation of supply authorities, it revised this idea and now proposes a 3-kW (13 A at 230 V) standard socket-outlet. It considers that with modern materials and technique such a plug could be produced of an overall size not greater than that of the present 5-A standard. The necessity for local fusing is accepted, as the accessories would be installed in ring-main circuits fused at too high a rating to give sufficient protection to appliances. It should be emphasised that the Committee assumes that future tariffs will be such as to require the use of one meter only for each consumer.

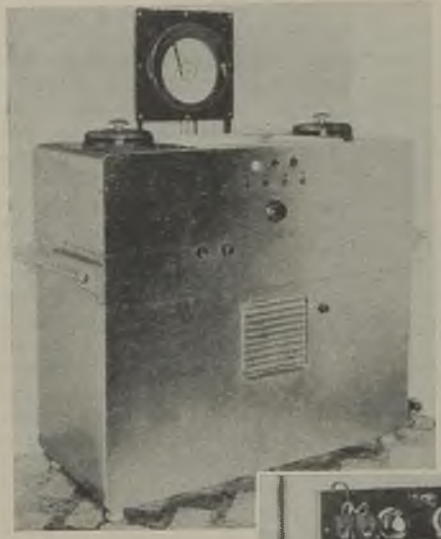
Replies to Questions

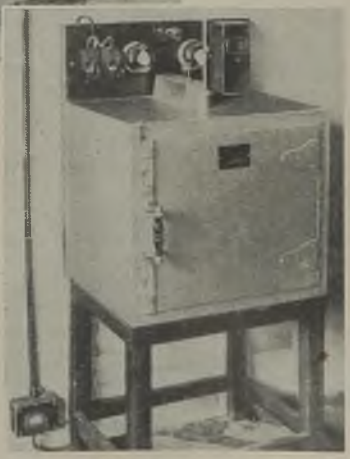
IT was fairly generally agreed by the undertakings who responded to the list of questions put by the Committee (representing 85 per cent. of the domestic consumers) that the present situation was unsatisfactory and that a new domestic standard plug and socket were needed. Opinion in favour of a 13-A standard was substantial, although advocates of 10A were not negligible. Fused pins rather than fused sockets were favoured by a very great majority but opinion was more evenly divided between round and flat pins—about two-thirds being on the side of the round pins. All but a very small minority agreed to abide by the decisions of the greatest number but we are not told on what points these few have based their determined individualism.

Electro-Farming—I

Some Recent Developments at Aylesbury

IN recent articles in the *Electrical Review* dealing with electricity supply conditions in wartime, we stressed the great change that has taken place generally in the outlook of the British farmer towards the assistance which can be given to him by the electrical industry. Right up to the early part of this war one of the greatest difficulties encountered by the supply engineer in the farming and agricultural areas was the inherent conservatism of the farmer; every new connection and load increase on the farm was won only after a sales effort far greater than was required in most industrial fields. It is probably the present shortage of labour which has turned the tables, but be that as it may, the fact is that now the order of things is such that more often than not the initial approach for a connection or load development is in the reverse direction, from the farmer to the supply undertaking.





Electrically, the main interest of artificial insemination is in the storage of the semen and sterilisation of instruments and receptacles. Storage refrigerator (above) and sterilising cabinet (right)

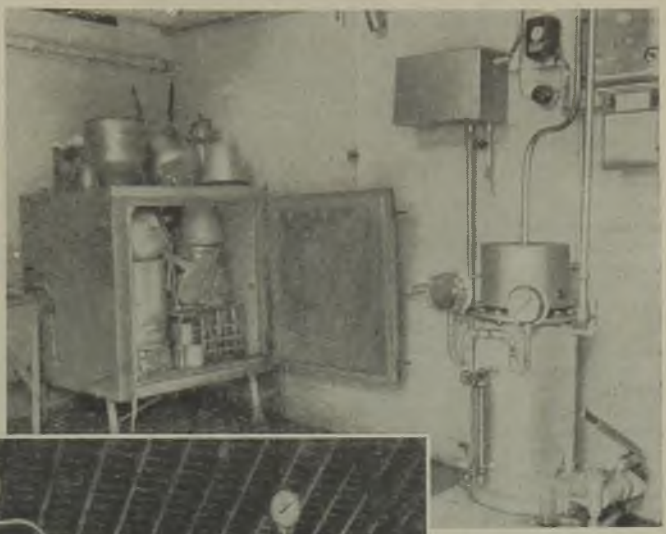
In view of this change now is obviously the time for an effort to stress further the help which the electrical industry can give to the farmer, not merely under war conditions, but at all times. With this in mind, we have asked Mr. F. Bent, chief engineer and manager of the Aylesbury electricity undertaking, to give us his views on the broad aspects which we have indicated and, supporting him, we are dealing in this and a second article with developments which we have seen in the Aylesbury area.

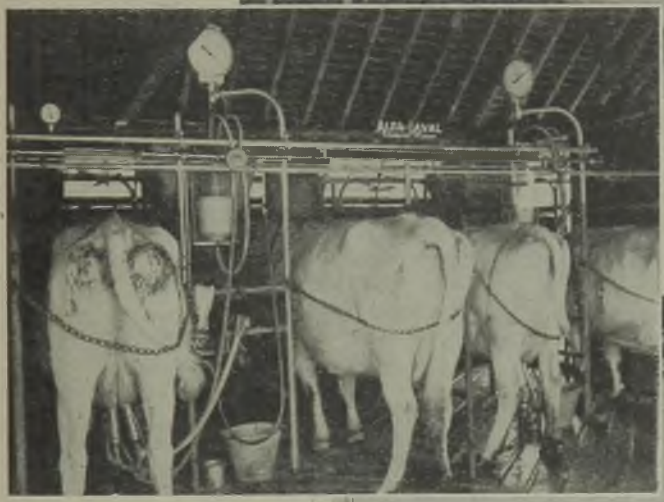
An outstanding innovation in the farming world in recent times has been artificial insemination in connection with cattle breeding, particularly since the Ministry of Agriculture introduced regulations for the control of this development. Obviously, a trend towards eliminating the heavy costs involved in transporting bulls about the country, or indeed the world, must demand great attention, but a more immediate aspect of even greater interest is the official support which appears to be given to the idea of taking the semen to the occupied countries immediately they are liberated with a view to the re-establishment of the live-stock herds of Europe which have no doubt been reduced to a very low level by the Nazis. Electrically the main interest in artificial insemination lies in the storage of the semen, and the sterilisation of the instruments and receptacles used. At the artificial insemination centre at the Round Hill Farm Estate at Kimble we were able to see these applications.

In order to store the semen it is necessary to reduce the sperm to a state of dormancy and maintain them in this condition until they are required for use. This is done in a special type of refrigerator having two containers; in one of these the semen is reduced in temperature to 5 deg. C., and in the other it is maintained at this temperature with extreme accuracy. In the refrigerating cabinet a small unit cools air which is drawn through radiators by fans into the containers. The amount of cool air circulated through the containers is varied by thermostatic control of the speed of the fans, and in this way a very high degree of

accuracy is achieved. Under the container there is a storage water heater which serves for washing the instruments, etc.

in which the semen is first cooled down to the required temperature is a small heating coil operated by a "programme controller," and by means of valves the air is bypassed over this heating coil during the first part of the operation in order to prevent the temperature of the semen being reduced too rapidly. Later the valves reverse and allow the air to pass over the cooler before its introduction to the container. In addition to the thermostatic control of the fans there is also similar





Milking equipment: Above, sterilising boiler and chest. Left, two-unit milking machine. Below, motor-driven vacuum pump

control of the refrigerator motor, after the style of normal refrigeration equipment. The close control is aided by a Cambridge disc-type regulator.

Dry sterilisation of the instruments and receptacles is effected in a Gallenkamp sterilising cabinet which is operated at 100 deg. C. under thermostatic control by a "Sunvic" regulator. The cabinet is loaded at 1,200 W. These two important electrical appliances are housed in a laboratory which is equipped with tubular heating under thermostatic control at 60 deg. F., and to complete the electrical equipment in the room

It is difficult to imagine a greater electrical aid to the farmer than mechanical milking, and at the Ilmer House Farm we saw a particularly modern installation and were

delighted to hear the views of Mr. Attenborough, the owner, on the great value of electricity on the farm. The installation embraces two milking units at four cow stalls and serves 35 cows, and it is entirely under the care of two land girls whose daily task is not finished until the whole system is sterilised and the various equipment rooms and cows' stalls are washed spotlessly clean.

As soon as the suction cups are applied to the udder the milk is drawn into a glass container between and above the two cows and just below the level of the system pipeline. When the milk has been automatically weighed by this glass container it is passed on to a similar glass container in the cooling room, and from this it is released under ball-valve control to pass over a water-cooled cooler. The installation, which is an Alfa-Laval combined milker, is served by a 700-RPM vacuum pump which is belt-driven by a 1-HP, 1,000-RPM motor. This pump creates the necessary suction in a removable container in the pipeline just above the pump, and there is a direct pipeline connection from this container to the milking bay. Mr. Attenborough pointed to the importance of giving careful attention to the pulsators to ensure proper emulation of the calf suction.

For sterilising the complete system, including the pipeline, containers and all the receptacles, a complete sterilising installation includes a 20-kW 3-phase G.E.C. electrode boiler which is fed by a small ball-valve water tank. A small hand pump provides for make-up water and pressure boosting. In ten minutes the boiler creates a pressure of 15 lb. per sq. in., governed by a Drayton pressure regulator mercury switch which automatically releases the supply contactor when the pressure rises to 30 lb. per sq. in. It is merely necessary to open a particular valve to sterilise the pipeline, while another valve controls the entry of steam into an equipment chest in which the milking utensils are sterilised. A third valve controls the delivery of steam into a water trough through an injector unit on a flexible lead for the provision of a quick supply of washing-up water.

The supply for the sterilisation plant is separately metered and a typical consumption for a recent quarter was 1,194 kWh. The consumption on the rest of the farm in the same period was 2,731 kWh, including supplies for milking, chaff-cutting, fodder machinery, pumping and domestic uses. The all-in price per kWh averaged 1⅛d.

An aid to the farmer by way of a contribution to the general care of animals is a Wolseley portable machine which can be used either for the clipping of horses or cows or the shearing of sheep, simply by the application of a cutting head suitable for the particular performance required. The clipper or cutting unit is directly coupled through a flexible shaft to a portable geared fractional-HP motor which is carried on the back of the attendant by means of shoulder straps.

Portable clipping machine in use

Scottish Hydro-Electric Schemes

THE executive of the Local Authorities' Hydro-Electric General Committee has agreed to support the contention that the Highlands should now be made a development area corresponding to special or distressed areas nder present legislation.

At a previous meeting it was suggested that wind power might be a suitable method of developing small blocks of power for the use of rural communities. This suggestion was communicated to the North of Scotland Hydro-Electric Board, and it was now reported that a reply had been received stating that the Board had the matter under consideration.

Representatives from Dumbartonshire explained the County Council's attitude towards the Loch Sloy scheme (constructional scheme No. 1) and stated that the Council had been unable to settle its differences with the Hydro-Electric Board in regard to the provision of water for domestic purposes. It was decided to write to the Secretary for Scotland intimating that the Committee had received information as to the Loch Sloy scheme, and viewed with grave concern the position which had arisen.

In a letter to *The Times* of August 4th, Brigadier Lord Lovat complained that the public was given insufficient information regarding the Board's schemes to enable it to enter any necessary objections during the forty days allowed. He also questioned the propriety of commencing such work at the present time.

Electricity and Agriculture

What of the Future?

By F. Bent, A.M.I.E.E., A.M.I.Mech.E.

SOME of the aspects of the wartime activities of British agricultural industry are being dealt with in the *Electrical Review*, with particular reference to the uses of electricity as a valuable aid to essential food production. It will be apparent to anyone who is in close contact with the farming industry that remarkable results have been achieved in food production, comparable in every way with the efforts of the engineering industry in the output of war weapons. Great credit is due to the farming community in co-operation with the Ministry of Agriculture and the local Executive Committees for converting what was formerly a depressed industry into such a virile and prosperous state within a comparatively short space of time.

Mr. Bent is borough electrical engineer of Aylesbury

The great change which has taken place in the outlook and the economical status of the more progressive type of farmer is exemplified by the increasing demand for electrical machinery and equipment, such as that described in this and other issues of the *Electrical Review*, required to cope with problems of increased production and shortage of labour. Electrical milking methods have returned to favour and many milking plants have been installed, including the modern combine recorder type employing a pipe-line system in which the milk is taken direct from the cow to the churn or bottle *via* the cooler, the milk being accurately measured in the process.

From a load revenue point of view the milking machine may be almost negligible, but with its associated sterilising equipment it offers great scope in this direction as a plentiful supply of steam and hot water is needed, for which electrode and immersion-type boilers are eminently suitable. The demand for this and other electrical dairy equipment will no doubt be stimulated by the provisions of the new Milk and Dairies Order under which, in due course, it will become compulsory for every producer and distributor efficiently to sterilise all utensils and equipment to ensure that the milk shall be handled under the most hygienic conditions.

A further useful field of electrical load development is provided by the artificial drying of grass and cereals. Many electrically driven drying plants are now in operation and there is a steady demand for new installations. The electrical equipment comprises the motors required for driving the fans, conveyors, etc., ranging from 15 to 40 HP, according to the design and output of the plant. Since these drying plants are not operated during the winter months, the load has extremely good " off peak " characteristics, meriting the particular interest of rural supply authorities. It is profitable to offer a lower tariff rate to encourage this class of load, especially in view of the potential business to be secured by the development of electrical resistance air-heating systems as a reasonable competitive alternative to the coke-fired furnace systems. We may expect further progress in the future in the

Above: Has the Continental-type "universal" motor found a counterpart in this country? Left: The deep-well electrically driven pump affords a great service to many farms

operation of grain-drying plants, in conjunction with the combine harvester, which will enable the farmer to cut, thresh and dry the cereal crops in a continuous operation largely independent of the weather conditions.

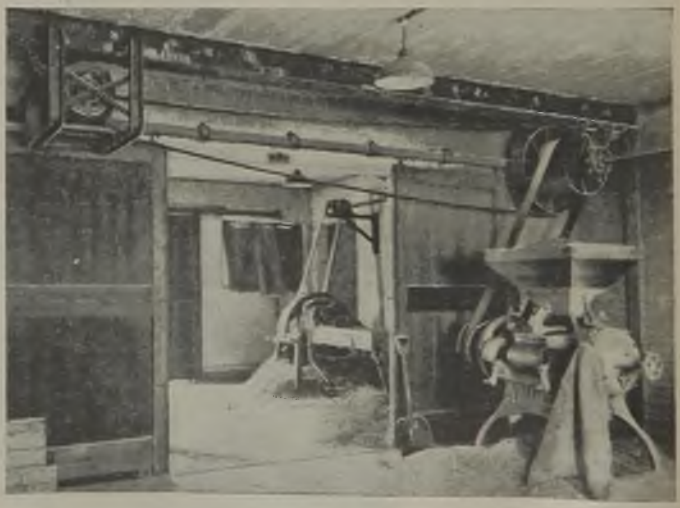
The poultry farmer can be a good customer: this incubator has a capacity for 16,000 eggs

Electrical ploughing methods have had little application in this country, due to the development of the versatile mechanical tractor for this class of work, the latter possessing the advantages of portability and relatively low capital cost.

In the Aylesbury 230-sq. mile area of supply there were some 260 farms connected before the war, excluding 150 small holdings and horticultural premises, being for the most part situated in the vicinity of the h.v. transmission or l.v. distribution systems. The majority were connected free of cost on a 20 per cent. guaranteed revenue basis, operating over a period of five years. The average revenue per farm was £10 per annum.

During the war, a further 60 farms have been connected on terms incorporating a substantial capital contribution from the consumer in proportion to the cost of the extension to the individual premises. The average revenue per farm had increased to £15 per annum in 1943, at an average price of 1·4d. per kWh sold. The fact that farmers were able and willing to make considerable payments to obtain a supply speaks well for the improved state of the agricultural industry and the appreciation of the amenities afforded by the supply. It is unfortunate that restriction of capital, materials and labour prevent several further supply applications being accepted at the present time. The prospects of this industry maintaining its present position in the post-war period will, of course, greatly depend on the Government's foreign trade policy, but provided proper control is exercised over importation of foodstuffs, there appears to be no valid reason why the industry should not continue in a state of reasonable prosperity.

Various reports on post-war planning have laid emphasis on the importance of extending rural electrification to include isolated farms and sparsely populated areas. Everyone will agree that this is a most desirable object, but it is equally important that the resulting burden of this unremunerative service should not fall entirely on the electricity supply industry, because post-war manufacturing industries will demand electricity at keen competitive rates for energy and the "substance" of



Out-of-the-way driving arrangements for a chaff cutter (rear), a grinding and cutting machine, and an oil-cake breaker (not shown)

industrial sales should not be sacrificed in the attempt to gain the shadow of the planner's dream of 100 per cent. rural electrification. For this reason State financial aid should be given to develop schemes mainly concerned with the connection of consumers remote from the transmission lines, as recommended in the report of the I.E.E. Post-War Planning Committee.

The capital cost of connecting the 190 remote farms in the Aylesbury area will be some £46,000, or an average of £240 per farm for 3-phase supplies, involving capital and interest charges of £3,200 per annum. The annual revenue required to cover this charge by sales of electricity, without profit, would, on present-day costs and tariff, have to be at least £13,300, or £70 average per consumer, which, of course, is impracticable.

The need for State aid in this matter has been clearly recognised by the Government of Eire in its plan to make a 50 per cent. grant towards the capital cost of a comprehensive post-war farm electrification scheme, and it is interesting to note here that some Mid-Bucks farmers have received 50 per cent. grants through the Ministry of Agriculture towards the cost of the connection of the main water supply services to their premises.

Rural electrification has progressed steadily since the last war, despite the many obstacles placed in the way of development and erection of overhead line systems which persist under the present inadequate legislation, in consequence of which much valuable time and energy is wasted on the procedure of obtaining the numerous separate consents of landowners, tenants, local authorities, planning officers, *ad infinitum*. Reasonable control of supply authorities' powers in this respect is, of course, necessary. On the other hand, the present unreasonable powers of opposition should be swept away by revised legislation. Wayleave and line erection consent procedure should be simplified and a uniform scale of wayleave payments adopted which could be enforced, irrespective of the nature of the land concerned.

Supply authorities should not be penalised by having to pay substantial sums in the form of rates to the various district councils in return for the benefits conferred by electrification in the shape of improved amenities and capital appreciation of building property. There is great justification for claiming a drastic de-rating policy for the supply industry and in this connection the rate-free privilege of the Post Office in respect of telephone lines and cables forms a precedent which surely cannot be ignored.

Post-war planning reports stress the need for a cheap and abundant electricity service all over the countryside, and the supply authorities may be confidently expected to do their full share in this direction, provided they are allowed to tackle the uphill work with the brakes off.

Electric Ploughing

E.R.A. Report as Basis for Experimental Investigation

A CRITICAL résumé of the application of electricity to field operations in agriculture, mainly ploughing and smaller machine cultivation, has been published by the British Electrical and Allied Industries Research Association. This report* has been prepared by Mr. C. A. Cameron Brown in order to present evidence on which to base experimental investigation of the subject.

Available information about the various ways in which electricity has been utilised for driving field ploughs and smaller machines for cultivating market gardens is first summarised and then the various interests concerned in the establishment of a practical way of doing those operations electrically are analysed. The possible sphere of application is defined and the potential importance of the electricity consumption to distributors of power is emphasised.

Reference is made in some detail, with illustrations and diagrams, to different ways in which electric ploughing has been attempted and the conclusion is reached that the most promising method under British conditions is that of Mr. H. G. Kemp, of the Ashburton Electric Power Board, New Zealand, which it is suggested should form the basis of further experimental investigation. It is described as the nearest approach to a successful effort, five machines being in regular use by 1940 for 800 hours each per annum.

Tractors of fairly orthodox pattern are employed, with a 20- to 25-HP motor substituted for the engine. A cable drum, with a 0·7-HP winding motor, is mounted on a turntable fitted upon the tractor so as to swing freely in any direction. A jib lifts the cable clear of the implements, the cable tension keeping the jib turned in the appropriate direction for the direct pay-out of cable to a lorry carrying a 30-kVA transformer and switchgear for stepping down from 6,600-V distribution lines (No. 8 galvanised steel wire) supported overhead on wood poles.

The drum holds 500 yards of three-core trailing cable, tough rubber sheathed, which

* Ref. W/T8. Price 6s. 3d. post free from the Electrical Research Association, 15, Savoy Street, London, W.C.2.

suffices for freely and completely working an area of from 25 to 32 acres from one power-tapping point. Thus most fields in Britain, frequently four, could be worked from one common power supply point. For fully cultivated land, ploughing consumes 38 kWh per acre while the remaining operations up to and including drilling need a further 52 kWh per acre. Those figures are in fair agreement with the estimated expectation of 80 HP-hours per acre of arable land in Britain.

Mr. C. A. Cameron Brown, author of the report

Summarising his report, Mr. Cameron Brown expects the responsibility for further exploration in this country to fall upon the electricity supply authorities. Manufacturers should be interested in the secondary market for motors, cables and fittings, while there is stated to be a strong case for Government collaboration in view of the public good that might be expected to ensue from an economically strengthened rural electrification system.

While the farmer may not be primarily concerned with the development of electric power for performing field operations, he may have a strong secondary interest in the prospect of becoming a direct gainer from a strongly established economic rural electrification system. Thus it might not be practicable to expect the co-operation of agricultural organisations in the earlier more electrical experiments, but it might be obtainable in later stages of the investigations.

Possibilities for Electricity Suppliers

The main interest involved is therefore that of the suppliers of electric power. The report shows that, even without harvesting operations, there could be a field demand of some 45 kWh per acre of arable land per annum, which would return (at 1d. per kWh) up to £20 per 100 acres. Such an income would justify an extra expenditure of £12,000 which (assuming a post-war rate of £400 per mile) would represent some 30 miles of extra connections, or (half-a-mile per farm average) an addition of 60 farms supplied.

On a probable post-war basis of 14 million arable acres the same proportion of electrified operation would mean 1·4 million acres ploughed and cultivated, consuming 60 million kWh and saving 7 million gallons of fuel oil. The revenue of £280,000 per annum would justify 3,500 miles of power lines not otherwise available for farm service. It is deemed highly probable that a thoroughly comprehensive rural scheme might materially reduce costs, so enhancing the value of the ploughing load and revenue as a redresser of the economic balance of the more difficult rural areas.

It is not yet visualised that the ratio of development will be such as to justify electrical ploughing tractors being built as a standard article. British requirements would be for 3,500 tractors, but the more likely procedure is for the first 100 machines to be adaptations of internal combustion designs. This conversion will call for a considerable amount of electrical equipment, much of it of standard type.

The probable sequel to an established method of electrified garden tillage must not be overlooked. The consumption of electricity per acre is not likely to be less than in the case of the larger ploughing machines and with intensified market gardening use on the same plot would recur every year. Tillage machines are particularly applicable to all holdings of under 5 acres and to many of larger size; of the former alone there were over 65,000 in England and Wales before the war. In the market garden tillage sphere manufacturers' interest would exceed that of suppliers of power.

The report concludes with the suggestion that the E.R.A. should undertake investigational research with the object of establishing a technique that will enable electrical methods to be fitted into general farm practice, rather than of developing an electrical machine. Such research would last for from three to five years. The ploughing experiments should be based on the Kemp design of electric tractor and should not be made without preparation for the expenditure of up to £10,000. Market garden tillage experiments should initially be based on the Brown Boveri electric tractor and the Michigan motor-driven cultivator, involving the ultimate provision of £3,000.

At first the E.R.A. might have to act mainly independently. In the later stages full collaboration of such organisations as the National Institute of Agricultural Engineering should be sought, as well as that of electricity supply authorities.

Canadian Standards

MANUFACTURERS who export electrical equipment and appliances to Canada may care to know that the Electrical Code, Part I (1939 edition) is now being generally revised preparatory to the publication of a fifth edition. Any and all proposals for modification will be welcomed and should, if possible, be in the form of the actual text desired to be incorporated as new or revised rules in the Code. Proposals should be submitted not later than October 1st, 1944, to Mr. W. R. McCaffrey, secretary, Canadian Standards Association, National Research Buildings, Ottawa, Canada.

Electric Kitchens

An Aspect of Post-War Domestic Electrification

By R. Illingworth,
O.B.E., M.I.E.E., M.I.Mech.E.
(Borough Electrical Engineer, Poplar)

THERE has been so much controversy with regard to the introduction of a domestic type of fuse-pin plug and socket that I have been prompted to pen this article enlarging upon the views outlined in my letter which appeared in the *Electrical Review* of June 9th. I am indebted to those responsible for the introduction of the fused-pin plug and socket since they engendered certain ideas which culminated in a satisfactory solution of the difficult problem of how to wire the "Poplar" kitchen unit (Fig. 1) which was admirably dealt with in the *Electrical Review* of April 14th, when it was disclosed that plans were almost complete for mass production of the unit under provisional patent.

Briefly, the predominating thought behind the design of this all-electric unit is to ensure that the post-war house is provided with the accepted pre-war electrical luxuries in such a manner that they satisfy both householder and engineer. From a selection of twelve standard sub-units embodying an oven, a hotplate, a refrigerator, a water heater, etc., as many as 104 practical variations accrue, covering a range of kitchen sizes from 6 ft. 6 in. to 11 ft. long. One of the most difficult problems was how to mass-produce a flexible interchangeable kitchen unit and yet retain a simplified form of electrical installation by carrying out the major portion of this work at the factory and so reducing to the minimum the electrical work on site.

The pre-war conception of an all-electric kitchen was a variety of highly-priced, highly-finished appliances fitted into any convenient corner and added to or subtracted from according to the economic status of the consumer, each additional appliance entailing the addition of another cable to the complicated web already existing. This pre-war practice prompted me to adopt the post-war maxim "One kitchen—one kitchen service cable" upon which the unit wiring was developed. It was necessary to ascertain what demands would be made upon such a kitchen service cable if the largest combination of the "Poplar" kitchen unit were installed. The loading of the electrical appliances, in watts, would be:—Large oven, 2,700; hotplates, 5,000; water heater, 3,000; refrigerator, 180; recess light, 100; dryer, 120; fan, 26; clock, 5; kettle, 2,000; iron, 400; wash boiler, 3,000 (or washing machine, 180). The total connected load would thus be approximately 72 A which, allowing for a generous diversity factor, would require a kitchen service cable capable of carrying 40 A.

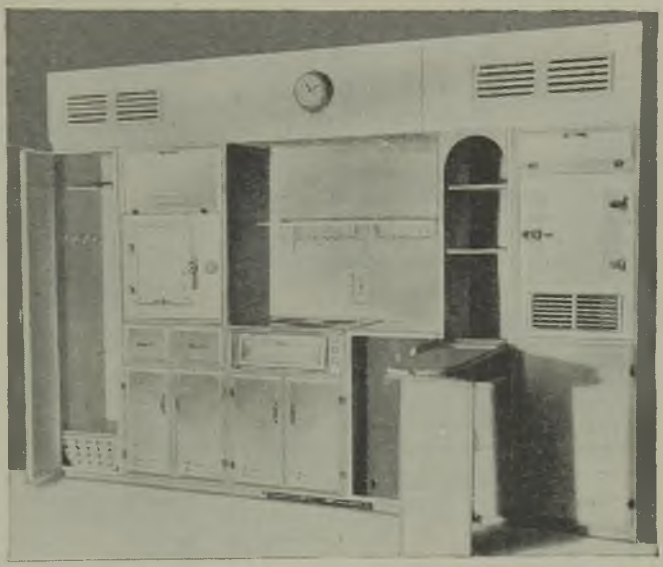


Fig. 1.—General appearance of the "Poplar" kitchen unit

Since only the hotplate gave an appliance load exceeding 13 A the load of any individual sub-unit was limited to this figure, this condition being satisfied throughout by splitting the hotplate load into the hob load of 3,000 W (13 A) and the grill boiler load of 2,000 W (8·7 A), the two circuits being isolated from each other both electrically and physically.

The next point to be decided was the method of protecting each appliance and its connecting cable. The large bulk appliances, *i.e.*, oven, hotplate, water heater and refrigerator, were each fitted with a local isolating switch by the manufacturers; hence the only remaining

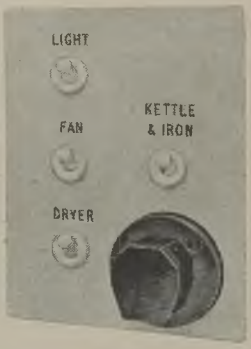


Fig. 2.—Sub-circuit control unit

circuits requiring switch control were the recess light, dryer, fan, kettle and iron. These were connected to a specially designed sub-circuit control unit (Fig. 2) to be housed in one side of the recess splash guard remote from the hotplate. This permitted ease of manipulation by the housewife and eliminated the danger of deterioration by heat radiated from the hotplates.

The cable supplying this sub-circuit control unit was taken back to a central distributing point situated underneath and thermally insulated from the hotplate, together with the cables supplying the oven, hotplates, grill boiler, water heater and refrigerator (Fig. 3).

It was at this central distributing point that advantage was taken of the adaptability to this particular scheme of the proposed 13-A fused-pin plug and socket. A composite board was designed (Fig. 4) housing six sockets built up to a common

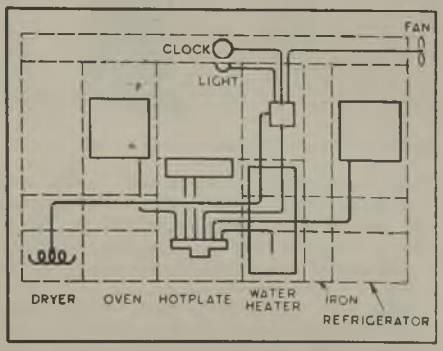


Fig. 3.—Layout of kitchen service cable

pair of busbars, and controlled by a 60-A double-pole isolating switch. It was intended that the main supply cable from the consumer's service unit, which before the war was known as the cooker service, would now serve the complete kitchen, and become known as "the kitchen service cable."

Certain improvements in the main control unit have since been made, but the underlying principles remain unaltered. Earthing is effectively catered for, this being an inherent characteristic in the design of the socket.

Each appliance would be supplied with a predetermined length of flexible cable ready for connection, *via* detachable cable channels, to a 13-A fused-pin plug. To facilitate assembly on site the clock and fan would have local plug and sockets and the recess light an adaptor fitting, while the dryer would be wired direct. The electrician on site would merely be called upon to connect up the various tails to the fused-pin plugs and insert them in the main control unit to which he would connect the kitchen service cable already laid over a pre-selected route.

Study of the diagram (Fig. 5) will no doubt raise several debatable points. It

Fig. 4.—The specially-designed main control

will be noted that the clock and fan will be protected by 13-A fuses. As I argued in my letter of June 9th, rarely does a domestic appliance blow a fuse through overload, and to endeavour to protect these low-rated appliances against an internal fault by installing a low-capacity fuse is not logical, since reduction in fuse rating does not of itself reduce the fault current. Even the 1-A fuse used on some clock circuits will blow at about $1\frac{1}{2}$ A, representing a fault load of about 345 W, *i.e.*, seventy times the full load of the clock. Is any clock or fan designed for domestic use guaranteed to stand up to the resulting stresses? Since there is little discrimination in the fault clearing times of the small domestic fuses, I submit that a 13-A fuse can be used throughout a domestic installation regardless of the wide variation in the loading of the separate electrical appliances. The only objection I can think of to this practice is that a high resistance fault may slowly break down and in so doing subject a small flexible cord to a substantial and prolonged overload. Since it is now generally accepted that flexible cords do carry appreciable overloads without detrimental effect, I

support the view expressed by Messrs. Smith and Jacobi in their I.E.E. paper last September, that the 14/·0076 flexible cord should be dispensed with and the minimum size set at 23/·0076. This should mitigate possible fears of fire.

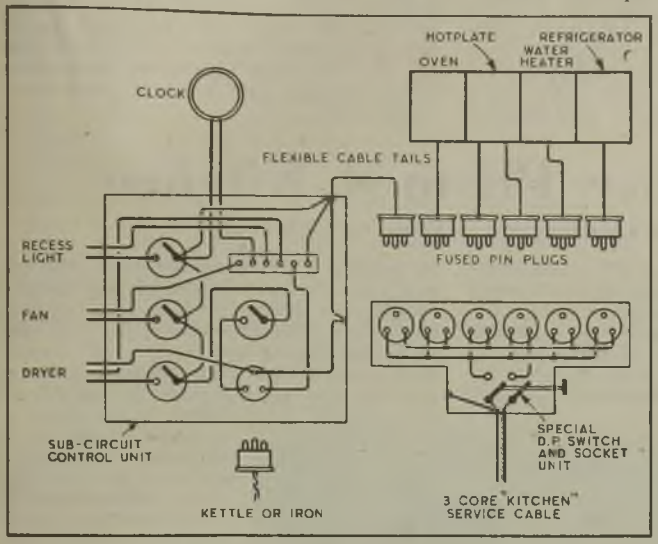


Fig. 5.—Electrical connections to kitchen sub-units

Reverting to kitchen electrical installations, I have endeavoured to show that with the help of seven 13-A fused-pin plugs and sockets, the requirements of an all-electric kitchen are satisfied. Also, by the adaptation of the simplified form of wiring described, an installation is provided which permits expansion without disturbance of initial work and reduces to a minimum maintenance time on site—a very important point from the supply engineer's point of view.

What of the wiring of the remainder of the house? I am in favour of the 13-A fused-pin plug and socket and its use with the much debated ring-main system, thus reducing the number of types of plug in a house to one. The minimum number of socket outlets shown in Fig. 6 is seventeen, but seven of these would be incorporated in the kitchen unit, leaving ten to be provided by the electrical contractor; here again I advocate the use of one size of fuse in the fused-pin plugs, *viz.* 13 A. No matter how carefully the contractor may grade the fuse in the original installation, the supply engineer knows from experience that the consumer will please himself how to use or abuse that installation, especially where replacement of fuses is concerned. Why not ensure a reasonable measure of control by installing a sufficient number of socket outlets with fused-pin plugs limited to one size of fuse?

Other subjects in the domestic electrical sphere upon which it is advisable at present to maintain an open mind are the use of conduit and possible alternatives, standardising domestic meters and the consumer's service unit. There is no doubt that conduit will continue to be the accepted cable carrying medium for quite a long time to come. I think more use should be made of the metal trim which will ultimately supersede the wood used in the interior finishings of buildings in such parts as covings and door and window frames. On one London housing estate the metal trim of the door frame is used for housing room switches, but to date development in this direction has been slow. Possibly the introduction of the ring-main system may prove to be the necessary incentive.

Service units are still dependent upon the efforts of meter manufacturers, but the sub-division of circuits in the proposed arrangement is relatively simple.

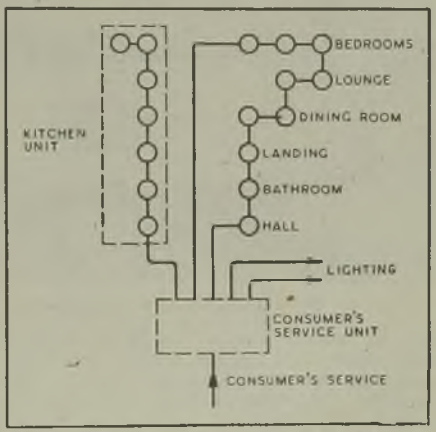


Fig. 6.—Disposition of sockets throughout house

From the foregoing it is obvious that I have aided and abetted contravention of the existing eleventh edition of the I.E.E. Regulations for the Electrical Equipment of Buildings. Particularly does this contravention apply to Regulation 116 in the sub-circuit wiring of the sub-circuit control

panel ; Regulation 202 in the assessment of the load of a circuit when made up as a ring main; and Regulation 612 in the protection of final sub-circuits. It will be noted that these contravened regulations apply to flexibles, plugs and socket outlets and fuses. These contraventions, in any case, will arise with the growth of post-war development.

There has been so much controversy associated with the matters I have touched upon that investigation and overhaul of existing rules will be really necessary. There should be a tendency towards increased collaboration between manufacturers, contractors, supply engineers and the compiler of rules and regulations, supported by the British Standards Institution and the findings of the Electrical Research Association. Only in such a way will true development materialise.

Another Planned Kitchen

Unit Construction Scheme at Cambridge

A GOOD deal of interest will undoubtedly be created by a planned kitchen forming the principal feature of an exhibition, which for the next six weeks the Cambridge Electric Supply Co., Ltd., is holding in its showrooms. Although believing that the floor area allowed is insufficient the company has deliberately kept to the 10 ft. by 8 ft. area which official circles appear to consider adequate for the average home. This decision has, however, the advantage of demonstrating how a very great deal in the way of bringing electrical facilities into the kitchen can be accomplished even within these limitations.

General view of the "Cambridge" planned kitchen

In the general arrangement every endeavour has been made to ensure that the kitchen is easy to run and the work of the housewife accomplished with the minimum of effort and time. The principle of unit cabinet and cupboard construction has been adopted throughout so that the assembly will still retain its unified appearance whether installed complete or gradually in sections, perhaps bought on easy purchase terms. All the cupboards—there are eleven of them—and drawers have been designed for easy cleaning and an ingenious feature of the former is the fixing of magnetic catches on all the doors. The cabinets are arranged from the ceiling level to floor to avoid dust accumulation and adequate toe space has been allowed at the bottom of each unit.

On the right side of the outside door there is a small drop-down shelf for placing provisions received from the tradesmen. Perishable goods are placed directly into a "Prestcold" refrigerator on the left-hand side. This refrigerator is of a really practical size having a 4·4 cu. ft. capacity with a shelf area of 8·3 sq. ft. It is fitted with automatic temperature control and is conveniently installed at waist level. Below it is a cupboard for vegetable storage fitted with wire-mesh shelves allowing the dirt to fall through to a tray beneath. By the side of the refrigerator stands another tall cupboard for housing the vacuum cleaner, brooms and brushes, etc.

Facing the refrigerator and occupying the whole of the wall space is the food preparation section. On each side of the cooker, which is in a central position, are working tables, all at the same level. The one to the right has a heat-resisting vitreous enamel top unaffected by hot utensils, while at the end of the other and larger table is a serving

hatch communicating with the dining room. Above each of these tables is a 15-A plug point for use with a kettle, coffee percolator, iron, toaster or food mixer, the last-mentioned appliance having accessories for grating, scouring saucepans, etc.

Streamlined Cooker

The cooker is a streamlined English Electric model of the latest post-war design embodying two boiling rings (the larger having a special heat regulating device and simmering control), a combined hotplate and grill, and a thermostatically controlled oven. The main switch is at the base of the cooker for foot control. A canopy above the cooker removes any cooking odours and steam and keeps the kitchen cool and fresh. Ventilation is augmented by an electric fan set in the outside wall at the end of the canopy ducting. The canopy also conceals a steam-proof lighting system which illuminates the top of the cooker without glare.

On the 8-ft. wall under the window is a combined Hotpoint sink unit which incorporates, besides sink and draining boards, a clothes washer and wringer and a 20-gall. automatic water heater, which provides 6 gall. immediately and the full quantity of hot water in a very short time. A full description of this unit appeared in our issue of June 16th (page 850). To the right of the sink unit is placed an electrically heated drying cabinet, 2 ft. wide and 18 in. deep, which contains adjustable racks and shelves for wet clothes, towels and general laundry. The moisture-laden air from the top of the cabinet is taken outdoors through a short duct and cowl, thereby ensuring rapid and uniform drying. There are two 1-ft. lengths (60 W each) of tubular heater.

Warming System

To warm the kitchen a 500-W low temperature Unity panel heater has been inset in the ceiling. The control for this heater is grouped with the switches for the ventilating fan and the lighting for the cooker and a strip-light over the work table. Two-way switching for the general lighting is provided at the two doors. An electric clock is mounted on the cooker canopy.

Credit for the production of the planned kitchen is due not only to Mr. P. Sydney, manager of the company, and his staff, but also to the parent company, Edmundsons Electricity Corporation, Ltd., a large number of manufacturers, women's organisations and housewives too. The scheme is not considered final and constructive criticisms are welcomed, visitors being given questionnaires to fill in after they have seen it. As comparisons will almost certainly be made with the "Poplar" kitchen unit (with which Mr. R. Illingworth deals further in this issue), one of these has been erected alongside. Incidentally, it is claimed that, despite the greater facilities provided, the Cambridge unit can be produced more cheaply.

Apart from the planned kitchen, which is arranged as a part of a "Cookery Cottage," there is a model bathroom containing the latest type of Heatrae 12-gall. water heater for bath and hand basin and a Unity heated towel rail. Among a general display of labour-saving appliances are a Premier "Pylon" kettle with automatic resetting safety device, several types of cooker, a Heatrae 1½-gall. water heater, a Unity combined radiator and clothes airer and a B.T.H. refrigerator.

On Wednesday last week the exhibition was visited by the Mayor and Mayoress of Cambridge, Alderman and Mrs. W. L. Briggs, Sir Montague and Lady Butler, Lt.-Comdr. R. L. Tufnell, M.P., members of the Council, Mr. M. D. Bradford, chairman of the Cambridge Electric Supply Co., and other directors.

Power Station Sites

Support for Durham Scheme

THE North Eastern Electric Supply Company's proposal to erect a new power station at Kepier, near Durham City, continues to be the subject of local and national discussion. Support for the scheme has been expressed by farmers of the county who agree that the site chosen is the only possible one; they express the hope that every precaution will be taken to preserve the amenities of the district. It is emphasised that the country dwellers were in urgent need of electricity and water, the opinion being expressed that they are entitled to the same facilities as those enjoyed by townsmen.

The Durham Miners' Association has also approved the scheme on the grounds that it is imperative for Durham to maintain its industrial population and keep its place as an industrial county; a good supply of electricity would ensure this.

A resolution has been passed by the East Durham Planning Committee that the scheme should not be opposed if no suitable alternative site is available. It is suggested, however, that consideration should be given to an alternative site at Washington suggested by the Committee's engineer.

Other bodies which have urged that the scheme should be proceeded with are the Durham Rural District Council, the Brandon Rural District Council and the Durham City & District Trades Council.

Lincoln Extensions

Replying to a question in the House of Commons on Thursday last, the Parliamentary Secretary to the Ministry of Town and Country Planning said that Lord Portal was consulting the Minister of Fuel and Power and the Electricity Commissioners upon the proposal to erect cooling towers, etc., on a site in the neighbourhood of Lincoln Cathedral (the St. Swithin's station of the Lincoln Corporation).

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT a meeting in St. Louis which marked the sixtieth " birthday " of the American Institute of Electrical Engineers Dr. A. P. M. Fleming, who had flown from this country for the occasion, presented **Dr. Irving Langmuir** with the Faraday Medal awarded him by the (British) Institution of Electrical Engineers. At the same meeting the election of **Mr. C. A. Powel** (Westinghouse Electric & Manufacturing Co.) as president for the coming session was announced.

Mr. N. R. Elliott, borough electrical engineer of Gravesend, has been appointed to succeed **Mr. A. E. McKenzie** as borough electrical engineer of Wimbledon at a salary of £2,000 plus £250 for undertaking responsibility for the installation and the maintenance of engineering plant for other Corporation departments. Mr. Elliott was educated at St. Catherine's College, Cambridge, taking a tripos in both mechanical sciences and law (he is a barrister as well as an engineer). He began his career with Stephen Sellon & Partners, consulting engineers, Westminster, and was responsible for the carrying out of a £400,000 contract in Yorkshire. Later he served in the chief engineer's and managing director's departments of the London Underground Companies and then went to the London and Home Counties J.E.A. as personal assistant to Mr. F. W. Purse, the chief engineer.

Mr. N. R. Elliott

His next post was that of commercial assistant to the late Mr. W. B. Woodhouse, managing director of the Yorkshire Electric Power Co., with whom he remained until 1936 when he became deputy engineer and manager of the Ilford Corporation undertaking. Upon the retirement of the late Mr. C. F. McInnes in 1939 he was appointed borough electrical engineer of Gravesend. Mr. Elliott has contributed articles to the *Electrical Review* on the subject of bulk supply charges.

Gravesend Corporation is advertising for a successor to Mr. Elliott. The salary offered is in accordance with the " Walker Scale," at present £1,422 per annum, and will be paid from the date of taking up duties.

Mr. A. E. McKenzie has been at Wimbledon for twenty-two years, having succeeded the late Mr. H. Tomlinson-Lee in 1922. He was born at Southampton in 1878 and was educated at Hartley College in that town, at Finsbury Technical College and the Manchester Technical College. In 1901 he was appointed assistant engineer to the County of London Electric Supply Co., and in the following year went to Manchester as resident engineer later becoming deputy chief engineer. From 1919 to 1922 he was chief engineer on the staff of C. P. Sparks & Partners, the consultants, then going to Wimbledon where, since his advent, development has been extraordinarily rapid. Mr. McKenzie is a past chairman of the North-Western Centre of the I.E.E. and of the Council of the British Electrical Development Association and has been chairman of several E.D.A. and B.S.I. Committees. He is receiving a superannuation allowance of £2,056 per annum.

Mr. A. E. McKenzie

I.M.E.A. Appointments.—The postponement of the annual meeting of the Incorporated Municipal Electrical Association involved the postponement of the election of officers. The Council has, however, received the resignation of Mr. F. Newey (Lincoln) and has appointed as president for 1944-45 Mr. W. P. Lilwall (Fleetwood) who had already been nominated. Alderman W. Walker (Manchester) has been appointed vice-president. Members of the Council due to retire have also resigned and the following appointments and re-appointments have been made: Group "A".—Alderman Capt. C. Saer and Messrs. A. J. C. deRenzi and F. Swarbrick. Group "B."—Alderman G. B. Brooks and Messrs. J. S. Pickles and W. A. Royle. Group " C."—Alderman A. Lester Boddington, Councillor Lt.-Col. H. A. Sale and Messrs. L. Romero and J. W. J. Townley. These gentlemen will serve until the date of the next annual general meeting. The casual vacancy on the Council (Group " B ") caused by the death of Councillor H. M. Cassells has been filled by the appointment of Alderman J. R. Potts.

Mr. G. J. Evans (Pontypridd) and Mr. P. E. Rycroft (Great Yarmouth) have been elected associated members of the I.M.E.A.

Mr. A. R. Walker, who has been acting city electrical engineer of Chichester, since the death of Mr. R. V. Weare last year, is retiring and the City Council is advertising for a new city electrical engineer and manager. The salary will be in accordance with the National Joint Committee's agreement (at present £1,013 per annum) but, under Clause 10, 85 per cent. will be paid for the first year, 92½ per cent. for the second and the full rate thereafter.

Mr. H. J. Cash recently intimated that he wished to retire from the Council of the Electrical Contractors' Association although he will remain a member of several important E.C.A. committees. At a Council luncheon on July 19th Mr. Cash was presented by his fellow members of the Council with a gold wristlet watch and a radio set as a mark of appreciation of his valuable services to the Association. Mr. Cash was president in 1918-19 and 1919-20 —two most difficult years. He is vice-chairman of the I.E.E. Wiring Regulations Committee and has been an active member of the N.R.E.I.C.

Board since its inception. A portrait in oils of Mr. Cash by Mrs. Kent Harrison (daughter of the late Mr. Howard Marryat) is being added to the collection of portraits of past-presidents at Africa House, Kingsway, the Association's headquarters.

Mr. T. O. Orr has resigned his position with the Directorate of Industrial Electrical Equipment of the Ministry of Supply and has joined the export department of Lancashire Dynamo & Crypto, Ltd.

Because of ill-health **Mr. W. K. Whigham** has resigned from the North of Scotland Hydro-Electric Board, on which he has represented the Central Electricity Board, and **Sir Duncan Watson**, J.P., M.I.E.E., has been appointed to take his place. Sir Duncan, who received his knighthood in 1927, is chairman of Duncan Watson (Electrical Engineers), Ltd., and of a number of other companies.

At a recent meeting of the National Executive Council of the Electrical Power Engineers' Association it was intimated that **Mr. W. Arthur Jones**, the general secretary, was willing to continue in the service of the Association beyond next January when he would be eligible for pension. **Mr. G. W. Essex**, the assistant general secretary, had stated that he would be unable to succeed Mr. Jones for domestic and health reasons. It was decided that Mr. Jones should continue in his present position for twelve months from January 1st next; that Mr. Essex should be transferred to the position of national negotiations secretary, thus becoming secretary of the staff side of the National Joint Board; that **Mr. J. F. Wallace** should be appointed assistant general secretary and a new assistant secretary appointed to take his place in the Northern Area; and that as soon as practicable an assistant secretary should be appointed for the North-Western Area. As we have reported, an advertisement for two assistant secretaries has already appeared.

At the same meeting it was resolved that **Mr. W. J. Oswald** should be given an appreciation on vellum of his services to the Association during the past twenty-five years together with a grant of £50.

Mr. J. W. Ridgeway (manager of the Radio Division of the Edison Swan Electric Co., Ltd.) has been appointed chairman of the British Radio Valve Manufacturers' Association for a third year.

At the August 1st meeting of the Council of the City and Guilds of London Institute the Fellowship of the Institute was conferred upon Mr. Julian L. Baker, F.R.I.C., Mr. E. Bate, B.Sc., Sir George H. Nelson, M.I.E.E., Sir James Scott Pringle, K.C.B., O.B.E., M.I.E.E., and Mr. F. S. Whalley, M.C., M.I.E.E.

Mr. G. H. Bowden, A.M.I.E.E., informs us that he has arrived back in England from South Africa. His present address is 15, Belvedere Road, Bristol, 6.

Mr. Joseph Sales, who has retired from the Stafford works of the English Electric Co., Ltd., where he had been employed as a tool maker, after fifty-nine years service, was recently presented by Mr. J. W. C. Milligan, manager of the works, on behalf of the directors and management, with a testimonial inscribed with his years of service and the date of presentation. Mr. Sales entered Siemens' works at Woolwich in 1885, and was transferred when the Stafford works were opened in 1903.

Mr. R. P. Hilton, of the London office of Bruce Peebles & Co., Ltd., who has been injured by enemy action, wishes to thank all those friends who have kindly written to him and regrets that as he is still in hospital he is unable to write to them personally. He is making satisfactory progress.

Mr. William Bird, managing director of the Engineering & Lighting Equipment Co., Ltd., is to be married at Ayr Old Church, Scotland, on September 5th to Miss Elizabeth Macdonald, a director and secretary of the same company.

Obituary

Mr. J. Snow Huddleston.—By the death of Mr. Johnson Snow Huddleston on August 5th the electric cable-making industry has lost one of its best-known members. Mr. Huddleston was born at Lincoln in 1872. He was apprenticed to Siemens Bros. & Co., Ltd., in 1889 and later, from 1893 to 1896, worked for the company on outside cable contracts in many towns. He joined the sales side of the cable department in 1897 and had an office at Queen Anne's Gate. He remained with Siemens Bros. until 1918 when he became general manager of the Union Cable Co., Ltd., being appointed managing director in 1932. Shortly afterwards he was made managing director of Southern United Telephone Cables, Ltd., and chairman of United Telephone Cables, Ltd., holding these positions until shortly before his death. He was also a director of other companies in the cable industry.

Mr. Huddleston was an active member of the Cable Makers' Association from its inception and he served as chairman in 1925 and 1935. During the last war he joined the R.N.V.R. and served in France and Belgium He was a freeman of the City of London and a member of the Worshipful Company of Horners and of the City Livery Club.

The many friends which Mr. Huddleston made in the industry, especially at conferences, will greatly miss him.

Mr. C. M. Johnston.—The death occurred at Shrewsbury on August 2nd of Mr. Charles Morison Johnston. He was for forty years the Shrewsbury Corporation's electrical engineer and manager and retired in 1938, when the undertaking was taken over by the West Midlands Joint Electricity Authority. He was a native of Newcastle-on-Tyne and, before going to Shrewsbury in 1899, had been electrical engineer to the Lancaster Corporation. On his retirement from the Shrewsbury position, he became a consulting engineer. Mr. Johnston was seventy and leaves a widow, two sons and a daughter.

Mrs. E. Kilburn Scott. — The death is announced, at the age of seventy-eight, of Clara Emily, widow of Mr. Ernest Kilburn Scott, M.I.E.E., who died in 1941.

Will.—The late **Mr. O. S. Nichols**, manager at Sheffield, and formerly at Birmingham, for the British Thomson-Houston Co., Ltd., who died on April 12th, left £8,111 (£7,838 net personalty).

CORRESPONDENCE

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

Technical Writing

THE contribution by Mr. G. E. Williams to the May issue of the I.E.E. *Journal* on "Technical Writing" which you discussed in your admirable editorial of July 7th should certainly be of interest to every engineer, whether he is a budding author or just the occasional compiler of everyday technical reports—which must, after all, also be tolerably readable. While I agree, however, that any conscious striving after literary effect should be avoided, a fluent and easy style is always desirable and helpful. So often a paper on an original and interesting subject is spoilt by inadequate presentation. In this connection, I am thinking less of the mathematical type of article appearing in scientific journals, than of the more generally informative contributions to technical literature.

In my opinion, the art of literary expression can best be acquired by constant reading of good English literature. Quite apart from the resulting enlarged vocabulary, this gives a sense of style and rhythm together with the kind of taste which would eliminate purely literary "padding" from a technical article as being unsuitable and out of place.

Unfortunately, the educational system at present is hardly calculated to provide engineers with a cultural background of this kind. The complete neglect of English and literature in most secondary schools after the School Certificate—which is taken at the age of 15 or thereabouts—for the purpose of premature specialisation in scientific subjects, is now frequently deplored. Specialisation is carried further in the engineering faculties of our universities, where time and opportunity for a more general education were, even before the war, all too limited.

It is to be hoped that post-war reforms will provide for a broad and comprehensive education, enabling young people to express themselves freely on any subject, and also giving them a fuller and less one-sided outlook on life.

Renishaw, Derbyshire. W. HEYMAN.

Post-War Development

MR. DERENZI'S admission of part responsibility for the preparation of the White and Brown Memoranda is no doubt of interest to central station owners (if not already known to them), but his letter throws no new light on the subject. He must derive cold comfort from the fact that "after the long and serious consideration it has given to these proposals" the members of the I.M.E.A. Council are pulling both ways.

The question, "Does the I.M.E.A. Council know where it is going?" still seems to be a pertinent one. Might I suggest the answer: "Towards disruption"? ELECTRON.

Power Plans in Chile

From a Santiago Correspondent

CHILEAN development plans include electrical and power engineering projects which are regarded in Santiago as among the most important undertakings now being considered for the welfare of the Republic. Exploratory surveys begun some four years ago from Arica to Puerto Montt have revealed hydro-electric resources with an approximate total capacity of 6,000,000 kW. At present only about 145,000 kW is being used.

During the first stage of the development scheme it is proposed to install 745,000 kW of plant. Total expenditure is estimated at 2,400,000,000 pesos. The plan adopted by the Corporation for the Development of Production, a quasi-official organisation established a few years ago, includes the construction of central stations and primary distribution lines, rural electrification networks and mechanical irrigation installations.

Under the primary distribution plan the country is divided into seven large geographical areas. Central stations at Sauzal, Abanico and Pilmaiquen, together with transmission lines and primary substations are now under construction and are expected to cost some 340,000,000 pesos. The central station at Sauzal, on the Cachapoal River, will contain three units with a total capacity of 100,000 HP and will provide power for the Chilean Electric Company, which supplies Valparaiso, Aconcagua, and Santiago. The capital cost of this station is approximately 150,000,000 pesos, exclusive of the cost of transmission lines.

Work Already Started

The Abanico station is now under construction and the United States Government has authorised the manufacture of the necessary hydro-electric equipment. It will develop 150,000 HP and a 160-km transmission line will link the plant with Concepción to supply power to the area between Los Angeles and Chillan as well as Concepción, Chiguayante, Tome, Lirquen, Penco (the coal zone), Talcahuano and the naval base. The cost will be about 135,000,000 pesos. The station at Pilmaquen will have an initial potential capacity of 12,000 HP, to be increased to 48,000 HP, the cost being approximately 54,000,000 pesos.

The working out and execution of the electrification plan have been undertaken entirely by Chilean technicians, engineers and workmen. The Corporation for Development of Production has erected factories at Osorno, Ovalle and Talca for making concrete posts for use in the construction of transmission lines. Loans to the amount of 6,000,000 pesos have been granted to municipalities and electricity supply companies for the improvement of existing installations or the establishment of new services.

Plugs and Sockets

Views of Installations Study Committee

LAST week we referred to the delay in the publication of the report of the Electrical Installations Study Committee. This is still not expected for a few weeks but in view of the considerable discussion which there has been on domestic plugs and sockets it has been felt that the Committee's views on this particular matter, which have formed the subject of a supplementary report, should be given at once.

In its study of the subject the Committee had received the views of the Electrical Contractors' Association and the electricity supply associations, but it felt that it was desirable to approach the individual supply undertakings and, through the Electrical Development Association, circulated a "questionary" on the subject to all undertakings in Great Britain and Northern Ireland.

One Meter Only

The Committee's main report is based on the assumption that generally domestic tariffs will be such as to require the use of one meter only, leading to simplification of the wiring system. It is evident that there is a desire for a single size and type of plug and socket for all portable lamps and domestic appliances in the smaller type of house and that with the advent of so much new building now is the time to settle the question.

Evidence showed that few, if any, portable appliances of more than 2-kW rating are used in smaller houses. Higher-rated non-portable appliances—cookers, water heaters, etc.—have their own fixed wiring. It was therefore felt that a rating of 10 A should be sufficient. The 5-A three-pin B.S.S. plug and socket have been used for 10 A by one or two undertakings and some manufacturers considered that with a tightening up of the B.S.S. (No. 546) they could be rated at 10 A thus avoiding the necessity for new jigs and tools for the production of a new standard. But not all of the existing accessories could be so rated and sockets incorporating a 5-A switch would definitely be unsuitable. The proposed uprating is strongly opposed by the contractors' organisations and other users.

Room Circuits

The Committee recommended that, for economy and flexibility, all socket-outlets in small houses should be on ring or room circuits. This would be a departure from I.E.E. Regulations and would necessitate the fusing of the plugs or sockets. If the existing 5-A size were retained it would be necessary to have the fuse in the socket on account of the numbers of unfused plugs already in existence. But this would considerably increase the price of each socket-outlet and it is doubtful whether it would be so convenient to the user.

The Committee is of the opinion that too much attention should not be attached to the advantages or disadvantages of using the existing standard. The design agreed upon should be suitable for all requirements and should be generally used in new domestic installations so that within a reasonable period of years the present confusion would be largely eliminated.

Evidence was provided by the questionary that a 3-kW outlet is sometimes required. It is considered that the existing 15-A B.S.S. plug is too cumbersome and that using more recent materials and technique it is possible to make a 3-kW (13 A at 230 V) socket-outlet without exceeding the overall dimensions of the present 5-A standard plug and socket. The Committee thinks that in future all plugs and flexibles should be rated in kilowatts at 230 V. If a new standard is decided upon it should be non-interchangeable with anything else.

The Committee has invited the British Electrical and Allied Manufacturers' Association to proceed, as a matter of urgency, with the preparation of basic designs for a 3-kW plug to form a basis for joint discussions prior to the submission of a request to the B.S.I. for the preparation of an agreed standard.

Summary of Replies

Replies to the ten questions put to them were received from 350 undertakings, supplying about 85 per cent. of the consumers of the country. The views of the majority may be summarised as follows :—

(1) The present position with regard to plugs and sockets is unsatisfactory, is inconvenient to consumers and is hampering development.

(2) A standard domestic socket-outlet suitable for all portable lamps and appliances should be adopted.

(3) A number of socket-outlets should be used on a single circuit with local fuses.

(4) A completely new standard socket-outlet, not interchangeable with any existing standard, or an alternative of a 10-A standard with pin spacing and dimensions the same as the existing 5-A three-pin standard are favoured.

Questions (5) and (6) asked for an estimate of the number of 5-A plugs in use in each undertaking's area and the number of domestic consumers.

(7) A majority is in favour of a 3-kW (13-A) plug as against a 10-A rating.

(8) The local fuse is preferred by most undertakings to be in the plug rather than the socket.

(9) About two-thirds of the responding undertakings (on a "consumer-weighted" basis) prefer round to flat pins.

(10) A very large proportion (94 per cent.) agree to accept the majority opinion on the most desirable type of socket-outlet and to adopt it for general future application.

In the course of examination of the question as a whole a number of points of technical detail have been noted by the Committee. The provision of protection for sockets is mentioned. It is considered safe on AC circuits to disconnect by withdrawing the plug ; but it might be desirable to have an alternative design incorporating a switch. The socket-outlet connection terminals should accommodate a 7/·029 cable looped in and out of a "spur" connection if required, *i.e.*, three 7/·029 cables.

It is recommended that the sockets should be mounted well above floor level and the plug should have its flexible connection entry at the bottom. Resilient members of the combination should be incorporated in the socket and if solid pins are used they should not be slotted.

As the plugs and sockets may be used on ring circuits, provision should be made in the plug for a 13-A cartridge fuse and alternatively for a 3-A fuse which should be readily interchangeable and identified.

It is desirable, if possible, that the new standard socket should fit into an existing standard connecting box. The plug should accommodate satisfactorily circular flexible cords of the 23/·0076 in. or 70/·0076 in. sizes.

Electricity in New South Wales

Questions of Control and Post-War Developments

RENEWED attention is being directed to the future control and development of the electricity services of New South Wales which in the past has been the subject of numerous reports, notably one in 1937 by Messrs. Rendel. Palmer and Tritton, the London consulting engineers.

In 1941 a conference of local government representatives considered two proposals: one prepared by the Electricity Advisory Committee, outlined a new constitution for itself with greater executive and discretionary powers, and the other by Mr. W. H. Myers, chief electrical engineer of the N.S.W. Railways, proposed the formation of a generating and transmission commission, with distribution left in the hands of local authorities. The conference endorsed the principle of continued and extended control and management of the generation and transmission of electricity by local authorities, rejected Mr. Myers's proposal and approved that of the Electricity Advisory Committee. According to the *Electrical Engineer and Merchandiser*, the Local Government Association of N.S.W. has recently circulated the resolutions passed at the conference, urging that action should be taken to set up the revised Electricity Advisory Committee.

At a recent meeting of the Sydney County Council the chairman tabled a resolution, which was approved, expressing the Council's opinion that there was an urgent need for a strong, permanent body to control electricity in the State.

In a paper presented to the Sydney Division of the Institution of Engineers recently Mr. Myers contended that the formation of a body similar to the Central Electricity Board of Great Britain, but on a smaller scale, would be almost ideally suited to meeting the administrative needs of the major electric power services of the State and would reduce fairly rapidly the cost of electricity to the community as a whole. He gave figures showing that the total generation of electricity in the State in 1942 (2,099 million kWh) was almost equally divided between Government and local authorities.

Dealing with plans for meeting the growth of demand in the next twenty years, Mr. Myers gave as the two major developments required a new base load coal station at Lake Macquarie, serving Sydney and Newcastle by a 165-kV and quadruplicate 66-kV lines respectively, and a new 165-kV interconnecting line between Lake Macquarie or Newcastle and Brisbane, with 66-kV secondary lines along the route. Other schemes mentioned were the development of the potential power in the Snowy River waters and conversion of existing railway routes to electric traction.

Assuming a 50 per cent. increase over pre-war costs, tapering to 25 per cent. in four or five years, he gave the following rough costs:—Power plant and transmission lines to meet the growth of demand in Sydney and Newcastle, £8,000,000; 66-kV line between Newcastle and Nymboida stations, £300,000; Snowy River development (mainly civil engineering work), £200,000; transmission line, Newcastle to Brisbane *via* New England tablelands (surveys), £10,000; railway electrification, Sydney to Newcastle, £2,500,000; railway electrification, Sydney to Lithgow (control work), £100,000; 66-kV lines in western areas, £230,000; Wyangala hydro station (now in hand), £140,000; and miscellaneous 66-kV lines, £400,000, a total of £11,900,000.

Plant Protection at Glasgow

THE general manager has reported to the Glasgow Electricity Committee that the brick and reinforced concrete structure for the protection of plant at Dalmarnock power station has now been completed and that the final measurement showed an excess of £588 over the contract price of £8,483. This was principally accounted for by increased wages and cost of materials and further amendments to the design to provide additional safeguards.

COMMERCE and INDUSTRY

War Damage Payments. Joint Committee and Planning.

I.M.E.A. Annual Meeting

IT has been decided that the annual general meeting of the Incorporated Municipal Electrical Association shall be held in the Provinces on Thursday, September 14th; the place and time will be announced later. The meeting was to have been held in London on June 22nd, but was postponed. The Council's report for 1943-44 was summarised in the *Electrical Review* of June 16th (p. 839).

Damaged Business Premises

Last week the Chancellor of the Exchequer saw a deputation from a number of bombed towns who expressed the view that owners of business premises damaged by enemy action were treated less favourably than owners of dwelling houses. Sir John Anderson assured them that provided the business premises were structurally sound and adequately equipped for their purpose and did not represent a wasteful use of the site they would qualify for cost of works payments under the test prescribed in Section 7 of the War Damage Act, 1943. The War Damage Commission was satisfied, on present evidence, that the test was producing the intended result. The Commission was ready to reconsider any case provisionally classified as qualifying for a value payment where the owner had good reason to think that that classification was wrong.

Electrodes for Welding

Electrodes for arc welding mild steel (by hand) are classified according to operating position and their suitability for deep penetration in a 16-page booklet issued by the British Electrical and Allied Manufacturers' Association (publication No. 119, price 1s.), 36, Kingsway, London, W.C.2.

The electrodes are grouped in five selected ranges of positions in which they are intended to be used, which are defined and illustrated by means of sketch diagrams. The expense of bevelling the edges of plates that are to be butt-joined can in some cases be avoided by the use of appropriate electrodes, which are capable of a greater depth of penetration than is normally obtained. Certain types used for making fillet welds also have this characteristic. Both these classes are indicated in five pages of tabulated data, the qualifications to be satisfied before an electrode can be deemed to be deeply penetrative being stated. All the electrodes listed in this publication conform to the requirements specified in B.S. 639.

Electricity Supply and Planning

A memorandum prepared by the Joint Committee of Electricity Supply Organisations on the Town and Country Planning Acts, 1932 and 1943, and proposed legislation is published as a supplement to the July *I.M.E.A. Journal*. This stresses the desire of electricity supply authorities to co-operate in planning schemes but puts forward a number of directions in which their interests should be considered. In the first place it is suggested that they should be given proper representation on planning bodies and it is maintained that the protection afforded by the 1932 Act should be retained. It goes on to deal with such matters as the acquisition of land, compensation for costs incurred due to the operation of planning schemes, interim development restrictions, the reconstruction of areas destroyed by enemy action, and reimbursement for expenditure which undertakings may be required to make by planning authorities.

Summaries are given of the provisions of the Town and Country Planning Bill, 1944, and the Town and Country Planning (General Interim Development) Order, 1944.

Industrial Lighting Fittings Prices

On and after September 1st, until further notice, the following will be subject to a war-time advance of 45 per cent. on pre-war list prices, in place of the previous 33⅓ per cent. advance:—Cast-iron watertight fittings; hand lamps (all types); and ships' fittings of the industrial type.

Venezuelan Imports

The *Board of Trade Journal* states that by a recent presidential decree a number of classes of goods have been exempted from the requirement of prior import permits upon importation into Venezuela. These include "electrical installations" and accessories, generators, transformers, electrical measuring instruments, accumulators and parts, insulating tubes, bulbs, refrigerators and radio transmitting and receiving apparatus.

West Hartlepool Apprenticeship Scheme

The West Hartlepool Corporation has adopted an apprenticeship scheme to be applied to all Corporation apprentices. The scheme has been submitted to various trade unions, including the E.P.E.A. and the E.T.U., which have approved the plan. Apprenticeship will start at sixteen and end at the age of twenty-one.

Glasgow and E.D.A.

The Glasgow Corporation Electricity Committee at its last meeting again deferred consideration of resumption of membership of the British Electrical Development Association until a future date.

Mysore Power Scheme

A report in *Great Britain and the East* states that the four Indian engineers employed on the Jog Falls hydro-electric scheme, Mr. J. L. D'Sa, Mr. P. Mariappa, Mr. K. S. Sivaprakasam and Mr. K. Ramchandra Setty, who have been in England for the past fourteen months helping the manufacturers who are supplying the machinery, have now left on their return to India. Mr. Sivaprakasam and Mr. Setty, the electrical engineers of the party (the other two being mechanical engineers) have spent much time in inspecting wartime electrical research.

On their return to India the four engineers

will have the responsible task of setting up and bringing into operation the machinery for Mysore's new undertaking. The contract for the machinery was placed with the British Thomson-Houston Co. and Boving & Co., covering turbines, generators, transformers, and switchgear. There are four 14-pole alternators, each rated at 15,000 kVA (12,000 kW at 0·8 power factor), 11,000 V, three-phase, 50 cycles. They will be driven by water turbines at 428 RPM. It is expected that the first of the four alternators will reach India in time to be in operation in about six months from now. The others will follow as soon as possible.

Farm Motors

It is not appreciated so generally as it might be that an electric motor costs less, has a much longer useful life and needs far less attention than an internal combustion engine of the same HP for driving fixed and semi-portable machines on farms. A standard motor, which is usually in stock, is obtainable from Higgs Motors, Ltd., for driving most farming appliances as briefly described in an 8-page leaflet just issued. A standard gear-box is also available for use when the driven appliance operates at a very low speed.

Australian Tungsten Wire

The production of tungsten rod and wire in Australia, which had been short of these products, was referred to by Prof. J. Neill Greenwood at a meeting of the Australasian Institute of Mining and Metallurgy. He said that advantage had been taken of the progress made by the Broken Hill Pty. Co., Ltd., in the extraction of highly purified tungstic acid from Tasmanian wolframite to develop the production of tungsten rod and wire in Australia.

Wire-drawing Dies

In collaboration with the Diamond Die and Tool Control of the Ministry of Supply, the British Standards Institution has issued WE/B.S. 1168 for diamond dies for wire drawing. It relates to dies of the non-reinforced type with bores up to 0·06 inch diameter and defines the quality of the stone as well as appropriate minimum wall thicknesses and the smallest allowable weights for various bores. The finish of the hole and its dimensional accuracy are prescribed, while notes are included on methods of examining and measuring dies. The essential dimensions of die cases are also specified, together with a system of marking for indicating the size of the die and the material it is intended to draw. An appendix contains detailed diagrams of typical profiles of die bores for drawing copper, bronze, resistance steel and tungsten wires. Copies of the document are obtainable for 2s. post free from the British Standards Institution, 28, Victoria Street, Westminster, London, S.W.1.

American Importing Organisation

The Westinghouse Electric International Co., which for more than 25 years has operated in the international field as an exporter, has now entered the import field, according to an announcement by Mr. John W. White, president of the company. Mr. White said that they proposed to use their world-wide organisation as the basis for conducting a general import business. The company was well fitted to carry on this type of trade because of its long international experience and by this move would do its part in furthering reciprocal trade among nations. Instead of the old "one way street" it proposed to open a wide two-way highway for future foreign trade.

Mr. Hampton C. Marsh, who has been appointed manager, said that the new department had already started import negotiations in some of the foreign countries which were free to participate in trade under war conditions. Later the company plan to offer representation in the United States for firms abroad. It was thought that this method of dealing would cause foreign business men to look more kindly upon American industry, with a resultant stimulation of international trade as well as develop more friendly relations diplomatically. It was expected that most of the company's imports would be raw materials, with few manufactured articles brought in. Careful studies would be made to avoid importing goods which would compete with American industry.

English Electric Works Savings

Works savings groups operated by the English Electric Co., Ltd., have now passed the £750,000 mark. These groups, which have shown a continuous improvement since their inception in 1940, have membership up to 91 per cent. of employees and collectively represent one of the strongest industrial groups in the country. A great effort will shortly be made to step-up contributions in the hope of reaching £1,000,000 by the end of 1944.

Trade Announcements

Aerialite, Ltd., states that a fire which occurred in its factory on July 28th was confined entirely to the stores, and has not affected its production department. The company is now functioning as normal.

The name of Alliance & Surrey Wholesale, Ltd., has been changed to Alliance Wholesale, Ltd.

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be received within a month from August 2nd:—

NUELAM. No. 628,893, Class 9. Electric battery and accumulator jars made of laminated paper, of synthetic-resin impregnated paper; or synthetic-resin impregnated textile material or a combination of these two materials.—United Ebonite & Lorival, Ltd., Springside Works, Little Lever, near Bolton, Lancs.

R.E.A.L. (design). No. 628,502, Class 11. Electric radiators, electric lighting apparatus; fittings and parts thereof not included in other classes.—Rowlands Electrical Accessories, Ltd., R.E.A.L. Works, Hockley Hill, Birmingham, 18.

SYNFRED. No. 628,568, Class 17. Insulating varnishes, insulating materials. — Pinchin, Johnson & Co., Ltd., Witley Court, Witley, Surrey.

Universal Machine Set

Laboratory Equipment for Electrical Engineering Students

By G. N. Patchett, B.Sc., Graduate I.E.E.

THE apparatus described in this article was designed to enable experiments to be carried out on many different types of machines without incurring the large initial outlay of buying one of each. The present difficulty of obtaining machines and finding space for them was also an important consideration.

Two identical 2-kVA two-pole single-phase rotary convertors, formerly required for supplying AC for radio work, were used. These were of the separate-winding type (*i.e.*, two electrically separate windings on the same armature), designed for 230-V DC input and 230-V AC output at approximately 50 cycles per sec.

The two machines were connected through a chain coupling and mounted on a common channel-iron bed plate, one rigidly and the other in trunnion bearings made from two ball races fitted to collars bolted to the frame of the machine. The "swinging" machine was arranged as a dynamometer by attaching to it a torque arm which, in turn, was attached to a spring balance; the latter could be removed and the machine locked in any position over an angle of 180 deg. A pointer indicated the electrical angle between the two field systems. The two armatures were so adjusted that they were electrically in line, so that the angle shown by the pointer also indicated the electrical angle between the induced voltages in the armatures. The machines were compound wound with field windings brought out separately so that the compounding winding could be connected so as either to oppose or to assist the shunt winding.

Speeds, Voltages and Currents

The following tests and characteristics can be obtained when No. 1 (fixed-frame) machine only is used: Speed and armature-voltage of DC motor with constant field current; speed and field current of DC motor with constant armature voltage; and the efficiency and regulation of rotary convertor.

In a second series No. 1 machine is employed as a motor and No. 2 machine, locked rigidly to the bed plate, as a generator in order to ascertain: Speed and voltage of DC generator, separately excited and shunt excited; field current and voltage of a DC generator, speed being constant; voltage and load (regulation) of shunt and compound generators; voltage and speed of alternator, field current being constant; voltage and field current of alternator, speed being constant; regulation of alternator with different magnitudes and power factors of load; efficiency and regulation of DC motor generator, of DC motor and AC generator, and of AC motor (synchronous) with DC generator and with AC generator; shunt- and crossed-field DC three-wire balancer.

Obtaining Efficiencies

From a third series, using No. 1 machine as a motor and No. 2 machine as a dynamometer, there can be obtained: Speed and load characteristics of shunt and compound motors: efficiency at various loads of shunt and compound motors; efficiency of synchronous motor; efficiency of shunt and compound DC generators (input measured by torque arm); efficiency of alternator; effect of power factor on driving torque of an alternator.

In a fourth case No. 2 machine is used on its swinging frame. Regarding No. 1 machine as a DC motor, two AC voltages are obtained, one of which may be varied in magnitude (by changing the field current) and in phase (by swinging No. 2 machine) relative to the other; these may be used to show phase difference on a cathode-ray oscillograph and can also be employed for experiments in vector addition.

By locking No. 2 machine at an angle of 60 deg. a type of three-phase supply may be obtained. The two windings are connected at one end to form an open delta connection, so that voltages at the three terminals are 120 deg. apart; although this does not give a true three-phase supply it may be used for running an induction motor or showing a rotating field. The method of obtaining a two-phase supply is by setting No. 2 machine to 90 deg.

Other Possible Uses

This list does not include all possible experiments and many of the less common, such as separation of losses in an auxiliary motor and those which can be done on any DC machine, have been omitted. If machines were specially built for this purpose a series-field winding enabling series motor and generator characteristics to be taken would, I think, be worth while. Other experiments could be carried out, for instance, by the use of two multi-phase rotary convertors or by coupling an induction motor to the same shaft.

Fuel in Industry

Progress of Efficiency Campaign

A REPORT on the progress of the fuel efficiency campaign during the eighteen months to the end of December last has been issued in pamphlet form (F.E.C. 246/1) by the Ministry of Fuel and Power. The report is submitted by the Committee on the Efficient Use of Fuel, under the chairmanship of Dr. E. S. Grumell, C.B.E., which was originally set up by the Secretary for Mines in 1941.

When the Ministry of Fuel and Power was created in June, 1942, the Committee recommended that the newly appointed Regional Controllers of the Ministry should be requested to set up district Fuel Efficiency Committees whose members, in collaboration with the whole-time engineers of the Ministry, should undertake the systematic inspection of all industrial undertakings in the same way as was already being done in North Wales. This proposal was adopted and during the period covered by the report 11,680 factories consuming in the aggregate 39 million tons of coal a year were visited, with 4,951 follow-up visits.

Estimate of Potential Savings

The engineers' estimates of the savings that would result from the carrying out of their recommendations averaged about 10 per cent., or nearly 4 million tons per annum. This does not include economies in gas, electricity and fuel oil which have resulted from the co-operation of representatives of these fuel-supplying industries with the Regional Fuel Efficiency Committees. It is pointed out that often more urgent than any increase in thermal efficiency is the extent to which substitutes for the types of coal in short supply can be assimilated, and a large proportion of the effort, especially of the Ministry's whole-time engineers, has been devoted to this aspect.

Dealing with the regional organisation, the report says that there are some 700 members of the Regional Fuel Efficiency Committees and their panels carrying out the inspection of over 1,500 factories a month. The original staff of eight district engineers placed at the disposal of the then Mines Department by the Coal Utilisation Joint Council has been increased to forty-six and to these are being added, as the result of a recommendation made by the Sibly Committee, some twenty junior fuel engineers, recent science graduates who have been given a short intensive course in fuel technology. The activities of the regional organisation have been enhanced by the work of the fuel efficiency committees set up by trade associations, numbering about fifty.

The foregoing activities have been primarily directed towards " general " industry. Although the aggregate consumption of the major coal-using industries—gas, electricity, coke-ovens, railways, collieries, iron and steel, etc.—exceeds that of general industry, it is realised that the scope for economy is not proportionately so great. Meetings have, however, been held with each of the committees which these industries have set up. It is considered that often the greatest progress has been made by arranging for technical help to be given to the smaller units by the officers of the larger ones, and a system of this kind organised by the gas industry is cited. The main-line railways and the L.P.T.B. have formed a fuel efficiency committee which has held a series of meetings, and a joint committee with the Ministry has been established by the coal-mining industry.

Dealing with the training scheme, the report states that up to the end of last year enrolments totalled 13,908 (4,601 during 1943) and lecture courses have been held at 119 centres. A later development has been specialised lectures on various aspects of power and heat utilisation adapted to the needs of particular regions. The problem of providing the right instruction for boiler house operatives has been solved by making a short film on boiler house practice which has had a most favourable reception. The Committee is strongly of the opinion that the use of this method should be extended, and films on steam utilisation and the operation of furnaces are planned. The absence of a comprehensive handbook on the efficient use of fuel was found to be a great handicap and one of the Committee's major preoccupations has been the preparation of such a book.

Finally, reference is made to the assistance of technical sub-committees in preparing short pamphlets on various aspects of fuel technology, and the titles of twenty-eight of these bulletins are listed in an appendix. The Committee comments that there is still a regrettable lack of information on the performance and advantages of even the commonest types of fuel-burning appliances. While its work has been primarily directed to improvements in the operation and maintenance of existing plant, its survey has revealed many gaps in existing knowledge and points the way to permanent improvement in the utilisation of the nation's fuel resources.

The report is dated January, 1944, but as it has only just appeared one passage calling for the maximum effort by propaganda and other means to prevent any relaxation of the will to economise " during the coming summer " is a rather tardy exhortation.

Radio Cut to Save Electricity

ALL broadcasting stations in New Zealand are closed down for certain periods during the day to assist in the conservation of electricity. According to a report in the *New Zealand Electrical Journal*, a third week-day " silent period " became effective on May 22nd, making in all two hours daily—8.15 to 8.45 a.m., 11 a.m. to noon and 5.15 to 5.45 p.m. In a joint statement the Minister of Munitions (Mr. Sullivan) and the Minister of Broadcasting (Mr. Jones) said that the consumption of electricity by broadcasting stations was comparatively small, but the total consumption of receiving sets was considerable, and an appeal was made that the public should co-operate by switching off their sets.

Organisations of the Industry—VIII

Electrical Power Engineers' Association

By W. Arthur Jones,
A.M.I.E.E., General Secretary

THE younger generation of supply engineers have probably no conception of the conditions which prevailed in the electricity supply industry in the early years of this century, and, therefore, cannot form an accurate idea of the changes which have been brought about, particularly since the formation of the E.P.E.A. in 1913.

In February, 1913, there was published in the columns of the *Electrical Review* an article entitled "Holidays in Central Stations," giving particulars of the salaries, hours of employment and holidays of charge engineers and switchboard attendants in twenty-eight undertakings with a capacity of 1,000–2,000 kW and nineteen undertakings

Left: Mr. Stanley Gough, President of the E.P.E.A. Right: Mr. W. Arthur Jones.

between 3,000 and 4,000 kW. It was shown that the lowest salary in the first group for a charge engineer was 25s. per week, whilst the highest was £160 per annum. In the second group the lowest salary was 35s. per week, whilst the highest was £200 per annum.

With regard to hours of duty, the prevailing custom in those times was to consider it essential for a charge engineer to be available during the whole period that the station was running, and, therefore, the average hours per week of charge engineers were fifty-six, as only three of them were usually employed. In some stations where there were fewer than three the average hours per week were as high as sixty-four or more. When one man had any time off, his colleagues had to work overtime without additional remuneration, though slight modification of this occurred in some undertakings when, on periods of light shifts, the switchboard attendant or junior charge engineer would take over the charge engineer's duties. There were certainly a few stations where the forty-eight hour week had been put into operation, but in only five of the forty-seven undertakings referred to was this the case.

The engineer of to-day, being unfamiliar with conditions of this kind, may well ask why such a state of affairs was allowed to exist and why men continued to work for such inadequate remuneration. There were probably two reasons for this, first, that the industry was young and growing rapidly and there were still prospects of good positions being obtained after experience had been acquired; in consequence many young engineers, with the assistance of their parents, took jobs at small salaries primarily to gain experience, although the effect was to depress the general level of salaries, particularly with respect to those who were in the industry for the sake of a livelihood. The other reason was the extreme individualism of the engineers themselves. In general they abhorred combination of any kind and preferred to play a lone hand, each man for himself, and very often men did not hesitate to take advantage of one another in their endeavours to secure advancement for themselves.

The First Steps

As far back as 1910 and 1911 the correspondence columns of the *Electrical Review* indicated that there was a feeling abroad as to the unsatisfactory nature of the conditions of employment and salaries in the supply industry. In December, 1912, one of the correspondents intimated his desire to hear from those interested as to whether they would be prepared to take part in the formation of an Association of Central Station Engineers, and as a result of this invitation a meeting was held in January, 1913, attended by twenty-one engineers, who decided to take steps to form such an association. Subsequent meetings were held and an organising committee was formed, and at a meeting of this committee held in February, 1913, 120 applications for membership were received and passed. The movement spread throughout the rest of the country and meetings were held in the provincial centres and particularly in Manchester. The support given to the new movement was such that in June, 1913, it was able to hold its first annual conference and also to lay down the aims and objects of the new Association.

One of the earliest decisions which the organising committee had to make was in relation to the question as to whether the

new organisation should or should not be based on trade union principles, and registration as a trade union was decided upon. The principal weapons to be used in the achievement of the above objects were correspondence or deputation. The new organisation considered arbitration to be the most satisfactory method of settling differences arising between station engineers and their employers and only as a last resort was more forceful action to be relied upon.

The membership of the Association had touched the 1,000 mark when war broke out, and the immediate effect was a depletion of its numerical strength and also a very natural loss of interest. During 1915 and 1916 the Association was in a state of suspended animation, but matters came to a head during 1917 on account of the various awards made to the manual workers to meet the increased cost of living—by that time it had reached a figure of 80 per cent. above July, 1914—and the lack, except in a very few isolated cases, of any similar provision on behalf of the staff worker.

"Drastic Action" Averted

During this period also negotiations were taking place in several parts of the country in respect of a schedule of salaries for technical staffs. These negotiations did not make sufficient progress, and in October, 1918, the Association made an application upon all electricity supply authorities in the United Kingdom, claiming an advance of 20 per cent. plus £90 on pre-war salaries. This application was eventually considered at a conference representing the I.M.E.A. and the company undertakings, which recommended that the claim was justified and should be acceded to. When, however, an endeavour was made to implement this recommendation it was found that there were certain legal difficulties which prevented the supply undertakings giving effect to the recommendation, as a result of which it became necessary for the Association to issue an intimation of drastic action.

Further negotiations took place, and subsequently an arbitrator issued Award 9281, the "Stoker Award," embodying the recommendations of the conference. One of the conditions was that the parties should meet for the purpose of agreeing upon a schedule of salaries, thus laying the foundation stone of the present schedule of the National Joint Board.

The next great problem to engage the attention of the Association arose from the proposal of the Ministry of Labour that a National Joint Industrial Council should be formed for the electricity supply industry, and a conference held in June, 1918, agreed to this. Objections were raised, however, by representatives of the organisations of manual workers to the representation of the E.P.E.A. upon such a council, and it eventually became necessary to form a National Joint Board, consisting of representatives of the employers and of members of staffs. This decision, arrived at during a conference held in December, 1919, was subsequently confirmed by most of the employers' organisations represented.

A sub-committee formulated a schedule of salaries and conditions of employment which was published in May, 1920. At the outset there was considerable opposition on the part of individual undertakings to the idea of a National Schedule for the technical staffs, and in December, 1920, fewer than sixty out of over 260 undertakings coming within its scope had adopted it. By a vote representing a large majority of the membership it was decided that drastic action should be taken. Fortunately, and mainly by the good offices of the Ministry of Labour, it became unnecessary to give effect to this threat and from that time to the present the National Joint Board schedule has been generally recognised throughout the country, although during the period 1920-1923 many problems arose in individual undertakings relating either to the operation of the schedule itself or to an interpretation of its provisions.

One of the most remarkable features of the schedule has been that since 1920-1923 it has operated fairly satisfactorily throughout the industry despite the many changes which have taken place since that date, which have made its clauses to a very large extent obsolete. A revision is long overdue, and it is desirable that the schedule should be brought into line to deal with existing conditions.

Compensation for Members

A further activity of the Association during this period was in connection with the compensation provisions in the Electricity Supply Acts. It took a leading part in connection with the inclusion of the compensation provisions in the 1919 Act and also the amendments contained in the 1922 Act. Since the passing of the 1919 Act the Association has negotiated on behalf of 121 claimants, the aggregate compensation amounting to £74,830. In addition, and in conjunction with other associations, it has since that time, through the medium of a joint committee, taken steps to secure the insertion of, or amendment to, compensation provisions in all relevant Parliamentary Bills, both public and private.

Although the percentage of unemployment amongst the members of the Association has never been a high figure, the national conditions in 1922 caused an increase in the number of unemployed members, which demanded consideration by the National Executive Council, and as a result the Association instituted its unemployment fund, which has been in operation from 1922

to the present day. At about this time also the question of members who through ill-health or other causes might be in straitened circumstances demanded consideration, and the Association instituted its benevolent fund. Some two or three years later it included within the benefits of its benevolent fund the payment of a death benefit of £50 to the relations and dependents of all deceased members in benefit.

Educational Activities

On the educational side, from the earliest days the activities of the Association have been very considerable. At the outset these activities took the form of inaugurating and arranging technical lectures to its members, but at a later stage it became necessary to organise the Technical Groups. These groups are comprised of members of the Association and also technical members who generally are the engineers on the staffs of manufacturing firms and can become members of the Technical Groups without any obligations or responsibilities as members of the Association proper. This association of makers of apparatus and machinery and the users thereof has been of inestimable benefit to both parties. A further educational activity of the Association has been its correspondence tuition scheme, which was instituted to meet a particular demand of members who, for various reasons, were dissatisfied with existing facilities. This scheme has met with notable success.

In a short article of this description it is not possible to more than indicate some of the salient features of the Association's history, but that history is by no means finished. The work of the National Joint Board has removed a great many of the problems which troubled the Association in its early days, but there are still many outstanding grievances. The columns of its journal, the *Electrical Power Engineer*, have recently indicated one very clamant question, *viz.*. The hours of employment of shift workers and their demand for shorter duty.

ELECTRICITY SUPPLY

New Harrogate Switch House.

Barrhead (Renfrewshire).—ELECTRICITY FOR COOKING.—The Town Council is to install electric cooking in 20 wartime houses. They are the first Council houses in the district to be all-electric.

Barrow-in-Furness.—CHARGE FOR MOVING COOKERS.—The Electricity Committee has decided that a charge of 12s. 6d. shall be made for the transfer of a hired cooker to a new address in the borough, and 17s. 6d. in Dalton and the rural area.

ELECTRICITY FOR CANTEENS.—The Electricity Committee is to provide an electricity supply to school feeding centres at Askam at a cost of £777 and Cartmel, £200.

Birkenhead.—CONSUMERS' APPARATUS.—The Electricity Committee has obtained sanction to borrow £2,000 for consumers' apparatus.

Blackburn.—STREET LIGHTING POLICY.—Approval was given in principle to proposals for lighting main roads by electricity and the remaining streets by gas. The borough engineer is to discuss with the electrical engineer (Mr. R. H. Harral) and the gas engineer (Mr. J. D. Ashworth) the effect of the proposals on their respective undertakings.

Blackpool.—CABLE FOR STREET LIGHTING.—The Electricity Committee is to lay a new cable along the Promenade, between Cooker Street and The Gynn, in connection with street lighting.

Cheltenham.—SETTING AN EXAMPLE.—At a meeting of the Corporation Electricity Committee the borough electrical engineer (Mr. R. W. Steel) reported upon the condition of the transport vehicles. He suggested (and the Committee agreed) that in order to save petrol and to encourage the use of electric vehicles a 10 cwt. electric vehicle should be purchased at a cost of £395, plus £49 for battery charging equipment.

South Shields to Close Station.

Chesterfield.—STREET LIGHTING.—Subject to the approval of the Home Secretary, the Emergency Committee intends to introduce a greater amount of street lighting during the coming winter months. The electrical engineer has been instructed to prepare for this extra street lighting as from September 1st next.

Darlington. — COAL-HANDLING PLANT. — Sanction has been received by the Town Council to borrow £6,323 for extensions to the coal-handling plant at the electricity generating station.

Durham.—ROAD LIGHTING UNIFORMITY.—Durham County Council Roads Committee, which was represented at a conference of authorities in the locality of Gateshead, reports that the conference decided that uniformity in lighting of main roads was desirable. The Committee is seeking the views of the Ministry of War Transport upon the general question of the lighting of roads.

Eastbourne.—CONTROL ROOM LIGHTING.—A recommendation of the borough electrical engineer (Mr. N. Boydell) for an improved lighting installation for the control room, embodying fluorescent lamps, has been approved by the Electricity Committee. The cost is estimated at £230.

Enfield.—SUPPLY SERVICES IN NORTH MIDDLESEX.—At a meeting of the U.D.C. General Purposes Committee a letter was submitted from the Edmonton Corporation in connection with post-war proposals for electricity services. Recalling negotiations which took place in 1937-38 regarding the preparation of a scheme

for the North Middlesex area of the Northmet Company, the Edmonton Council considered that an agreed policy should be reached with regard to the operation of electricity in this area and expressed approval of the acquisition of electricity undertakings in North Middlesex by the London and Home Counties Joint Electricity Authority. The Enfield Committee deferred consideration of the matter.

Harrogate.—NEW SWITCH HOUSE.—To cater for the continued expansion of the electricity undertaking a new switch house was opened on July 26th by the deputy mayor, Alderman H. Boland. To mark the occasion he was presented with a token key of the switch house by Mr. R. P. Hollock, district manager of the Metropolitan-Vickers Electrical Co., Ltd., which supplied the switchgear.

Liskeard.—OVERHEAD LINES.—The Council is to raise no objection to a proposal of the Cornwall Electric Power Co., to place cables above ground for the supply of electricity at Sclerder, and to four farms.

London.—SITE FOR OFFICES.—After receiving a report from the borough electrical engineer and manager (Mr. E. E. Jolly) upon post-war development and in view of the consequent anticipated increase in load, the Bethnal Green Borough Council has instructed him to proceed with the acquisition of a site which will suitably house the whole of the staff of the undertaking.

PROPOSED TARIFF INCREASE.—Poplar Electricity Committee is applying for permission to increase by 12½ per cent. the basic charge of tariffs incorporating a coal clause adjustment.

SUPPLY FOR WELDING.—Southwark Electricity Committee is to provide a 150-kVA supply for a butt welding machine at a cost of £1,250, of which £750 will be contributed by the consumer.

Newcastle-on-Tyne.—NEW SUBSTATION.—The City Council has received sanction to borrow £1,060 for the erection of a substation and £7,100 for equipping it.

South Shields.—CLOSING DOWN OF STATION.—The Town Council has decided to give twelve months' notice to the Central Electricity Board of its intention to close the town's power station. The Electricity Committee has reported that for the year beginning January, 1946, it would benefit the Corporation to adopt the Board's North-East England tariff. The estimated saving in 1946 would be £3,000 and in 1947 £7,500. Further increased savings would be made in succeeding years. Plant at the station costing £130,000 is to be disposed of.

Stalybridge.—ALLOCATION OF PROFITS.—The Stalybridge, Hyde, Mossley and Dukinfield Joint Transport and Electricity Board made a net profit of £16,005 from electricity and £12,233 from transport in the year to March 31st last. It has been decided to make a grant of £4,000 to each of the four constituent authorities.

Tynemouth.—MODEL KITCHEN.—After considering methods by which the domestic use of electricity could most suitably be brought to the notice of the public, the Electricity Committee authorised the electrical engineer and the borough engineer to make arrangements for the erection in premises convenient for public exhibition of a full-scale model kitchen.

PURCHASE RIGHTS.—Inquiries have recently been made by the town clerk with regard to the existence of any purchase rights on the part of the Council in respect of certain small parts of the borough where the electricity supply is not afforded by the Corporation. At a meeting of the Electricity Committee he reported that he had been in communication with the clerks of adjoining authorities similarly affected and that the Seaton Valley U.D.C. had invited the Corporation to take joint action with a view to an extension of the time permitted for exercising purchase rights. The Committee decided to act on these lines.

Ulverston.—SUPPLY TO FARM.—The U.D.C. Electricity Committee has obtained sanction to provide a supply to Low Flan Farm which is within the area of the Barrow-in-Furness Corporation.

York.—ELECTRICITY FOR FARMS.—The Electricity Committee is to provide supplies to farms at Terrington at a cost of £997. The farmers have guaranteed a minimum consumption to the value of £124 per annum for fifteen years.

LOAN. — The Electricity Committee has obtained sanction to borrow £8,580 for mains and £7,598 for substation equipment in connection with supply improvements.

TRANSPORT

Darlington.—EXTENSION OF TIME.—The Darlington (Extension of Time) Order, 1944, extends for a further period of three years the time for the commencement of the running of trolley vehicle services on three routes.

Newcastle-on-Tyne.—RESTORATION OF SERVICE.—The Transport and Electricity Committee has decided to restore the trolley-bus service to Ferguson's Lane.

West Hartlepool.—YEAR'S SURPLUS.—The Town Council has decided to allocate £7,000 of the Transport Department's 1943-44 surplus of £9,198 to the reserve fund and use the remainder for the relief of the general rates.

RADIO & TELEPHONY

Australia.—TELEPHONE DEVELOPMENT.—Mr. W. P. Ashley, Australian Postmaster General, hopes to see a telephone in every home in Australia after the war. He has announced that a new flat rate for domestic telephone services to cover annual rental and all local calls will be considered as a post-war innovation to popularise the telephone and simplify accounting.—*Reuter's Trade Service.*

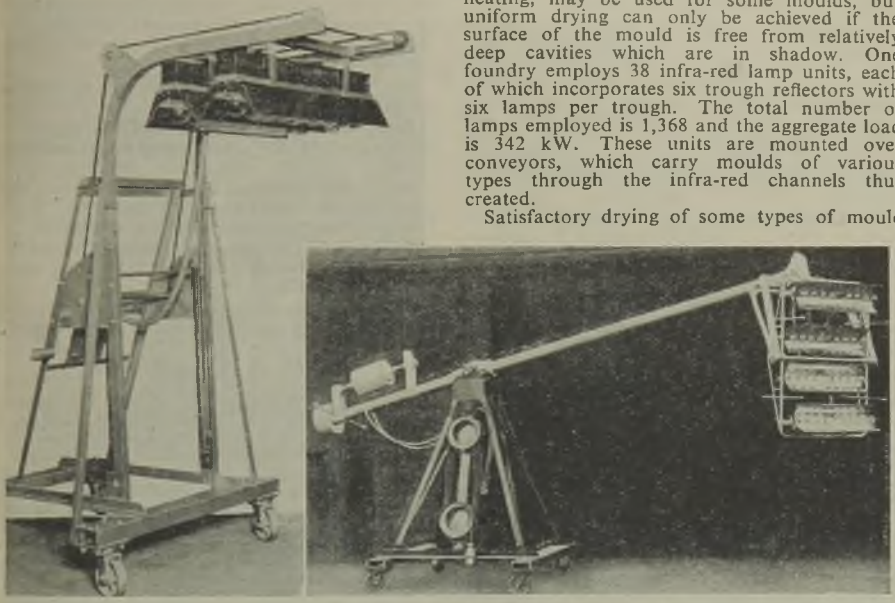
Glasgow.—TELEPHONE WAITING LIST.—There is a waiting list of 6,000 for telephones in Glasgow according to the G.P.O. telephone manager.

Hull.—TELEPHONE PROFITS.—The Corporation telephone undertaking, the only municipally owned telephone service in the country, made a profit last year of £24,627, after paying £15,421 in royalties to the Government. Out of a capital expenditure of £864,000 on the undertaking there remains only £50,241 in outstanding loans, and by drawing on the reserve fund the Corporation could pay off the whole of this and still have a balance of £5,000 on revenue account, so that the undertaking is virtually debt-free.

Infra-Red Heating

Adjustable G.E.C. Units

ALTHOUGH infra-red heat has so far been most widely employed for paint drying, that is by no means the only purpose for which it has been successfully utilised. Consequently, while the lamps and reflectors made by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, have been standardised, the structures on which they are mounted differ in form according to the shape and size of the articles to be heated. For instance, outfits designed for maintenance work are mobile, thus enabling them to be easily and quickly moved from one part of a workshop to another. In both cases the trough reflectors containing the lamp bulbs may be adjusted for height and direction, so that either vertical or horizontal surfaces may be irradiated.



Auto-truck repair drying outfit and (right) aircraft paint patching boom

One model (left-hand illustration) is specifically designed for drying paint on small auto trucks. The total loading is 4·5 kW. The paint patching model (right) is designed for the heat treatment of the fuselage, wings or any other part of an airframe. It comprises four troughs, each carrying nine infra-red industrial lamps, mounted on an adjustable framework attached to one end of a counterbalanced boom. In addition to the adjustments for height and direction which the journal and trunnion bearings provide, each trough may be independently adjusted so that paint patches in close juxtaposition may be individually dried. The total electrical loading is 9 kW; paint repairs, which formerly took eight hours by air drying, are dried in twenty minutes.

Although it is necessary to dry foundry sand moulds before pouring, in order to prevent the formation of blow holes, it is unnecessary to dry the whole of certain types of mould. Often generation of steam can be prevented by drying the surface skin to a depth of one inch or less. Automatic drying equipment, such as lamp heating, may be used for some moulds, but uniform drying can only be achieved if the surface of the mould is free from relatively deep cavities which are in shadow. One foundry employs 38 infra-red lamp units, each of which incorporates six trough reflectors with six lamps per trough. The total number of lamps employed is 1,368 and the aggregate load is 342 kW. These units are mounted over conveyors, which carry moulds of various types through the infra-red channels thus created.

Satisfactory drying of some types of mould is accomplished to a depth of 1/16 inch in about five minutes; in other moulds the time may be as long as thirty to forty-five minutes, according to the shape of the mould, the depth of the drying required, and the type and moisture content of sand which is employed in the foundry.

Telephone Shortage in Brazil

AT the end of 1943 over 22,000 prospective telephone subscribers were awaiting the provision of services, according to the report of the Brazilian Traction, Light and Power Co., which, through the Brazilian Telephone Co., Ltd., controls a large part of the telephone system of the country. This was due to the impossibility of obtaining the necessary materials, although some of the equipment ordered many months ago has been received and installed. At the close of 1943 the number of telephones in service was 277,734 as against 261,549 at the end of the preceding year.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Belliss & Morcom, Ltd., report a trading profit of £68,803 for the past year (against £67,418), after meeting taxation. From this are deducted directors' fees, depreciation and war damage premiums, leaving a net profit of £50,886 (against £48,662). The ordinary dividend is maintained at 14 per cent. and £160,290 (£154,209) is carried forward.

Greenwood & Batley, Ltd., report a net profit of £44,992 for the year ended March 31st last. This compares with £49,455 in the previous twelve months. These figures are reached after providing for E.P.T. and £68,119 (63,168) for income tax. A sum of £10,000 (£19,000) is set aside for contingencies, and a final dividend of 10 per cent., making 15 per cent. (same) is to be paid, leaving £38,614 (£33,266) to be carried forward.

Metal Industries, Ltd.—The report for the year 1943-44 shows a profit of £262,055 (against £263,194). Taxation absorbs £137,768 (£131,769); £10,000 is put to stock reserve and £4,549 to building and plant reserve. The final dividend on the "A" and "B" ordinary stocks is 6 per cent. (against 5½ per cent.), making 8½ per cent. (against 8 per cent.) for the year. £151,156 (against £149,846) is carried forward.

Crossley Bros., Ltd.—The net profit for 1933-34, after providing for taxation, amounted to £35,090 (against £33,933). General reserve again receives £10,000 and £5,000 (against nil) is put to staff pensions reserve. The deferred ordinary dividend is again 5 per cent. and £42,815 (against £41,164) is carried forward.

Crossley-Premier Engines, Ltd. (controlled by Crossley Bros.) show a profit of £35,450 (against £49,612) after meeting all expenses. General reserve receives £3,000 (against £5,000) and staff pension reserve £500 (same). The ordinary dividend is again 10 per cent. Goodwill has been written down to £1 from general reserve.

The British Thermostat Co., Ltd., announces that owing to unavoidable delay in completing the accounts for the year ended January 31st last, the board has decided to pay a second interim dividend of 11 per cent., again making 18½ per cent. In the circumstances the board will not recommend any further dividend for the year.

The City of London Electric Lighting Co., Ltd., has decided to defer payment of a dividend on the ordinary stock until the 1944 accounts are available. This course was followed last year for which a dividend of 5½ per cent. was paid in February last.

McMichael Radio, Ltd., is to pay a dividend of 10 per cent. on the participating preferred ordinary shares, representing arrears of 2 per cent. for the last quarter of 1938 and 8 per cent. for the year 1939.

George Kent, Ltd., report a profit of £32,944 for the year ended March 31st last. A final dividend of 7 per cent. making 10 per cent., plus 2½ per cent. is to be paid and £37,569 is carried forward.

Thorn Electrical Industries, Ltd., announce a profit of £82,644 for the past year, before providing for taxation, as compared with £81,676 for 1942-43. The dividend is again 20 per cent.

Tellus Super Vacuum Cleaner, Ltd., announces that the debit balance carried forward has been reduced to £17,248. The company has disposed of its interest in two subsidiaries for the written down value (£5,701).

The Northmet Power Co. is to pay an interim dividend of 3 per cent. (same).

Falk, Stadelmann & Co., Ltd., is paying a dividend of 7½ per cent. (same) on its ordinary shares.

De la Rue Plastics, Ltd., have acquired the whole of the issued share capital (£41,512) of Thomas Potterton, Ltd., heating engineers.

The London Passenger Transport Board is again paying an interim dividend of 1¾ per cent. on the "C" stock.

The Greengate & Irwell Rubber Co., Ltd., is again paying an interim dividend of 7½ per cent.

New Companies

Craig & Derricott, Ltd.—Private company. Registered July 27th. Capital £10,000. Objects: To carry on the business of manufacturers of, and dealers in, electric switches, switch and fuse gear and accessories, electric and other lamps, batteries, wireless sets, valves and accessories, etc. Directors: E. H. Derricott, Broome Close, Shenstone, Staffs; E. L. Derricott, 29, Walsall Road, Four Oaks, Warwickshire; and A. M. Craig, 12, Boscobel Road, Walsall. Registered office: Teddlesley Works, Teddesley Rd., Walsall.

Frigid Supply, Ltd.—Private company. Registered July 27th. Capital, £7,500. Objects: To carry on the business of manufacturers of, and dealers in, and letters on hire and hire-purchase of refrigerating machinery, thermostats, electrical and gas appliances, etc. Directors: G. F. Howard, Godlington, Swanage; and E. J. Haysome, 95, Victoria Park Road, Bournemouth. Registered office: 90, Holdenhurst Road, Bournemouth.

Raymond Stead, Ltd.—Private company. Registered July 28th. Capital, £100. Objects: To carry on the business of selling agents of electrical and mechanical goods, electrical engineers and contractors, advertising contractors and agents, wireless engineers, etc. Directors: M. M. Witmond, 176, Pulman Court, Streatham Hill, S.W.2; and E. A. Stead, 10, Milner Place, N.1. Registered office: 1, Dr. Johnson's Buildings, Temple, E.C.4.

Osborne Engineering, Ltd.—Private company. Registered June 29th. Capital, £1,000. Objects: To carry on the business of electrical, radio, motor and general engineers, etc. Subscribers: C. Morey-Binnington, 9, Tranby Lane, Anlaby, E. Yorks; and A. Lee, 230, Priory Road, Hull.

Companies' Returns

Statements of Capital

Tamworth District Electric Supply Co., Ltd.—Capital, £250,000 in 50,000 6 per cent. cumulative preference, 50,000 4 per cent. cumulative participating preference and 150,000 ordinary shares of £1. Return dated, March 22nd. 50,000 6 per cent. preference, 25,000 4 per cent. preference and 125,000 ordinary shares taken up. £120,000 paid on 30,000 6 per cent. preference, 25,000 4 per cent. preference and 65,000 ordinary shares. £80,000 considered as paid on 20,000 6 per cent. preference and 60,000 ordinary shares. Mortgages and charges: £83,557.

Rylands Electrical Co., Ltd.—Capital, £1,000 in £1 shares. Return dated April 4th. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Loch Leven Electricity Supply Co., Ltd.—Capital, £10,000 in £10 shares. Return dated March 28th. 500 shares taken up. £5,000 paid. Mortgages and charges: Nil.

Cahier's Electrical Vibrator Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1943 (filed April 17th, 1944). 361 shares taken up. £361 paid. Mortgages and charges: Nil.

Francis Bell & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated April 14th. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Croydon Cable Works, Ltd.—Capital, £170,000 in £1 shares. Return dated March 29th. 700 shares taken up. £700 paid. Mortgages and charges: Nil.

Simmonds & Stokes, Ltd.—Capital, £15,000 in £1 shares (all ordinary). Return dated April 14th. 10,204 shares taken up. £1,725 paid. £8,479 considered as paid. Mortgages and charges: £13,550.

Oliver Electrical Supplies Co., Ltd.—Capital, £100 in £1 shares. Return dated March 14th (filed May 18th). All shares taken up. £100 paid. Mortgages and charges: Nil.

Giffens, Ltd.—Capital, £5,000 in £1 shares. Return dated May 6th. All shares taken up. £2 paid. £4,998 considered as paid. Mortgages and charges: Nil.

Robson & Coleman, Ltd.—Capital, £3,500 in £1 shares (all ordinary). Return dated May 4th. 3,191 shares taken up. £1,835 paid. £1,356 considered as paid. Mortgages and charges: Nil.

Metropolitan-Vickers Electrical Co., Ltd.—Capital, £250,000 in £1 shares. Return dated March 23rd. 10,002 shares taken up. £10,002 paid. Mortgages and charges: Nil.

National Electrical Supplies Co., Ltd.—Capital, £3,000 in 2,000 preference shares of £1 each and 10,000 ordinary shares of 2s. each. Return dated April 10th. 1,200 preference and 6,500 ordinary shares taken up. £1,850 paid. Mortgages and charges: Nil.

Exide Services, Ltd.—Capital, £100 in £1 shares. Return dated April 10th. All shares taken up. £100 paid. Mortgages and charges: Nil.

G. & L. Electrical Supply Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1943 (filed March 20th, 1944). All shares taken up. £2 paid. £998 considered as paid. Mortgages and charges: £2,000.

Chesham Electric Light & Power Co., Ltd.—Capital, £300,000 in £1 shares. Return dated March 21st. 265,000 shares taken up. £244,998 paid. £20,002 considered as paid. Mortgages and charges: Nil.

Air Ducts, Ltd.—Capital, £10,000 in £1 shares. Return dated March 2nd. 9,503 shares taken up. £9,503 paid. Mortgages and charges: £89,335 (Floating charge to National Provincial Bank, Ltd.).

Electric Ignition Laboratory, Ltd.—Capital, £2,000 in £1 shares. Return dated February 21st. 1,500 shares taken up. £1,500 considered as paid. Mortgages and charges: Nil.

Edward Dewhurst, Ltd.—Capital, £20,000 in £1 shares. Return dated February 15th. 15,672 shares taken up. £1,502 paid. £14,170 considered as paid. Mortgages and charges: £7,761 7s. 6d.

Increases of Capital

Philco Radio & Television Corporation of Great Britain, Ltd.—The nominal capital has been increased by the addition of £250,000 beyond the registered capital of £450,000. The additional capital is divided into 150,000 6 per cent. cumulative redeemable preference shares of £1 each and 1,000,000 ordinary shares of 2s. each.

Wizard Production Co., Ltd.—The nomimal capital has been increased by the addition of £19,500, in £1 ordinary shares, beyond the registered capital of £500.

Mortgages and Charges

Nigerian Electricity Supply Corporation, Ltd.—Satisfaction to the extent of £79,628 on June 30th of trust deed dated August 24th, 1933, and registered August 31st, 1933 (supplemental trust deed dated July 6th, 1939, cancelling £20,000 of the original stock remaining unissued and amending the terms of the original trust deed) securing £300,000 6 per cent. first mortgage redeemable debenture stock.

Liquidations

Barlborough Electric Supply Co., Ltd.—At a meeting held at the Council School, Barlborough, Derbyshire, on July 25th a special resolution was passed that the company should be wound up voluntarily (the necessary declaration of solvency having been duly filed) and that Mr. J. E. Bird, 57, Saltergate, Chesterfield, should be appointed liquidator.

Industrial Electroplant, Ltd. (in voluntary liquidation).—Claims to be sent to the liquidator, Mr. A. F. Christlieb, 81, Cannon Street, London, E.C.4, by August 31st.

Bankruptcies

R. E. Pearcey, 103, Arthur Street, Withernsea, East Riding, motor and electrical engineer.—Application for discharge to be heard on September 13th at the Guildhall, Alfred Gelder Street, Hull.

STOCKS AND SHARES

TUESDAY EVENING.

THE upward course of Stock Exchange markets has been slightly checked by selling attributed to profit-takers prepared to accept the substantial appreciation that has accrued during the past few months. A contributory cause is the holiday season which, as usual, puts something of a brake upon enterprise. Nevertheless, prices are on the whole exceedingly well maintained. The Government is issuing a new series of Savings Bonds starting from this week, and dated five years longer than its predecessor—evidence, this, of the always increasing credit of the Treasury and the official determination to keep money rates as low as possible. The confident tone of the Prime Minister's speech last week, and the breaking-off by Turkey of diplomatic relations with Germany, are two other factors making for strength in Stock Exchange prices. The profit-taking and holiday influence counteract to some extent these favourable factors, but on the whole it will be noticed by reference to our price tables, how firm the markets keep, and how little setback there is in quotations.

Trustee Stocks and Others

Amongst stocks on offer that are eligible for trustee investment, mention may be made of £10,000 London Passenger Transport 4½ per cent. "A" stock, 1985-2023, obtainable at 122¼. The flat yield is £3 14s. per cent., reduced to 3½ per cent. if allowance is made for redemption at 100 at the earlier of the two dates. Of the Board's 5 per cent. "A" stock, bearing the same dates, £5,000 can be bought at 131½. This pays about 1s. per cent. more, both flat and to redemption, than the 4½ per cent. "A" issue. The 5 per cent. "B" stock 1965–2023 is on offer at 122¼, yielding £4 2s. per cent. flat, or 3½ per cent. allowing for redemption at 100 in 1965. All these are trustee stocks. Outside the trustee group, £2,000 Central London 4 per cent. guaranteed assented stock is on offer at 92¾ ex the dividend due this month. The return here is £4 7s. 3d. per cent. Metropolitan assented 3¼ per cent. stock can be bought at 62 to yield £5 0s. 6d., but the dividend falls to 3 per cent. in 1948 and investment fights shy, as a rule, of a security where the interest is shortly to be lowered.

Electricity Supply

The strength of the market for Home electricity supply shares is again demonstrated by the maintenance of all the recent improvements. The quotations given in our lists are the middle prices published in the Stock Exchange Official Lists, but the buyer who expects to get stock at these figures is much more frequently disappointed than is the seller who thinks that he, also, is entitled to realise his shares at the middle prices. Interim dividend announcements have begun to make their appearance and are, so far, the same as those of a year ago. Holders of shares remain in the dark as to the manner in which their companies are operating, but that the companies are making satisfactory headway is taken for granted. County of London are 6d. better at 42s. 6d. The City of London Electric has deferred consideration of an ordinary dividend until the accounts are made up for the year, thus following last year's precedent.

Price Fluctuations

Not many buying orders were required to bring about a sharp rise in Cable & Wireless ordinary stock. The price gained 3½ points, advancing to 83, and the 5½ per cent. preference moved up 10s. to 115. Anglo-Portuguese Telephones are a florin higher, at 29s. 4d., the 5½ per cent. yield on the money offering attraction. A rise of 3s. 6d. lifted Oriental Telephones to 52s. 6d., which makes the shares look fully valued. Shares in companies connected with telephone work are better in several cases. Hall's Telephones have strengthened to 33s. 6d. Telephone Manufacturing at 12s. 6d. are 9d. up. Automatic Telephone at 65s. have put on 1s. International "Tel. & Tel." have gained 2, to 23½. In the cable manufacturing group, Johnson & Phillips stand out with a rise of 1s. 6d. to 79s. British Insulated, Callender's and Henley's hold their gains of last week. Amongst other industrials, Consolidated Signals are 2s. 6d. higher at 6¾ and Chloride Electrical Storage are similarly higher at 4⅜. De la Rue dipped to 9¼ before recovering to 9½.

Brush Electrical

The price of Brush Electrical Engineering 5s. ordinary shares is quoted 3d. easier at 10s. 9d. Shares are obtainable at, or about, this figure. It is understood that a fairly considerable line of shares is in course of being marketed by the controlling company, Associated British Engineering. At the present price, the yield on the money is £4 3s. 9d. per cent. The dividend was recently raised from 8 per cent. to 9 per cent. and there is some talk of a possible return to the 10 per cent. dividend which, in earlier days, the Brush Company paid regularly every year.

London Electric Wire

Since 1936, the London Electric Wire Company & Smiths has paid dividends making 7½ per cent. for the year. As recently announced, this was repeated, for the eighth consecutive year, in respect of the twelve-month ended last December. An interim dividend of 2 per cent. was declared at the

(*Continued on page* 212)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend: Previous	Dividend: Last	Middle Price Aug. 8	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	62/–	..	4 0 8
British Power and Light	7	7	33/–	..	4 4 10
City of London	7	5½	29/6	..	3 14 7
Clyde Valley	8	8	42/–	..	3 16 0
County of London	8	8	42/6	+6d.	3 15 3
Edmundsons:					
7% Pref.	7	7	34/6	..	4 1 4
Ord.	6	6	31/–	..	3 17 5
Elec.Dis.Yorkshire	9	9	45/6	..	3 19 6
Elec. Fin. and Securities	12½	13½	59/–	..	4 11 4
Elec. Supply Corporation	10	10	47/–	..	4 5 0
Isle of Thanet	Nil	Nil	18/–	..	—
Lancs. Light and Power	7½	7½	36/6	..	4 2 4
Llanelly Elec.	6	6	26/–	..	4 12 4
Lond.Assoc.Electric	3	4	26/6	..	3 0 6
London Electric	6	6	31/–	..	3 17 5
LondonPowerRed. Deb.	5	5	105½	..	4 14 7
Metropolitan E.S.	8	8	41/6xd	..	3 17 0
Midland Counties	8	8	41/6	..	3 17 0
Mid. Elec. Power	9	9	44/–	..	4 1 9
Newcastle Elec.	7	7	31/–	..	4 10 4
North Eastern Elec.:					
Ordinary	7	7	35/–	..	4 0 0
7% Pref.	7	7	35/–	..	4 0 0
Northampton	10	10	49/6	..	4 0 6
Notting Hill 6% Pref. (£10)	6	Nil	11	..	—
Northmet Power:					
Ordinary	7	7	40/–	..	3 10 0
6% Pref.	6	6	30/6	..	3 18 8
Richmond Elec.	6	6	25/6	..	4 14 1
Scottish Power	8	8	41/–	..	3 8 0
Southern Areas	5	5	23/–	..	4 7 0
South London	7	7	28/–	..	5 0 0
West Devon	5	5	23/6	..	4 5 1
West Glos.	4½	3½	24/6	−6d.	2 17 0
Yorkshire Elec.	8	8	43/–	..	3 14 5
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	7/6	..	—
Calcutta Elec.	6*	6*	50/–	+6d.	2 8 0
Cawnpore Elec.	10	7	39/3	+6d.	3 11 5
East African Power	7	7	34/–	..	4 2 4
Jerusalem Elec.	7	5	29/6	..	3 8 0
Kalgoorlie (10/–)	5	5	11/6xd	+9d.	4 7 0
Madras Elec.	4*	Nil	33/–	−6d.	—
Montreal Power	1½	1½	23½	+½	—
PalestineElec."A"	4*	5*	40/6	..	2 10 0
Perak Hydro-elec.	6	7	14/–	+6d.	—
ShawiniganPower	83cts.	90cts.	16½	..	—
Tokyo Elec. 6%	6	6	24	..	—
VictoriaFallsPower	15	15	4½	..	3 12 7
WhitehallInv.Pref.	—	6	24/6	..	4 18 0

Company	Dividend: Previous	Dividend: Last	Middle Price Aug. 8	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955–60 (Civil Defence)	3	3	100xd	+½	3 0 0
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	107	..	4 4 1
1963–93	3½	3½	104½	+1	3 7 0
1974–94	3½	3½	101	..	3 4 4
London Elec. Trans. Ltd.	2½	2½	97½	..	2 11 3
London & Home Counties1955–75	4½	4½	111	..	4 1 1
Lond.Pass.Trans.:					
A	4½	4½	121½	..	3 14 1
B	5	5	121½	..	4 2 4
C	3	3½	71	−½	4 11 7
WestMidlandsJ.E.A. 1948–68	5	5	108½	..	4 12 4
Telegragh and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	120½	..	4 19 7
Def.	1½	1½	30	..	5 0 0
Anglo-Portuguese	8	8	29/–	+2/–	5 10 4
Cable & Wireless:					
5½% Pref.	5½	5½	115	+½	4 15 8
Ord.	4	4	83	+3½	4 16 5
CanadianMarconi$1	Nil	4cts.	10/–	..	—
Globe Tel. & Tel.:					
Ord.	8½*	5*	40/6	..	2 9 4
Pref.	6	6	30/–	..	4 0 0
GreatNorthernTel. (£10)	Nil	Nil	24½	..	—
Inter. Tel. & Tel.	Nil	Nil	23½	+2	—
Marconi-Marine	7½	7½	36/–	..	4 3 4
Oriental Tel. Ord.	16	10	52/6	+3/6	—
Telephone Props.	6	Nil	18/6	..	—
Tele.Rentals (5/–)	10	10	12/–	..	4 3 4
Traction and Transport					
Anglo-Arg. Trans.:					
First Pref. (£5)	Nil	Nil	2/6	..	—
4% Inc.	Nil	Nil	5½	−½	—
Brit.Elec.Traction:					
Def. Ord.	45	45	1315	+10	3 8 5
Pref. Ord.	8	8	180	..	4 9 0
Bristol Trams	10	10	56/6xd	+6d.	3 10 10
Brazil Traction	$1	$1½	26½	..	6 10 10
Calcutta Trams.	5½	6½	70/6	−3/–	1 17 2
Cape Elec. Trams	5	6	25/6	..	4 14 1
Lancs. Transport	10	10	45/6	..	4 8 0
Mexican Light:					
1st Bonds	5	5	107½xd	+4½	4 13 0
Rio 5% Bonds	5	5	105½	..	4 14 9
Southern Rly.:					
5% Prefd.	5	5	76	..	6 11 7
5% Pref.	5	5	116½xd	..	4 5 9
T. Tilling	10	10	60/–	..	3 6 8
West Riding	10	10	46/–	..	4 7 0

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Aug. 8	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron.Elec.Ord. ..	10	15	61/-	..	4 18 4
Assoc. Elec. :					
Ord.	10	10	56/6	..	3 10 9
Pref.	8	8	40/-	−6d.	4 0 0
AutomaticTel.&Tel.	12½	12½	65/-	+1/-	3 17 0
Babcock & Wilcox	11	11	54/-	−6d.	4 1 6
British Aluminium	10	10	51/6	+6d.	3 17 8
British Insul. Ord.	20	20	5⅞	..	3 8 0
British Thermostat (5/-)	18½	18½	20/9xd	..	4 9 0
British Vac. Cleaner (5/-)	15	30	30/-	..	5 0 0
Brush Ord. (5/-)	8	9	10/9	−3d.	4 3 9
Burco (5/-) ..	15	17½	16/6	..	5 9 5
Callender's ..	15	20	5⅛	..	3 11 2
ChlorideElec.Storage	15	15	87/6	+½	3 8 7
Cole, E. K. (5/-)	10	15	33/6	−1/-	2 4 9
ConsolidatedSignal	24	27½	6¾	+⅛	4 1 6
Cossor, A. C. (5/-)	7½*	10*	26/6	−6d.	1 17 6
Crabtree (10/-) ..	17½	17½	41/3	..	4 5 6
Crompton Parkinson Ord. (5/-) ..	20	22½	32/6	..	3 9 3
E.M.I. (10/-) .:	6	8	36/3	−3d.	2 4 6
Elec. Construction	10	12½	55/-	..	4 11 0
Enfield Cable Ord.	12½	12½	65/-	+6d.	3 17 0
English Electric	10	10	53/3	..	3 15 2
Ensign Lamps (5/-)	25	15	21/3	..	3 10 8
Ericsson Tel. (5/-)	22*	20*	56/3	..	1 15 7
Ever Ready (5/-)	40	40	44/6	−9d.	4 10 0
Falk Stadelmann	7½	7½	35/-	..	4 5 9
Ferranti Pref. ..	7	7	31/3	..	4 9 7
G.E.C. : Pref.	6½	6½	34/-	..	3 16 6
Ord.	17½	17½	98/-	..	3 11 6
General Cable (5/-)	15	15	15/-	..	5 0 0
Greenwood&Batley	15	15	46/- xd	+1/-	6 10 4
HallTelephone(10/-)	12½	12½	32/6	+1/-	3 17 0
Henley's (5/-) ..	20	20	28/3	..	3 11 0
4½% Pref. ..	4½	4½	24/-	..	3 15 0
Hopkinsons ..	15	17½	71/3	..	4 18 4
India Rubber Pref.	5½	5½	23/6	..	4 13 9
Intl. Combustion	30	20	6⅝	..	4 10 8
Johnson & Phillips	15	15	79/-	+1/6	3 16 0
LancashireDynamo	22½	22½	98/9	..	4 11 2
Laurence,Scott(5/-)	12½	12½	13/6	..	4 12 7
London Elec. Wire	7½	7½	39/-	..	3 17 0
Mather & Platt..	10	10	54/6	−⅛	3 13 3
Metal Industries(B)	8	8½	53/9	..	3 3 3
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	105/9	..	3 15 6
Pye Deferred (5/-)	25	25	35/-	..	3 11 5
Revo (10/-) ..	17½	17½	43/-	..	4 1 4
Reyrolle ..	12½	12½	72/6	+1/6	3 9 1
Siemens Ord. ..	7½	7½	35/6	−6d.	4 4 6
Strand Elec. (5/-)	7½	10	8/-	..	6 5 0
Switchgear & Cow ans (5/-) ..	20	20	19/-	..	5 5 1
T.O.C. (10/-) ..	5	7½	22/6	..	3 6 8
T.C. & M. ..	10	10	54/6	..	3 13 6
TelephoneMfg.(5/-)	9	9	12/6	+9d.	3 12 0
Thorn Elec. (5/-)	20	20	26/-	..	3 17 0
Tube Investments	20	20	100/-	−1/-	4 0 0
Vactric (5/-) ..	Nil	Nil	17/-	..	—
Veritys (5/-) ..	7½	7½	8/3	..	4 11 0
WalsallConduits(4/-)	55	55	51/-	..	4 6 3
Ward & Goldstone (5/-)	20	20	28/9	..	3 13 6
WestinghouseBrake	12½	14	75/-	..	3 14 9
West, Allen (5/-)	7½	7½	9/-	..	4 13 4

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 210)

same time. Two companies that it controls are the Liverpool Electric Cable Co., Ltd., and the Vactite Wire Company (1919), Ltd. The issued capital is £1,084,070, of which £400,000 is in 7½ per cent. preference shares, the remainder being in ordinary shares, all of £1 each. The present 39s. is almost the highest the ordinary have touched since 1936 when the price rose to 41s. 3d. Since then the lowest was 20s., in 1940. The company is in a good financial position and the shares, at 39s., give a return of £3 17s. per cent. on the money.

Miscellaneous Matters

The rise to 53s. 9d. in Metal Industries "B" shares is explained by an increase in the dividend from 8 per cent. to 8½ per cent. The report shows excellent figures. In the Indian section, Calcutta Trams at 70s. 6d. are another 3s. lower, more cautious views being taken of the repayment terms. Calcutta Electric Supply, however, are 6d. harder at 50s. and Cawnpores are better at 39s. 3d. Perak Hydro-Electrics further strengthened to 14s. A minor feature of strength is a rise to 13s. 3d. in Whitehall Electric ordinary. The radio section is quiet and rather disposed to dullness. E.M.I. reacted a few pence. E. K. Cole and Cossor are easier. Pye deferred retain their improvement to 35s. Philco show no change at 13s. 6d. : the new ordinary are 3s. premium.

Falk Stadelmann

Falk Stadelmann have declared an interim dividend of 7½ per cent. on the ordinary shares on account of the year ended last March ; the warrants will be posted on August 21st. No further dividend, it is stated, will be declared on account of this year. The company has paid 7½ per cent. in each of the three preceding years, following 7 per cent. in 1940, 6 per cent. in 1939 and 10 per cent. annually in the years 1936–1938 inclusive. The company operates seven factories and in the London area the work is concentrated upon the manufacture of incandescent gas mantles, electric cables, electric bells, etc. The Birmingham works deal with electrical installation materials, etc., and in Lancashire the company specialises in heating and cooking appliances for gas, electricity and petroleum. The ordinary shares are quoted at 35s., giving a return at that price of 4¼ per cent. on the money.

NEW PATENTS

Electrical Specifications Recently Published

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

AUTOMATIC Telephone & Electric Co., Ltd., C. Gillings and P. E. A. Cowley.—"Telephone or like systems." 696. January 14th, 1943. (562870.)

E. Bader.—"Apparatus for drying hair." 657. January 13th, 1943. (562814.)

W. A. Beatty.—"Radio transmission systems." 14540. October 16th, 1942. (562915.)

British Insulated Cables, Ltd., G. H. Walton, J. C. Quayle and P. Jones.—"Machine for covering wires with insulating materials." 10. January 1st, 1943. (Addition to 554176.) (562830.)

British Thomson-Houston Co., Ltd.—"Electric transformers." 1565/43. February 3rd, 1942. (562902.) "Switching mechanism for electric-discharge lamps." 2610/43. February 26th, 1942. (562909.) "Electric lamps." 5476/43. April 15th, 1942. (562945.)

British Thomson-Houston Co., Ltd., and F. Fitchett.—"Couplings for axial-flow fans," 7419. May 10th, 1943. (562841.)

A. C. Cossor, Ltd., L. Jofeh and B. C. Fleming-Williams.—"Electron beam deflection valves and circuits therefor." 6197/42 and 6196/42. May 7th, 1941. (Divided out of 560689.) (562914 and 562949.)

J. W. Dalgleish and Pye, Ltd.—"Electric condensers." 3494. March 3rd, 1943. (562821.)

Durham Cables, Ltd., and N. Stell.—"Apparatus for the indication and/or location of breaks in insulated electrical conductors." 5248. April 1st, 1943. (562942.)

General Electric Co., Ltd., H. C. Turner and J. Chamberlain.—"Electric dry-plate rectifiers." 17372. December 7th, 1942. (562862.) "Dry-plate rectifiers." 9601. July 10th, 1942. (562848.)

B. C. Joseph.—"Arms for telegraph poles or the like." 951. January 19th, 1943. (562900.) "Poles or standards." 15993/42. January 19th, 1943. (562958.)

J. L. Kier & Co., Ltd., O. L. B. Westergaard and K. W. Branczik.—"Cooling towers." 1892. February 4th, 1943. (562903.)

B. J. Moore and B. C. Moore.—"Electrical resistance heating elements." 1908. February 5th, 1943. (562904.)

Pirelli-General Cable Works, Ltd., C. W. Buckles and A. McAulay.—"Manufacture of rubber." 15796. November 9th, 1942. (562957.)

G. W. Poulton and Rockweld, Ltd.—"Electric control switches." 4610. March 22nd, 1943. (562938.)

S. Smith & Sons (Motor Accessories), Ltd., and W. O. Davis.—"Transmissions in indicating or recording instruments." 14430. October 14th, 1942. (562954.)

Sodeco Soc. des Compteurs de Geneve.—"Optical indicating device of the momentary power crossing an electricity meter." 5560/43. September 1st, 1942. (562965.)

Standard Telephones & Cables, Ltd., and L. J. Heaton-Armstrong.—"Radio guiding systems." 10700. July 30th, 1942. (562853.)

Standard Telephones & Cables, Ltd., C. H. Chambers and P. G. Collier.—"Electric remote indication systems." 627. January 13th, 1943. (562811.)

Standard Telephones & Cables, Ltd., P. K. Chatterjea, L. W. Houghton and C. T. Scully.—"Thermionic amplifiers." 628. January 13th, 1943. (562812.)

W. Stern.—"Electric resistance heating devices." 18308. December 24th, 1942. (562867.) "Thermal alarm or protective devices." 944. January 19th, 1943. (562899.)

A. V. Tomlinson (Union Switch & Signal Co.).—"Electrical control apparatus for railway signalling systems and the like." 14616. October 19th, 1942. (562955.)

W. W. Triggs (Seymour Corporation of Delaware).—"Magneto-electric machines." 9018. June 30th, 1942. (562951.) "Magneto-electric machines and method of making the same." 9021. June 30th, 1942. (562951.)

Ultra Electric, Ltd., W. C. Payne and E. G. Fookes.—"Dials for instruments requiring frequent recalibration." 17458. December 8th, 1942. (562885.)

W. G. Walter.—"Wave-form analysing apparatus." Cognate applications 2282/43 and 11700/43. February 11th, 1943. (562817.)

Westinghouse Electric International Co.—"Electric circuit-breakers of the gas-blast type.' 5176/43. March 31st, 1942. (562941.) "Fluid-pressure operated electric circuit interrupters." 5575/43. April 7th, 1942. (562967.)

Argentine Power Production

THE *Revista Electrotecnica*, the official organ of the Argentine Association of Electrical Engineers, publishes a summary of the progress of the electric power supply in the Republic during 1942 based on a report drawn up by the Argentine National Statistics Department. This shows that at the end of that year there were 977 central power stations in the country, five more than at the close of 1941, the aggregate capacity being 1,414,174 kVA as against 1,408,271 kVA. The output for the year was 2,773·5 million kWh, as compared with 2,643·9 million kWh in 1941, an increase of 4·9 per cent.

The steam-operated stations were responsible for 84·8 per cent. of the output, those equipped with internal combustion engines for 10·6 per cent. and hydro-electric plants for 4·6 per cent. As a result of the war, the steam plants, have been working at a reduced efficiency owing to substitute fuel with a lower calorific value than coal having to be used. In the year under review maize was used as boiler fuel for the first time, to the extent of 1,169,057 tons. The number of consumers in the country increased from 1,567,381 in 1941 to 1,630,010 in 1942 and the average annual consumption per inhabitant from 195 to 201 kWh.

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.

Clacton.—September 4th. Urban District Council. 11-kV switchgear. (See this issue.)

Fraserburgh.—August 18th. Town Council. Various works, including electrical, for completion of 13 houses. Specifications from the burgh surveyor.

Plymouth.—August 19th. Electricity Supply Department. Boiler water control and heat recovery equipment. (July 28th).

West Midlands.—August 25th. Joint Electricity Authority. Travelling crane. (July 28th.)

Orders Placed

London.—POPLAR.—Electricity Committee. Accepted. Six feeder pillars (£393).—British Insulated Cables.

Northumberland.—County Council. Accepted. Additions to the electric lighting system at Berwick Maternity Hospital (£202).—I. & E. Morton.

Oldham.—Accepted. Installation of electric heaters at St. Patrick's Schools.—F. Wall & Co.

Rotherham. — Transport Committee. Accepted. Spot welder (£110).—British Insulated Cables.

Sheffield.—Corporation. Accepted. Five 2½-ton electrically propelled refuse collection vehicles (£1,217 each).—Brush Electrical Engineering Co.

Warrington.—Corporation. Accepted. Two vertical boiler feed pumps and accessories at pumping station. — Worthington-Simpson. Batteries.—Chloride Electrical Storage Co.

Watford.—Electricity Committee. Accepted. Alternator repairs (£6,000-£7,000).—Brush Electrical Engineering Co. One 1,000-kVA transformer (£888).—Metropolitan-Vickers.

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.

Bakewell.—Hall, gymnasium, canteen, etc., as club for Bakewell and District Youth Committee (£11,000); A. S. McWilliam, president.

Bolton.—Works additions, Coopers Row, H. Rigby & Co.

Extensions Hollins Cottage Homes (£6,500); borough engineer.

Bootle.—Nursery and school kitchen, Chestnut Grove; baths, Knowlesley Road; and school huts, Merton Road, borough engineer.

Bury.—Works extensions; Horridge & Cornall, Ltd., calico printers, Bolholt Print Works, Bury.

Chester.—Youth centre, Blacon (£1,628); city engineer.

Extensions, Lower Bridge Street; Chester Chronicle.

Clay Cross.—Workshops, garages, etc., Kennings, Ltd., automobile agents and engineers, Clay Cross, near Chesterfield.

Coventry.—Extensions, Eshall Lodge Institution (£9,745); city engineer.

Croydon.—School canteens (£6,294) and Alterations at Coombe Lodge (£1,350), with electrical work; borough engineer.

Workshop, School of Building (£1,367); Norman Wright (Builders), Ltd.

Additions, Selhurst School (£1,450) and Polytechnic (£2,313); Walker (Tooting), Ltd.

Dundee.—Proposed work at Sheriff Court House (heating and lighting improvements); clerk, Sheriff Court Houses Committee, Forfar.

Enfield.—Extensions, Express Motor & Body Works, Great Cambridge Road; L. Robinson.

Restaurant, Brimsdown; U.D.C. surveyor.

Gloucestershire.—Extensions Boys' School, Winchcombe; county architect.

Hampshire.—Additions, Petersfield Institution (£7,000) and Bishopstoke Sanatorium (£1,200); county architect, Winchester.

Hawick.—Works canteen at Pesco hosiery factory; manager, Peter Scott & Co.

Hull.—Community centre (£6,000) and hostel, Anlaby Road; city architect.

Ilkeston.—Housing development (£18,062); J. Mowlem & Co.

Kilmarnock.—Pathological laboratory for Infirmary; Jas. Hay & Steel, 13, West George Street.

Lancashire.—Additions, Leigh Institution (£1,277) and central school kitchen, Crompton; A. T. Nicholson, county architect, County Offices, Fishergate Hill, Preston.

Macclesfield.—School kitchen, Pierce Street; M. A. Tetlow, borough architect, Pear Tree House, Jordangate, Macclesfield.

Oldham.—Works extensions, Hathershaw; E. S. England, architect, 12, Clegg Street, Oldham.

Additions to mills for welfare rooms; James Greaves, Ltd., Cotton Spinners, Derker Mills.

Rochdale.—Pump house; Standard Mill Co., Ltd. cotton spinners, Shawclough, Rochdale.

Runcorn.—Headquarters (£7,000); secretary, Corps of Sea Cadets.

Urmston.—Restoration of flats, Flixton, for U.D.C. (electrical work); J. Maunders & Son, Ltd., builders, 554, Lostock Road, Stretford.

Warwickshire.—Maternity home, Rugby; county architect.

Watford.—Works additions, Bushey Mill Lane; Blaw Knox, Ltd.

York.—Works additions, Avenue Road; Clifton Carriage Works.

Additions, Wigginton Road; Rowntree & Co., Ltd.

FAMOUS HYDRO-ELECTRIC STATIONS.

The Roosevelt Dam, Arizona (built 1905-11), is truly picturesque and unusual in its design and composition of rubble masonry and concrete. Constructed in a narrow rocky gorge, it is supported each side by natural rock abutments. With a capacity of 533,500,000,000 gallons it supplies water to 250,000 acres in the Salt River Valley, known as the American "Valley of the Nile." The power-house at the foot of the 286 feet high dam develops 20,000 H.P.

It's EASY to telephone in this ACOUSTI-BOOTH

Put your shop phones in Burgess Acousti-booths and you'll be able to hear clearly in spite of nearby noise.

There are no doors because no doors are needed. Patented sound-absorbing walls soak up factory noise and provide a "zone of silence" for easy telephoning.

Open construction makes these booths easy to keep clean and obviates any ventilation problem. Hundreds of these doorless booths are in constant use in all types of factories. Write for Bulletin BP.131/E.R.

BURGESS ACOUSTI-BOOTH

BURGESS PRODUCTS CO. LTD.
Acoustical Division, HINCKLEY, LEICS.
Phone : Hinckley 700 (3 lines)
London Office : 72 Horseferry Road, S.W.1
Phone : ABBey 1868
Scottish Representatives:
R. McCartney & Co., 142 Queen Street, Glasgow, C.1

FOR **LAMPS** OR **BULBS**

RIVAL LAMPS LTD.
Electric Lamp Manufacturers
Ace of Spades, Kingston By-Pass, Surrey
Phone : ELMBRIDGE 3623 & 5666

— a creative force in Britain's post-war engineering renaissance

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.

CLACTON URBAN DISTRICT COUNCIL

Supply and Erection of 11-kV Metal-Clad Switchgear

THE above Council invite Tenders for the supply and erection of 11-kV METAL-CLAD SWITCHGEAR (150-MVA RUPTURING CAPACITY) in the Urban District of Clacton.

Form of Tender, together with Specification and General Conditions, may be obtained from the Chief Electrical Engineer and Manager, Town Hall, Clacton-on-Sea, on payment of a deposit of One Guinea, which will be returned on receipt of a bona fide tender.

Tenders, on the prescribed form, must be delivered in a sealed packet, endorsed " Tender for 11-kV Switchgear," but bearing no name or distinguishing mark indicating the sender, to the undersigned at his office before noon on Monday, the 4th September, 1944. Tenders received without such endorsement will not be considered.

The Council do not bind themselves to accept the lowest or any tender sent in, and canvassing either directly or indirectly will disqualify.

CHARLES B. HEARN,
Clerk of the Council.

Town Hall,
Clacton-on-Sea.
2nd August, 1944. 491

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 GRAVESEND

Appointment of Borough Electrical Engineer and Manager

APPLICATIONS for the above appointment are invited from engineers who are experienced in the management and administration of an electricity undertaking. Candidates must have been engaged in the business of electricity supply for an extended period and have had practical experience in the generation and distribution of electricity.

The salary will be in accordance with the Agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers, dated 9th July, 1941. The present salary according to the scale is £1,422 per annum, and this salary will be paid from the date of taking up duties.

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

Application forms for the appointment may be obtained from the undersigned and must be returned by Friday, 1st September, 1944.

Canvassing either directly or indirectly will disqualify.

H. H. BROWN,
Town Clerk.

4, Woodville Terrace,
Gravesend, Kent.
3rd August, 1944. 492

CITY OF CHICHESTER

Appointment of Chief Electrical Engineer and Manager

APPLICATIONS are invited for the above appointment from qualified engineers not exceeding 45 years of age who are experienced in the management and administration of an electricity undertaking.

The salary will be in accordance with the Agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers, dated 9th July, 1941. The present salary according to the scale is £1,013 per annum.

In accordance with the provisions of Clause 10 of the Agreement, 85% of the salary will be paid for the 1st year, 92½% for the 2nd year, and the full scale salary at the commencement of the 3rd year. A car allowance will be paid.

The appointment will be terminable by 3 months' notice by either party and is subject to the provisions of the Local Government Superannuation Act, 1937.

The person appointed will be required to pass a medical examination.

Application forms, with conditions of the appointment, may be obtained from, and must be returned to, the undersigned by not later than 31st August, 1944.

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

ERIC BANKS, Town Clerk.
31st July, 1944. 483

APPLICATIONS invited for an Assistant Transformer Designer, should have had good education followed by university degree, keen, and a good sense of humour, permanent progressive position.—Box 494, c/o The Electrical Review.

ELECTRICAL and Hydraulic Engineers in Birmingham district require a young man to train under Electrical Engineer and Designer for responsible work. State technical and any works training, age, experience and salary required.—Box No. 152, Haddons Advertising Offices, 159, Great Charles Street, Birmingham, 3. 468

ELECTRICAL Wholesalers require a Clerical Assistant, conversant with trade and materials as handled.—London Electrical Co. (Blackfriars) Ltd., Blackfriars Road, S.E.1. 24

LIFTS. Representatives required South Coast areas by leading lift manufacturer. State area covered and experience in this class of work.—Box 487, c/o The Electrical Review.

MANAGER to take complete control of electrical contracting section of large engineering business. Essentials—first-class technical qualifications, wide knowledge of installation design, estimating and general business experience (preferably in contracting field). Salary up to £1,500, according to qualifications. Good prospects. Applications held confidential. State age, education and detailed employment record.—Box 482, c/o The Electrical Review.

PRODUCTION Manager required, over 35 years of age, with at least 10 years' experience of engineering factory management, preferably in electrical instrument or radio manufacturing, and fully conversant with time-study, buying control, factory loading, production planning. Permanent post with excellent post-war prospects offered to right man. Reply—Box 489, c/o The Electrical Review.

TRAVELLER required for North and North West London by electrical wholesale distributors. Must have knowledge of wiring supplies and general factory requirements.—Wm. Pryor & Co. Ltd., 3, Kingsland High Street, Dalston Junction, London, E.8. 6076

PLASTIC Moulders require Representative with first-class connections amongst manufacturers. Write—Box E.262, Willings, 133, Moorgate, E.C.2. 498

RESEARCH Engineer. Manager required for department engaged on research work in connection with the design, development and application of small D.C. and A.C. motors and generators. Applicants should be 30 to 45 years of age and must have had university training to at least an Engineering Honours Degree. Production and administrative experience desirable. Permanent appointment near London on urgent work of national importance. Salary up to £1,000 per annum. Applications, giving particulars of age, education, qualifications and experience, to—Box 469, 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

B.Sc. (37), exempted, designer of Transformers, Motors, Rheostats, free. Write—Box 6101, c/o The Electrical Review.

ELECTRIC Lighting Industry. Production Executive of good personality, sound mechanical training, linguist with Continental manufacturing experience, desires change of position.—Box 6091, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer, 37, desires change. Experienced in medium and heavy engineering, jig and machine tool work, plant maintenance and layout.—Box 6077, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer (46), A.M.I.E.E. desires change with a view to post-war permanency. Administration large factory, maintenance, manufacturing, generating, heating and ventilating experience. Free at short notice. Present salary £700.—Box 6066, c/o The Electrical Review.

ELECTRICAL Engineer (Grad. I.E.E., age 26), experienced in overhauling, testing and maintenance of electrical machinery, seeks position in Midlands, preferably Birmingham area.—Box 6098, c/o The Electrical Review.

ELECTRICAL Engineer (45), disengaged, seeks position in control of works maintenance staff and plant. Long experience all classes elec. and mech. plant, installation, buying and supervision of labour. Salary level, £520 p.a. —Box 6071, c/o The Electrical Review.

ELECTRICAL Supervisor, holding electrical engineering diploma, age 36, free, possesses initiative and drive.—Box 6096, c/o The Electrical Review.

ELECTRICIAN, house or factory wiring, over military age.—Box 6114, c/o The Electrical Review.

F.H.P. Motor and Ancillary Equipment Specialist (40), 21 years' comprehensive experience, energetic and enthusiastic, desires responsible managerial post, either sales or works.—Box 6108, c/o The Electrical Review.

MAINTENANCE and Plant Manager, A.M.I.E.E., desires change, anywhere.—W., 17, Avondale Park Gardens, W.11. 6064

YOUNG Electrical Engineer (exempt military service), with varied practical and theoretical experience in all types of electrical machinery, repairs, rewinding, installations, re-designs, testing, etc., good technical correspondent, seeks responsible position.—Box 6107, c/o The Electrical Review.

YOUNG man (21), exempt, Higher Nat. Cert. Elec. Engin. in generation, transmission, protection and elec. meds., seeks progressive position.—Box 6110, 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.

ELECTRIC MOTORS AND DYNAMOS

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

For Sale or Hire. Send your enquiries to:—

BRITANNIA MANUFACTURING CO. LTD.,
22-23, BRITANNIA STREET.
CITY ROAD, LONDON, N.1.

Telephone: 5512-3 Clerkenwell. 13

GEORGE COHEN, SONS & CO. LTD.

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GUARANTEED ELECTRICAL

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MOTORS, GENERATORS,

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

27

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.

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WATER TUBE BOILERS IN STOCK

Three 12,000 lbs. evaporation, 200 lbs. W.P.
One 12,000 ,, ,, 160 ,, ,,

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

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

32

ECONOMISERS IN STOCK

TWO Green's Economisers, 208 tubes, 250 lbs. W.P.
ONE Green's Economiser, 128 tubes, 185 lbs. W.P.

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

BURFORD, TAYLOR & CO. LTD.,
7, Commercial Street, Middlesbrough. Telephone 2622.

65

ONE MOTOR GENERATOR SET by E.C.C. Input, 440-volts, 3-phase, 50-cycles, 230-h.p., 730-r.p.m. Slip-ring Motor. Output, 162-kW, 440-volts D.C. Compound Interpole Generator. Direct coupled on cast-iron baseplate.

ONE REVERSIBLE BOOSTER SET by E.C.C., comprising Motor, 65 h.p., 440 volts D.C., 1,000 r.p.m., direct coupled to a 300-amp. 0/160-volt, 1,000-r.p.m. Generator, with exciter, 2 amps., 250 volts, 1,000 r.p.m. All mounted on cast-iron baseplate.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL

460

ARC WELDING MACHINES FROM STOCK

WE offer our latest type No. 2 Max-Arc Welder for immediate delivery, 15/250 amperes. Operates off any A.C. supply voltage. Send for details.

MAX-ARC WELDERS LTD.,
190, THORNTON ROAD, CROYDON.
THOrnton Heath 4276-8.
35

BURDETTE & CO. LTD.

Stock

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

STONHOUSE STREET, CLAPHAM, S.W.4.

Day and night service. MACaulay 4555.
17

A large stock of Searchlights (sale or hire), Mirrors, Lenses, A.I.D. Turnbuckles, etc., and Winches of our self-sustaining types, also surplus Carbon Rods, Ebonite and Fibre. Hundreds of thousands supplied during the last 40 years to Government departments, corporations and innumerable traders.—London Electric Firm, Croydon. 55

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

A.C. and D.C. Motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 4422). 6115

A.C. Motors, 1/50th h.p. to 3 h.p., from stock, for essential work only.—The Johnson Engineering Co., 86, Great Portland St., W.1. Tel. Museum 6373. 57

AERIAL Cables, all sizes quoted for; good deliveries against Government contract numbers.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6117

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

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

BEST English Cables, 1/.044 up to 127/.103, deliveries against M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6118

CARBONS, large stocks assorted sizes, solid and cored.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6119

ELECTRIC Hammers. The Kango Electric Hammer is a necessity for all works. It pays for itself in a few weeks. Write for descriptive pamphlet to—George Cohen, Sons & Co. Ltd., Wood Lane, London, W.12, and Stanningley, near Leeds. 25

ELECTRIC Light Plant, 16-h.p. Hornsby Oil Engine, 100-amps. Dynamo by Brush Company, 55 Tudor cells, switchboard, etc., supplying large private estate in Norfolk. Can be viewed by appointment.—Lacey N. Gooding, Estate Agent, Bury St. Edmunds. 466

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

FOR sale, 106-h.p. Petter Diesel Engine, four cylinder, vertical, cold start, 375 r.p.m., compressed air, direct coupled alternator, 66 kVA, 400/3/50, and exciter.—Box 6106, c/o The Electrical Review.

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

GENERATING Set, direct coupled Steam Generating Set on cast iron bed, 440 volts D.C., 70 kW, compound wound, with two-cylinder Belliss & Morcom Engine (high pressure and low pressure), £120.—Box 485, c/o The Electrical Review.

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

HOUSE Meters, 200/240 v., A.C. or D.C., 3, 5 and 10 amps., at 17s. 6d. each.—Universal, 221, City Rd., London, E.C.1. 42

KEITH Blackman Electric Blower, 3,500 c. ft. p.m., cpld. to 20-h.p., 400/3/50, ball-bearing motor, with O.I. starter.—Greenhalgh Bros., Burton's Field Mill, Atherton, Lancs. ~~£85~~

LEAD-covered and Armoured Cables, P.I. and V.I.R., various special lines at low prices.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6120

MOTOR Generator Sets and Convertors, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, City Road, London, N.1. Telephone, Clerkenwell 5512, 5513 & 5514. 28

MOTORISED ½" Bench Drilling Machine, 13 speeds, £11 11s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 51

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

ONE Motor Generating Set, input 230 volts, 950 r.p.m., shunt interpole, D.C. Motor, direct coupled on baseplate to Generator having an output of 80 volts, 45 amps., shunt wound.—Stewart Thomson & Sons, Fort Rd., Seaforth, Liverpool, 21. 457

PORCELAIN Cleats, 2 and 3 groove, various sizes ex stock, price list.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6121

PORCELAIN Insulators and Spindles, also Cleats, cheap.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6122

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

SELF Priming Electric Pumps, 300 g.p.h., £11 11s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 53

SINGLE-core V.I.R., Braided Flexible, heavy insulation, carry 24 amps., cheap.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6123

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