

ELECTRICAL REVIEW

FOUNDED
1872

Vol. CXXXIX. No. 3585

AUGUST 9, 1946

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N-S motor, conveniently
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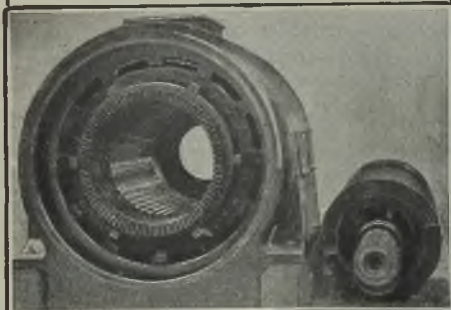
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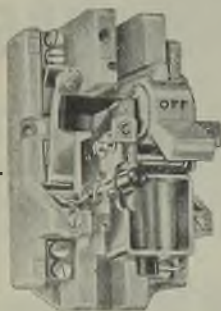
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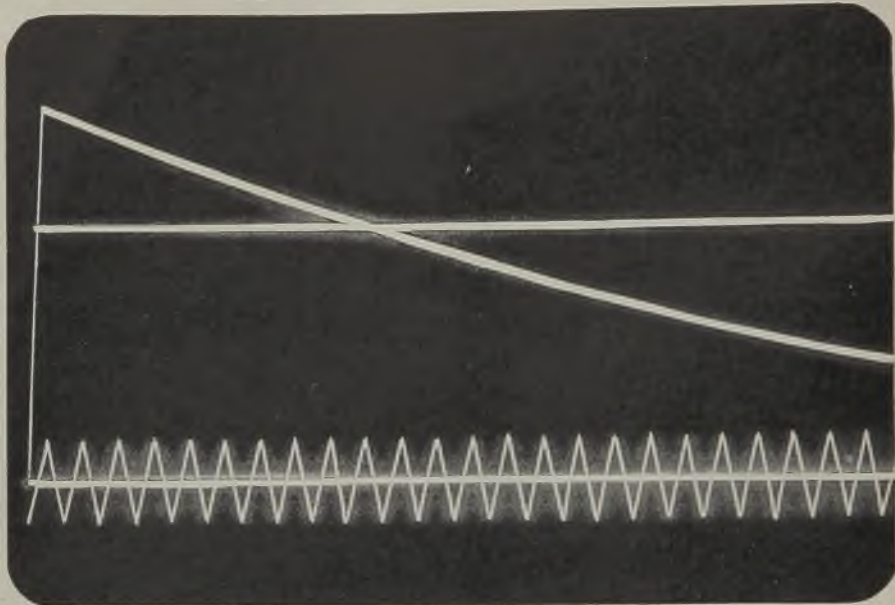
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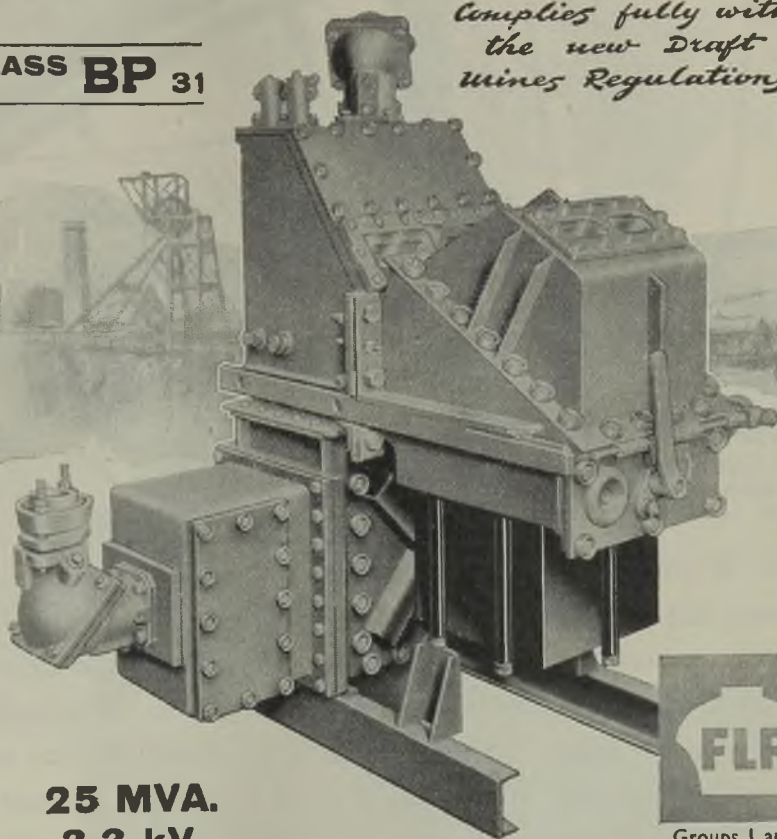
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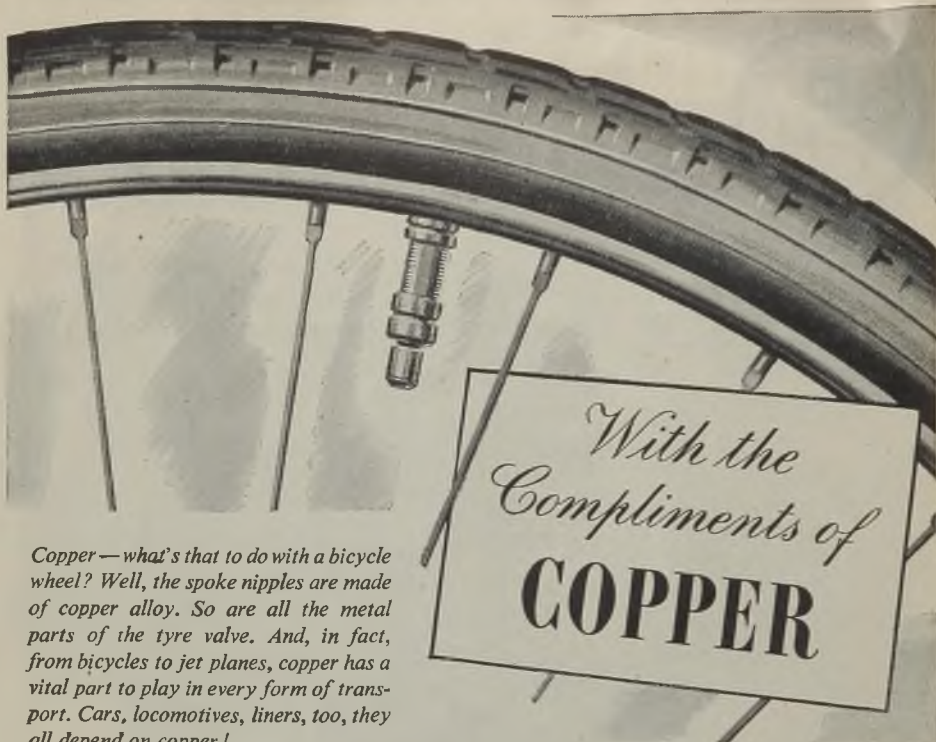
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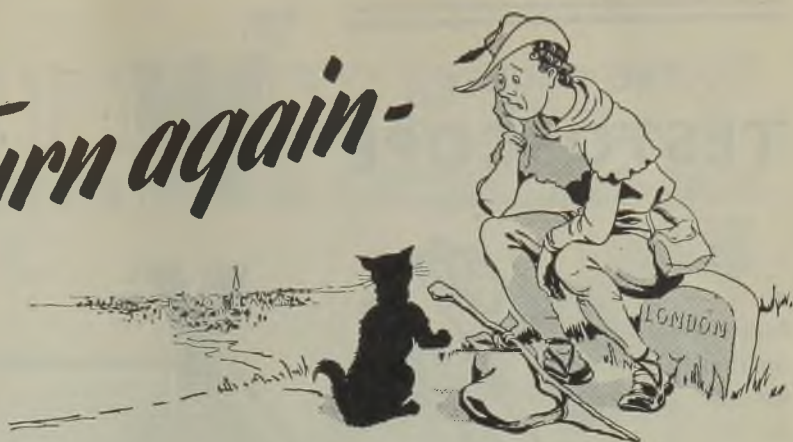
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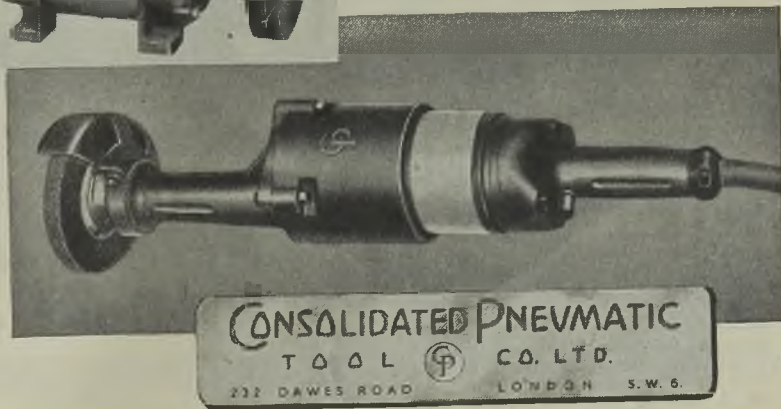
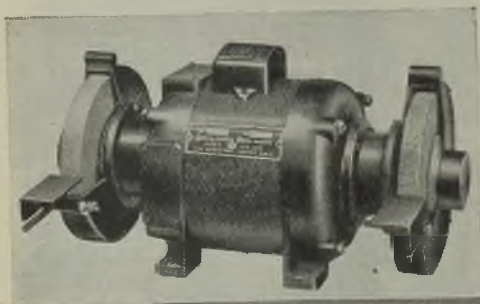
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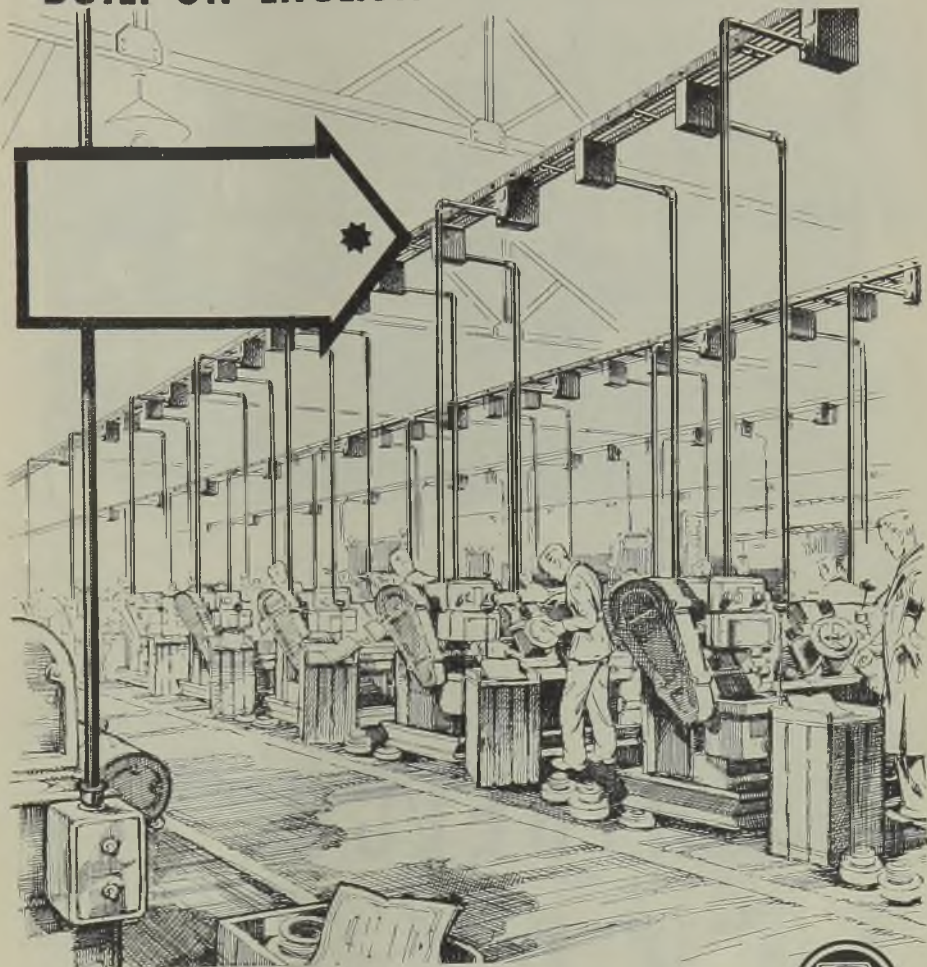
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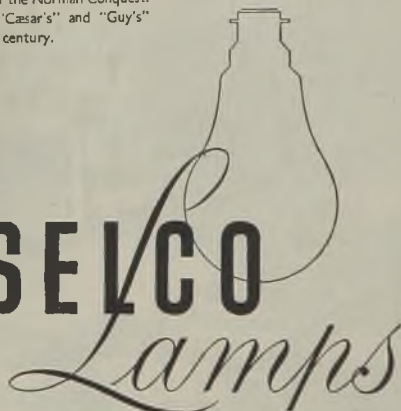


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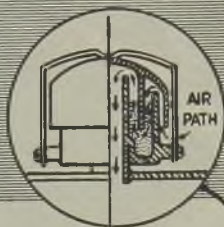
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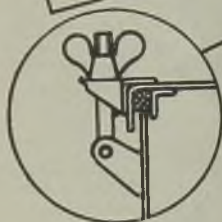
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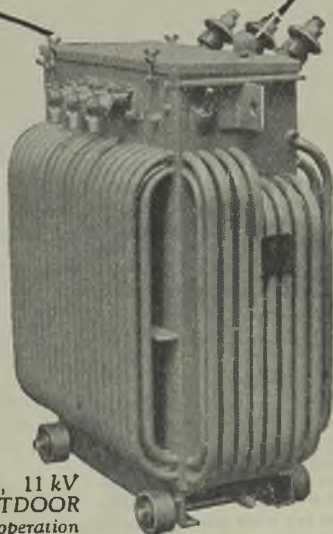
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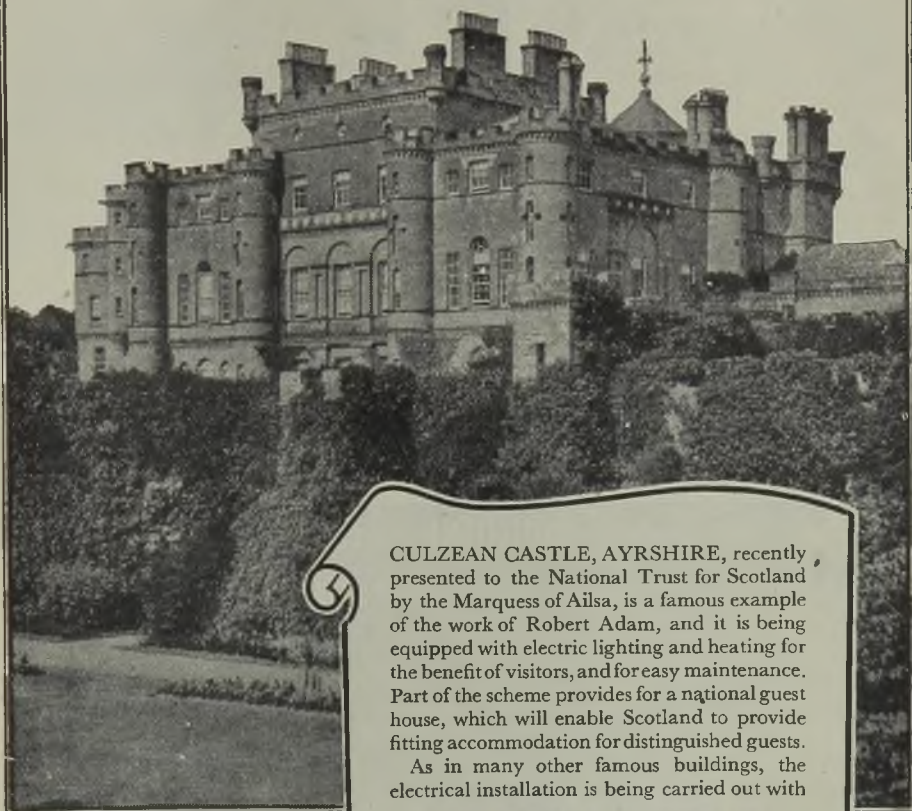
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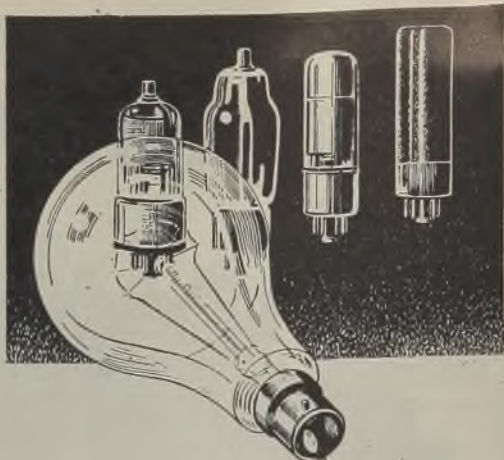
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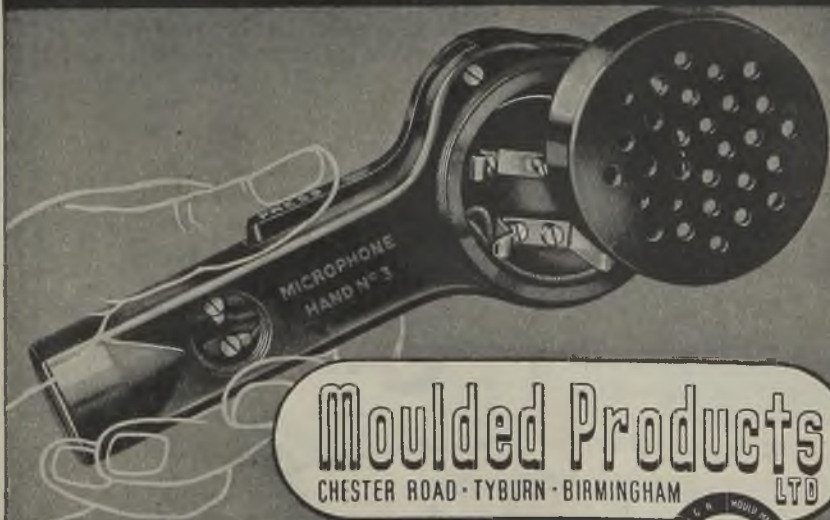
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We are indebted to the Royal Horticultural Society for access to their Library.

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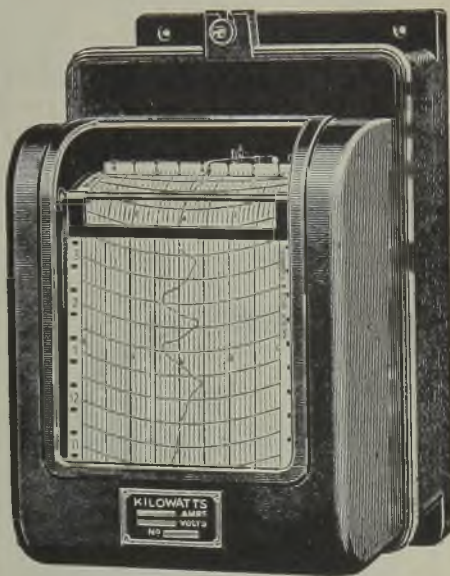
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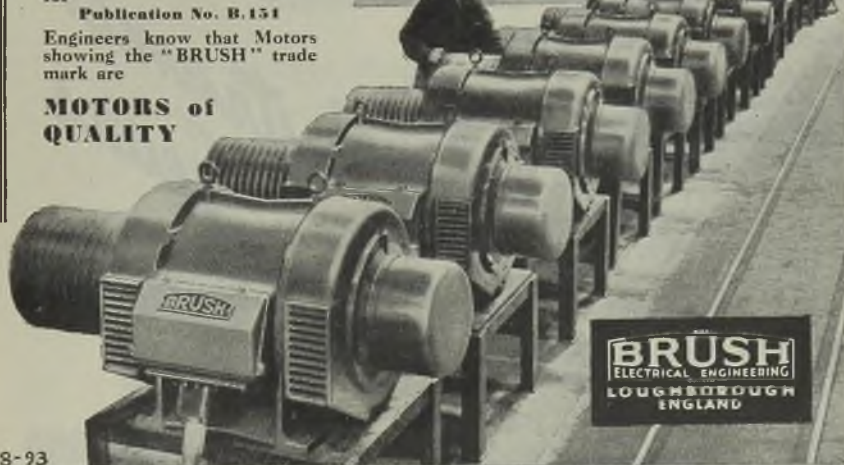
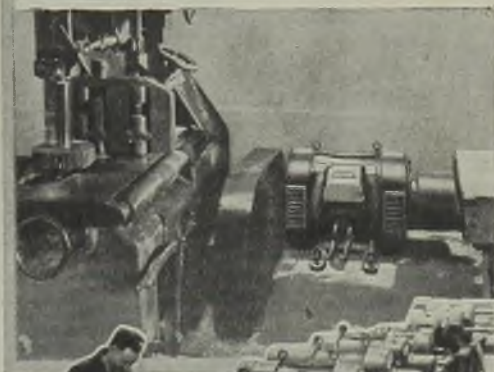
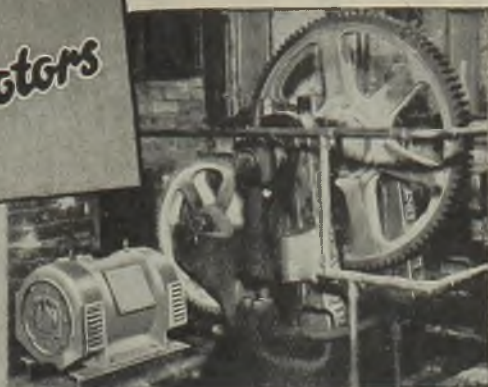
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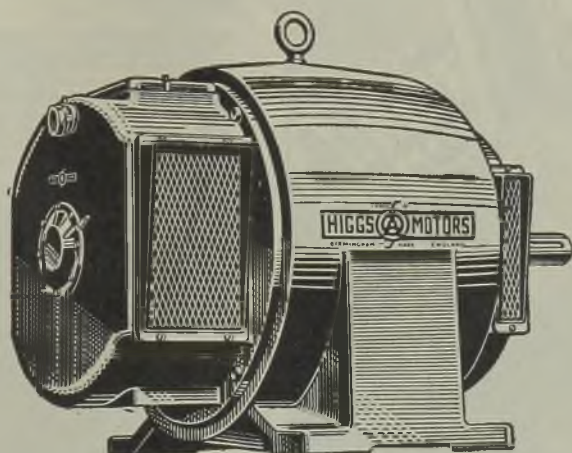
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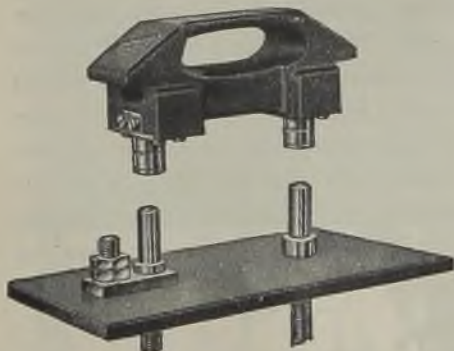


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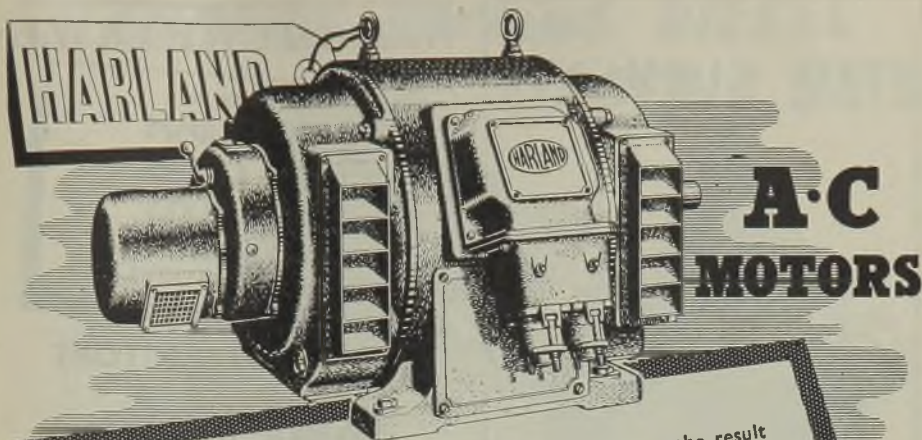
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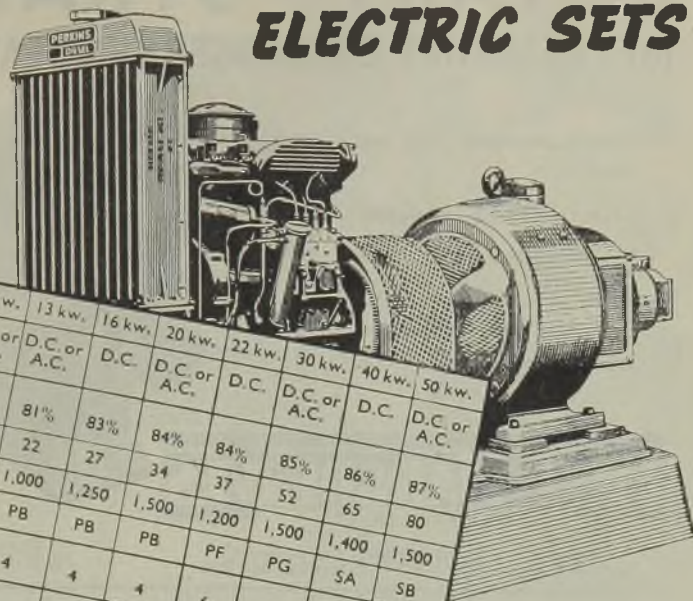
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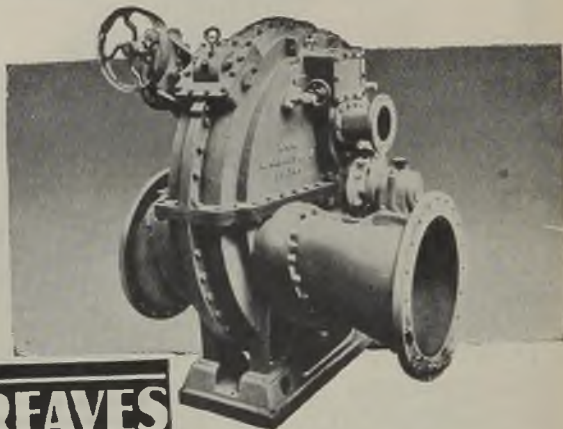
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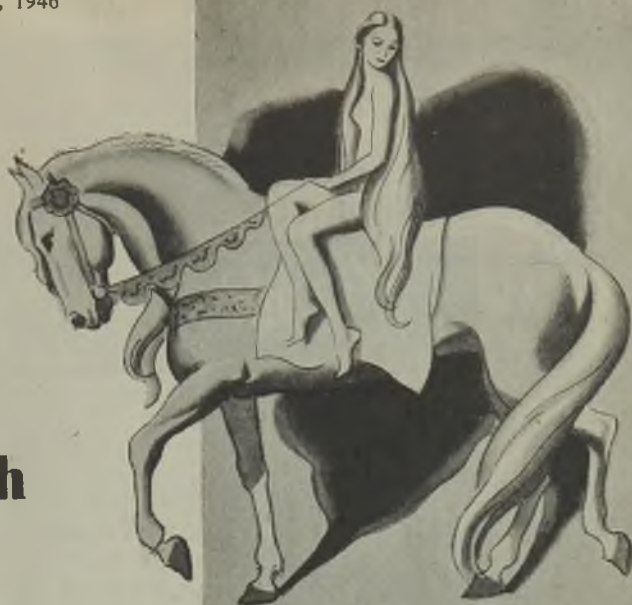
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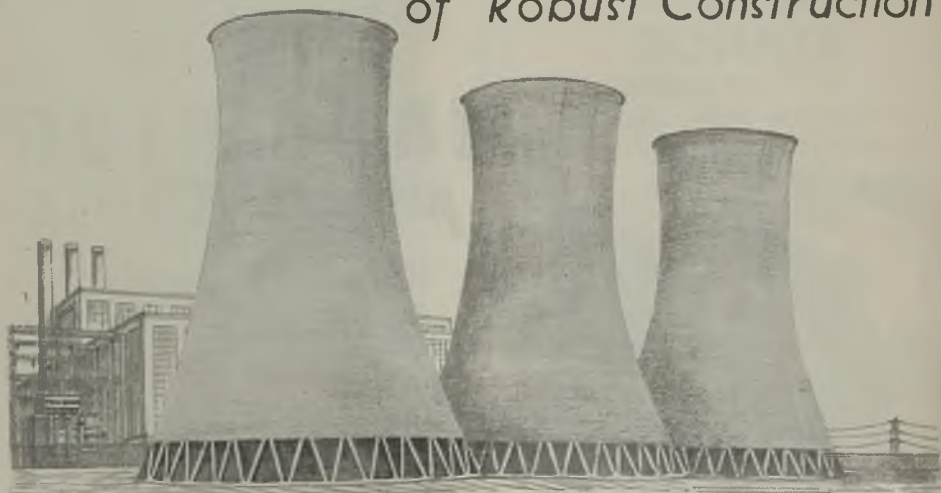
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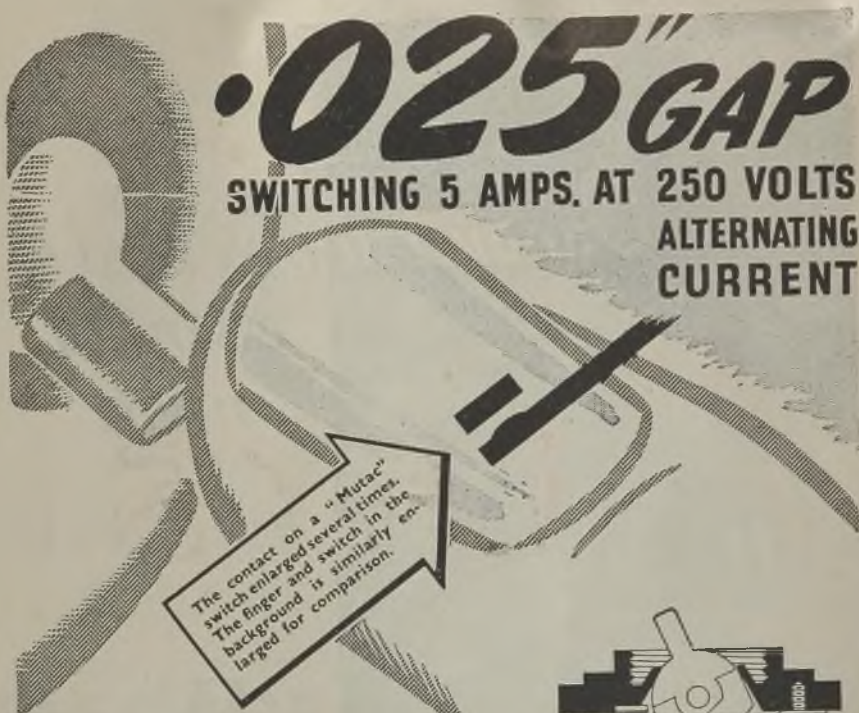
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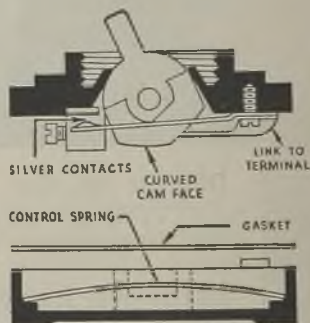
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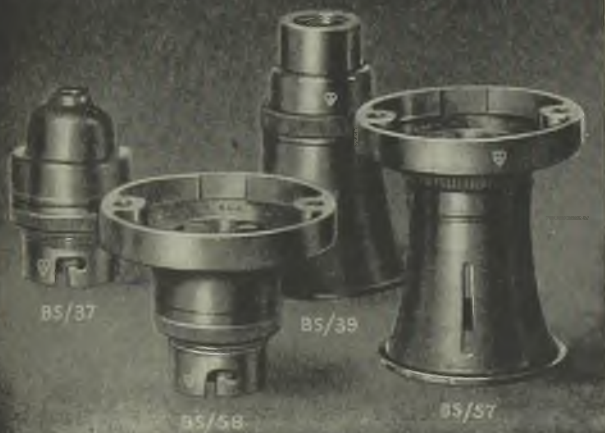
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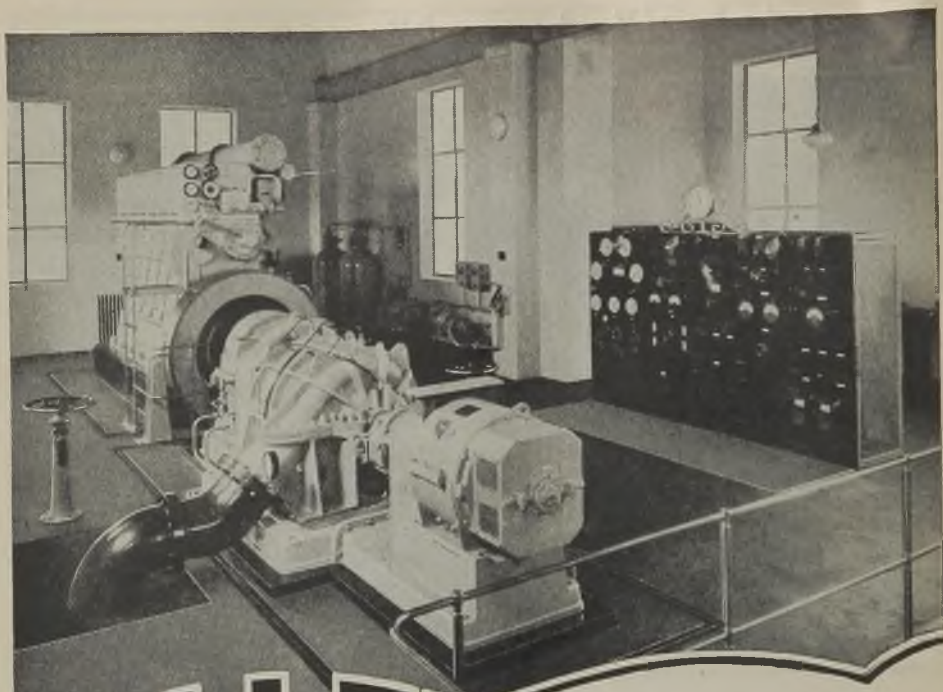
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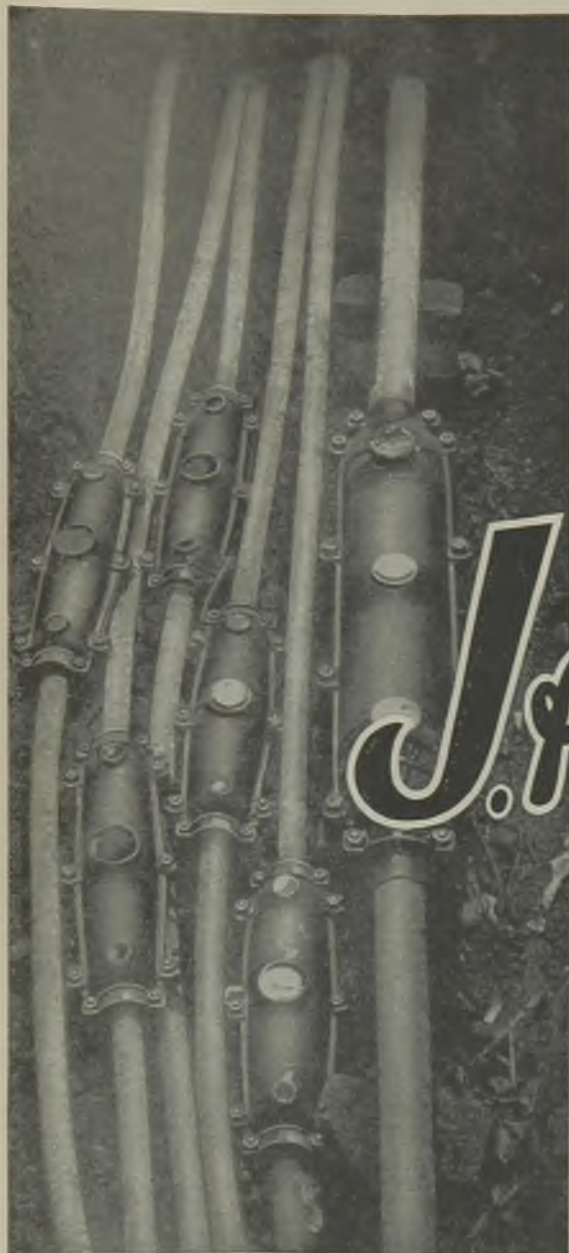
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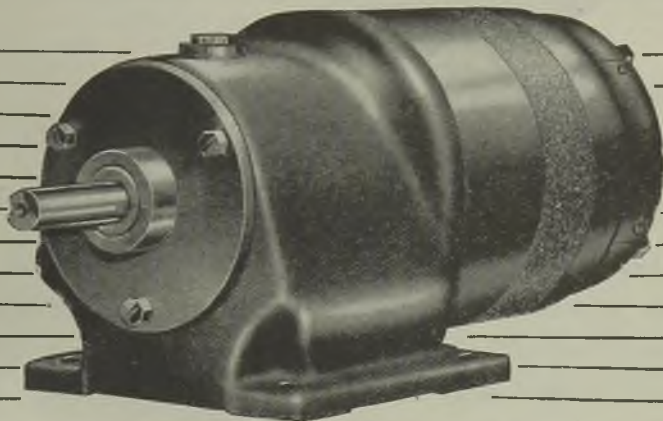
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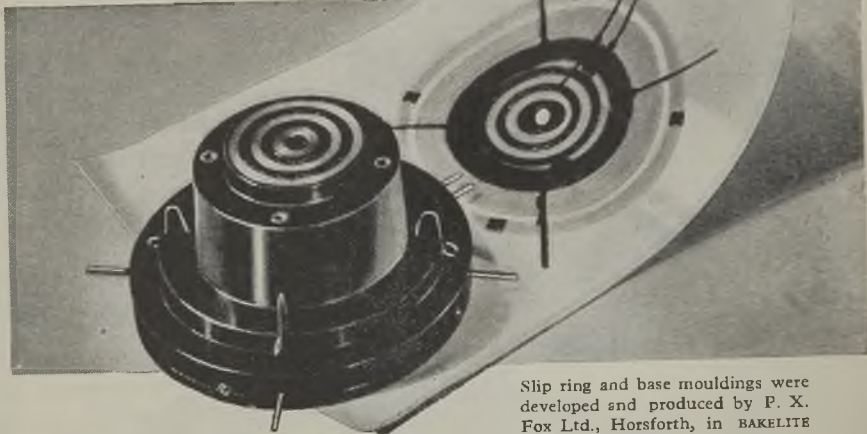
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ELECTRICAL REVIEW

August 9, 1946

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EDITORIAL, ADVERTISING & PUBLISHING OFFICES : Dorset House, Stamford St., London, S.E.1
Telegraphic Address : "Elecrev, Sedist, London." Code : ABC. Telephone No. : Waterloo 3333 (50 lines).
Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage. Entered as Second Class Matter at the New York, U.S.A., Post Office.

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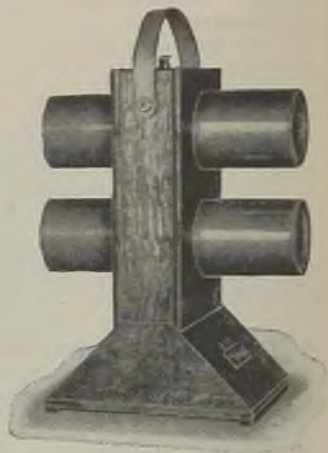
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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIX. No. 3585.

AUGUST 9, 1946

9d. WEEKLY

Technical Colleges

Research by Teaching Staffs

RECRUITMENT of men in all walks of life of the high type required by the electrical industry has been for some years a major preoccupation of its leaders. Hence the amount of thought and attention that is being given to the education and training of entrants into its ranks.

A prime need is for teachers of the right calibre. That means more than the holding of high academic qualifications, more even than a gift for imparting information. In technical colleges more especially it implies possession not only of a capacity to form clear ideas as to the manner in which their instruction is eventually to be applied but also of the power to instil confidence into engineering students (who usually have a practical bent) that their mentors have this aptitude. This would of itself give justification enough for the valuable exercise gained in the carrying out at colleges of applied research along avenues that seem likely to lead somewhere.

Teachers as Consultants

Some such considerations may be assumed to have influenced a recent circular of the Ministry of Education recommending that the teaching staffs of technical colleges should engage in research at the instance of industry. The Ministry went on to suggest that fees payable should be allocated by pre-arrangement between the individual and the college authorities and also that staffs should be encouraged to act as consultants to industry.

In taking exception to the last recommendation, a group of independent con-

sultants in a letter to *The Times* appear to have inferred that subsidized research would be undertaken for the sole benefit of a single firm, whereas the results of research at educational establishments should be freely available to industry as a whole. If results exclusive to any particular body are desired, recourse should surely be had to independent consultants, whose vitalizing function was never more important than it is to-day with the prevalent tendency to large-scale organization. Some safeguard of their position is to be found in the proviso of the circular that members of teaching staffs acting as consultants shall be competent to do so.

Lack of Practical Knowledge

The average teacher, the signatories stated, generally lacks the practical knowledge of industry, especially in its economic aspects, which is an essential qualification of a technical consultant. Industrialists concerned largely with production efficiency may be expected to be alive to this requisite and public bodies are well advised to give full scope to a form of private enterprise to which there is probably no doctrinaire objection.

It seems to us doubtful whether the independent consultants' case was fully answered by an admirable statement of the views of the Institution of Electrical Engineers which appeared over the signature of its secretary, Mr. W. K. Brasher, in a subsequent letter to the same journal. This statement concluded by advocating the remuneration of teaching staffs for research carried on outside their teaching hours—



a proposal that calls for amplification in detail before its merits can be appraised—but the question of acting as consultants to industry was not touched upon. Care would be necessary lest the incentive of seeing some useful line of applied research put into production presented greater attractions to teachers than the casting of seed upon the oft-seeming stony ground of students' minds. Research undertaken in technical colleges should have as its primary long-term object the training of engineers, its value to industry being merely a commendable by-product.

Electricity Tariffs SEVENTEEN years have elapsed since the Electricity Commissioners appointed the last committee on electricity charges and tariffs, under the chairmanship of Mr. A. C. Cramb; there had been an earlier one in 1925. Now the appointment of a further committee is announced with Sir John Dalton as chairman. The keynote of the terms of reference of the 1929 committee was uniformity; this time uniformity and development are the considerations. A link between the last committee and the present one is provided in the person of Mr. H. Bentham who again represents the Provincial Electric Supply Association.

Central Board Finance UNDER the 1926 Act, by which it was established, the Central Electricity Board was empowered to borrow up to £33½ million and by 1941 the limit had been raised to £70 million. Now approval has been given to a Special Order by which the Board's borrowing powers are increased to £100 million, thus trebling the original amount. At the end of 1945 the Board had about £3 million of unexercised borrowing powers so that with the sanctioned increase it will have £33 millions to play with. Estimates for the period ending with 1950 show that £26.6 million will be required, mainly for extensions of the grid but also for the Board's station at Earley and other purposes.

Portobello Extensions CONSIDERABLE economies in time and money will be achieved by the decision arrived at by the Edinburgh Electricity Department to clear out old plant in the Portobello power station and install modern generating sets

instead of erecting an entirely new station. Details of the scheme are given in this issue and from these it will be seen that it is hoped to have the first of two 60,000-kW sets in operation in less than two and a half years, whereas it would be four years before a new station could be got going. The two new sets will cost £2½ million while a new station would cost £4 million and in this way the Edinburgh undertaking's consumers will be saved an expenditure of as much as £200,000 per annum for twenty years.

Space-heating Calculations QUOTING from "Meteorological History and the Space Heating Machine," by R. Grierson (Institution of Mechanical Engineers, 2s. 9d. post free): "Warmed buildings should no longer be regarded as receptacles for unknown quantities of valuable heat energy." Much is due to the author, as Mr. R. A. S. Thwaites pointed out at the I.M.E.A. Convention last month, that heat requirements can now be calculated on a scientific basis. The practical aspects of the degree-day method as demonstrated on the Northmet system have been described by Mr. Grierson in our columns. The new document, which contains a considerable amount of hitherto unpublished basic data relating to extremes of temperatures in addition to average values for a long-term survey, is commended to the favourable attention of electrical space-heating engineers.

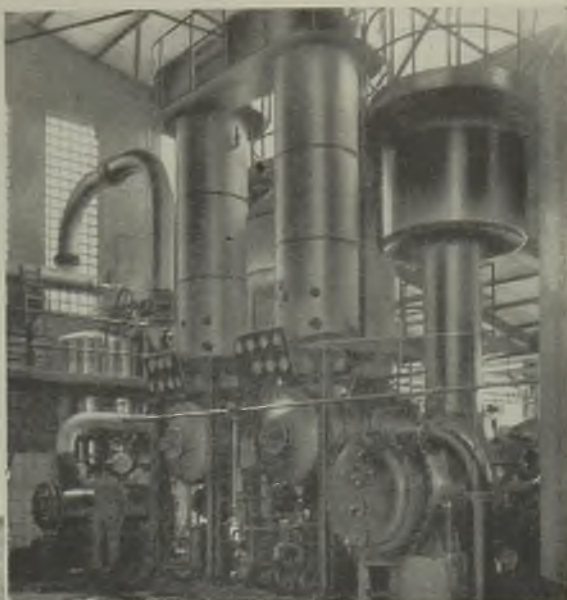
B.E.A.M.A. Directorship AT the time of the advertisement for a successor to Mr. Victor Watlington as director of the British and Allied Manufacturers' Association, we mentioned that the post was one requiring very high qualifications and experience. In selecting Mr. B. H. Leeson, of Reyrolles, for the position the Council of B.E.A.M.A. has undoubtedly chosen well, for Mr. Leeson (better known as Colonel Leeson) has had long service in the industry and although his principal work has been in connection with high-voltage switchgear he has been prominent in a company with varied interests which has given him a good all-round experience of electrical manufacture. Apart from being technically equipped, he has an excellent administrative record both within the industry and in wider circles.

Evaporated Milk

New Processing and Canning Factory

WITH the threatened reduction in fresh milk supplies next winter, condensed and dried milk are again likely to play an important part in our diet. To meet the situation, factories all over the country are now busily engaged on preserving large quantities of milk. At a new works at Whitland, near Carmarthen, Wilts United Dairies, Ltd., are producing as many as 80,000 16-oz tins of unsweetened evaporated milk a day, and in addition the company distributes a large quantity of fresh milk daily.

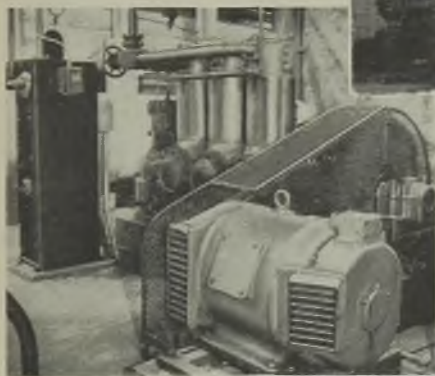
The milk is collected in churns by lorry from about 3,000 farms situated within a radius of fifty miles, on an average



Condensing plant at the Whitland, Carmarthen, factory of Wilts United Dairies, Ltd.

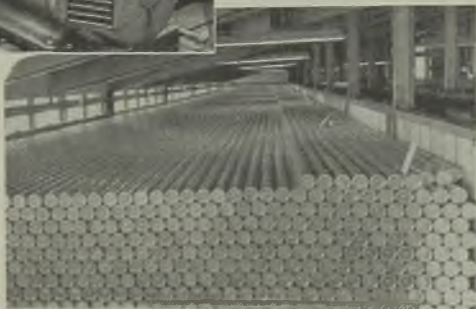
and automatically weighed. The empty churns continue their way on another chain conveyor (2-H.P., 940-r.p.m. motor) to two tunnel washers (10-H.P., 1,440-r.p.m. motors) where they are washed, steam sterilized and dried at a rate of 600 an hour on each of the machines.

From the receiving tanks the milk is taken by means of an 8,000 gal per hour pump, with a 9-H.P., 1,440-r.p.m. motor, through a brine cooler (operated by



This 100-H.P. compressor employed for milk cooling is shortly to be duplicated

53,000 gallons being handled daily. Unloaded from the lorries, the churns are carried on a chain conveyor, which is driven by a 6-H.P. 950-r.p.m. Lancashire Dynamo totally enclosed motor with E.A.C. starter, to the receiving tank where it is tipped



Fluorescent lamps are used to light the four stacking rooms, each one of which holds 330,000 tins

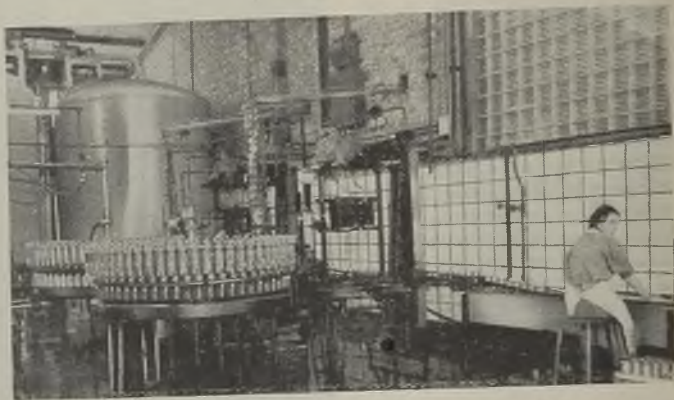
a brine circulating pump with a 6-H.P., 1,440-r.p.m. motor), which reduces its temperature to approximately 40 deg F, ready either for

dispatch in 3,000-gal glass-lined railway tanks, for storage in two 3,000-gal tanks while awaiting dispatch, or straight to the condensery for treatment. In the condensery, the milk goes from the cooler to six 3,000-gal storage tanks, where the cream is prevented from separating out by means of agitators (4-H.P., 1,440-r.p.m. motors) which blow air continuously through the milk. From the storage tanks, the milk is pumped with the aid of 3-H.P. 1,440-r.p.m. motors to recirculating tanks, where it is pumped (20-H.P., 1,436-r.p.m. motor) through a Peebles stainless steel steam heater. An automatic float switch which is incorporated ensures that the recirculating tanks are kept full.

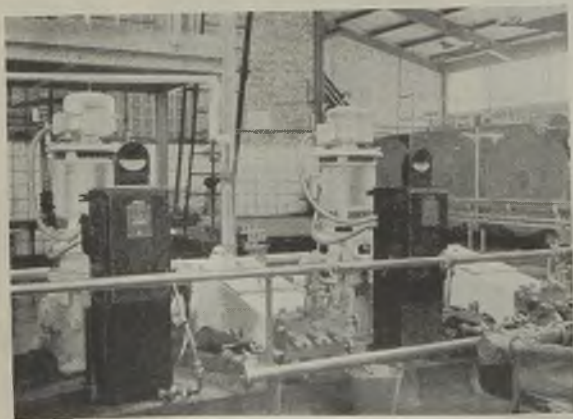
Leaving the heater, the milk passes to the "hot well" and is then delivered to the Peebles continuous evaporator working under vacuum. This evaporator, which is capable of dealing with 33,000 lb of liquid milk per hour, is of the "double effect" type, the milk being

steel collecting vessel at the desired degree of concentration. Entrained air and incondensable gases in the evaporator are extracted by means of a Pearn dry vacuum pump driven by a 15-H.P., 715-r.p.m. slip-ring induction motor with a Worthington Simpson surface condenser.

From the collecting vessel the milk is gravity fed to homogenizing machines which



Tins are filled and sealed automatically at the rate of 136 a minute. The testing tank is seen on the right



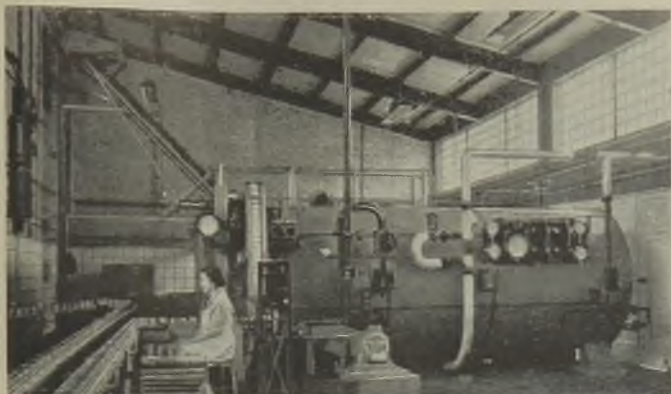
Before canning, the milk passes through homogenizers to ensure that the cream is distributed equally

distributed in a thin film passing downwards through the calandria tubes, and from the evaporator the product passes to a stainless

are operated through reduction gear from 32-H.P. motors running at 1,440 r.p.m. In its final form the evaporated milk is then pumped through brine coolers, which reduce its temperature to 40 deg F, to four 3,000 gal storage vessels. These are kept agitated by means of impellers. Inspection lamps are provided to enable the operator to keep an eye on the product at all stages of manufacture. These storage vessels, incidentally, are of glass enamelled steel construction.

Finally the finished product is passed to the filling machines. Though two of these machines are provided only one is used at a time, the other being kept as a standby. Each machine is capable of automatically filling and soldering tins at a rate of 136 a minute, to give an output of 80,000 tins a day.

Leaving the filler, the tins are carried along a conveyor to a testing bath where imperfectly soldered ones show bubbles and where only



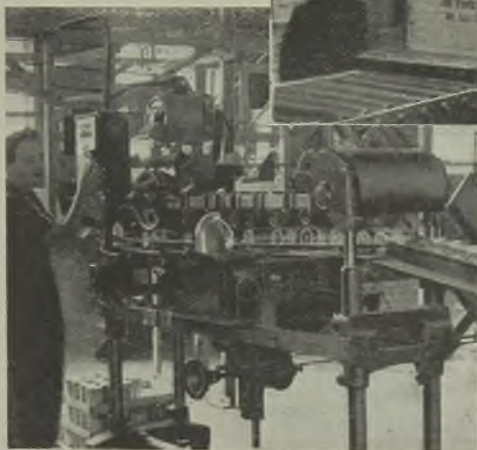
After sealing, the tins go to the sterilizer

partly filled ones float. Steam is used to dry the tops of tins ready to receive the batch number before they continue on another conveyor en route for sterilization. The filler and conveyor operate as a single unit and are driven by a 3-H.P., 715-r.p.m. motor.

The sterilization process is carried out by means of a continuous machine (Mather & Platt) consisting of three cylindrical units, a bringing-up unit, sterilizing unit, and cooling unit. The tins are carried around each unit by a slowly rotating spiral trackway and are there processed under counter pressure.

An inclined conveyor takes the tins leaving the cooler up to the stores where further horizontal cable conveyors feed four compartments providing accommodation between them for 1,320,000 tins. A fluorescent lighting installation over the storage space facilitates stacking. From store the tins can be speedily fed to the labelling machines which can handle 250 tins a minute, and they are then packed by

Labelling the tins is undertaken at the rate of 250 a minute



Automatic nailing machine for putting the lids on the packing cases

brought into service, and to provide additional steam and generating capacity two further 85-kW sets are now being installed. Steam is also used to drive two ammonia compressors for the cooling

hand into cartons or wooden boxes holding forty-eight tins each. Box making and nail-

there is in addition an electrically driven (with a 100-H.P. motor) which

ing machines are provided, as well as a box wiring machine. A final belt conveyor carries the filled boxes up to the dispatch department.

When the condensing plant is in operation and steam is required for process work a 250 - kW Lancashire Dynamo alternator driven by a Belliss & Morcom steam engine is

be duplicated. The boiler plant comprises two super economic units equipped with 15-H.P. and 7-H.P. motors driving the induced draught fans and 1-H.P. motors driving the stokers.

When the process steam is not required for condensing purposes, the electricity supply is taken from the West Cambrian Power Co., Ltd., the two supplies being connected in parallel. The maximum demand on the power company's supply is about 220 kW. The substation switch-house was

supplied by the City Electrical Co., Ltd. Practically all the motors used are of Lancashire Dynamo & Crypto construction with E.A.C. starters. In view of the damp conditions prevailing all the wiring has been carried out with Pyrotex mineral insulated cables.

We should like to thank Wilts United Dairies for permitting us to visit the works and also Mr. L. Coleman, manager of the works, and Mr. G. Hutton, engineer, for their help in preparing this article.

New B.E.A.M.A. Director

Appointment of Mr. B. H. Leeson

THE Council of the British Electrical and Allied Manufacturers' Association has appointed Mr. Bruce H. Leeson, O.B.E., M.I.E.E., to be Director of the Association as from October 1st, 1946, in succession to Mr. V. Watlington.

Mr. Leeson, who was born in Surrey, served an apprenticeship as a premium pupil and gained the City and Guilds honours grade certificate in electrical engineering at Battersea Polytechnic. He then joined Siemens Bros. Dynamo Works, Ltd., and took part in high-voltage switchgear development.

In 1914 Mr. Leeson was called up as a Territorial and served in the Divisional Engineers of the Royal Naval Division, a unit sponsored by the I.E.E. In 1919 he accepted an invitation from Mr. H. W. Clothier to join A. Reyrolle & Co., Ltd., and he formed a technical and research department for the company. He was intimately connected with the establishment of the first short-circuit testing station in Great Britain in 1929, and subsequently with the standardization of switchgear performance which enabled certificates of rating to be issued. This involved concurrent standardization of circuit-breakers by the B.S.I. and the I.E.C., and Mr. Leeson represented this country at the meetings which resulted in the I.E.C. Publication No. 56 in 1937 and B.S. 116. He was also closely concerned with the formation of the Association of Short-Circuit Testing Authorities and he is a director of the British Short-Circuit Testing Station, Ltd.

On the retirement of Mr. Clothier from his executive responsibilities in 1937, Mr. Leeson was appointed joint manager, and in the following year was elected to the board.



Mr. B. H. Leeson

At the close of the 1914-18 war Mr. Leeson had been transferred to the Tyne Electrical Engineers, which unit he commanded when war broke out in 1939, and he assisted in planning the A.A. defences of the district. Early in 1940 he was released from military duties to take up the position of general manager of Reyrolle's. When Mr. Norbert Merz, chairman of the company, retired early in 1945 and Mr. George Wansbrough took his place, Mr. Leeson became managing director. In the following year he joined the board of the Consett Iron Co., Ltd. He is also a director of E.R.A. Patents, Ltd., and Morphy-Richards, Ltd.

Mr. Leeson has been responsible for many papers and lectures given on engineering subjects here and abroad, and he has been very active in connection with various societies linked with the industry—among them the North-East Coast Institution of Engineers and Shipbuilders and the Institution of Electrical Engineers (he was chairman of the North-Eastern Centre in 1930). He has just been elected to the I.E.E. Council.

His administrative ability is equally demonstrated by his varied advisory positions and directorships. He is actively connected with organizations engaged in converting the North-East Coast from a "depressed area" into a "Development Area" for industry.

In addition to all this technical and administrative work, Mr. Leeson finds time to enter into many social forms of service; these are not limited to the normal recreative affairs of his company, for he is on the Council of the Tyne-side Council of Social Service. Mr. Leeson was awarded the O.B.E. in 1940, and later was appointed honorary colonel of the Tyne Electrical Engineers, a position which he still holds.

Glasgow Engineering Exhibition

An exhibition embracing all aspects of engineering components relating to mechanical, electrical, optical, scientific and marine instruments and tools is to be held in the Kelvin Hall, Glasgow, from November 15th to 27th.

Ripple Control

CENTRALIZED control of distant street or shop lighting, off-peak water heating and tariff changing for two-part metering is described in some detail in a G.E.C. brochure which illustrates the valve amplifying and relaying equipment and explains the general principles of the system with the aid of circuit diagrams. Pilot wires are not needed; instead a.c. ripples of musical frequencies (between 300 and 800 c/s) are injected into the mains network for actuating tuned relays at the distant switching points.

The G.E.C. system is suitable for both a.c. and d.c. networks; the signals can be injected into either the low or high voltage side of an a.c. network; the same type of signal is used throughout; more frequencies can be added without any alteration of or additions to relays already installed; the receiving relays cannot get out of step; the system is independent of the strength and duration of the signalling current between very wide limits; it is also independent of the state of the neutral conductor insulation.

Demonstration equipment at Magnet House includes a six-frequency master unit comprising the control push-button set and oscillator; two 150-W amplifiers and injection transformers; and various types of ripple relays for the six frequencies. The master unit in the showroom in the basement is arranged to transmit audio-frequency signals to an injection transformer and amplifier connected to a special showroom display, or alternatively to another transformer and amplifier installed in the Magnet House substation.

Area System in Miniature

The showroom display simulates conditions in a small area fed by a power feeder and indicates in model form the simplicity with which signalling may be carried out. Connected to the model are relays tuned to various frequencies to operate lamps and all operations are visible to the observer. A simple change-over circuit enables the output from the master unit to be transmitted to the amplifier in the Magnet House substation and the signals are then radiated over the whole of the 50-cycle mains network and may be picked up in any office of the building.

A portable relay is available for detecting the signal by connection to an ordinary power point. The relay will receive the ripple signal of a few milliwatts without being disturbed by the parallel connection of an appliance consuming more than a 1,000 W. The explanation is that the ripple power injected into the mains is calculated to produce a few volts on the total impedance of the power network, which calculation must take into account the different impedance of consumers' apparatus at ripple frequency. For example, coils, machines, etc.,

in the circuit have a much higher impedance at ripple frequencies than at 50 cycles, whereas capacities of cables and power factor correcting condensers have a reduced impedance at audio-frequencies. The ripple voltage distribution therefore tends to vary somewhat depending on the variations of the 50-cycle load, but is superimposed over this 50-cycle voltage and any appliance connected to the mains acts as a load also on the ripple amplifiers. In the ripple relay there is a filter circuit which has a high impedance to 50 cycles and a low impedance at ripple frequency.

I.M.E.A. and the Register

ENGINEER representatives of members of the Incorporated Municipal Electrical Association have been sent copies of a report prepared by Mr. E. A. Mills (Hackney) and Mr. R. Birt (Ealing) dealing with the present position of the National Register of Electrical Installation Contractors and the steps which they consider to be necessary to strengthen the organization and thereby assist in improving the general level of installation work throughout the country.

The report reviews the history of the Register and recounts recent events, including the decision of the Electrical Contractors' Association to advise members to withdraw from the Register and the rejection by the Ministers of Works and of Fuel and Power of suggestions that legislation instituting compulsory registration should be introduced.

This leads up to proposals for securing the support of I.M.E.A. members for the Register and the following recommendations are made:—

(1) That when advertising for tenders for installation work, a clause should be inserted stating that tenders are invited from contractors who are on the Register.

(2) That when inquiries are made in writing or in the showrooms for advice with regard to electrical contractors, registered contractors should be recommended.

(3) That where lists of electrical contractors are kept in showrooms for handing out to consumers, they should include only registered contractors.

(4) That where the authorities themselves carry out installation work, they should apply for registration.

The I.M.E.A. Council strongly commends these suggestions to the favourable consideration of members.

Mobile Canteen Helps E.I.B.A.

In 1941, the electrical industry of Leeds presented to the A.R.P. authorities in the city a mobile trailer canteen. This has now been sold and the committee responsible for the proceeds amounting to £128 5s. has presented the proceeds to the Electrical Industries Benevolent Association.

Views on the News

Reflections on Current Topics

AN interesting, but belated, echo of the strikes at Barking and Littlebrook in May appears in the July *Electrical Power Engineer* in the form of a report of a meeting of the Combined London Sections of the Electrical Power Engineers' Association held in June. From this I gather that the National Executive Council of the E.P.E.A. instructed members to carry out their own duties and responsibilities only during the dispute which was described as "unofficial." The meeting, by a large majority, passed a resolution "deploring" the Council's action as its effect was to place the members concerned "in a position where loyalty to the Association and the higher loyalty to the national interests could not be reconciled." A further motion condemned all unofficial strikes, the opinion being expressed that "it should be incumbent upon every member to do his utmost, either by voluntary assistance, or by supervision of such assistance, to maintain electricity supplies."

* * *

A few weeks ago I referred to the germicidal qualities of ultra-violet rays. Now I hear from America of another electrical development which will form a valuable accessory to installers and users of u.v. apparatus for this purpose. This is a portable electrostatic air sampler for counting disease-spreading airborne bacteria. Armed with this device, which weighs about 12 lb, it is possible not only to check the effectiveness of germicidal lamp installations but also to compute reasonably accurately the amounts of u.v. energy needed to keep airborne bacteria reduced to the minimum.

* * *

I am glad to learn from the August *Electrical Contractor* that the E.C.A. Technical Committee has reminded electrical contractors of the part which they can play in reducing radio interference when considering the installation of wiring and appliances. The Committee suggests the screening of wiring systems in blocks of flats. Generally, anti-interference measures will be applied to apparatus and this will usually be the responsibility of manufacturers.

* * *

Yet another town, Middlesbrough, is going over to electric street lighting for all future schemes, and the Council has called for a report on the practicability of converting the existing gas system by stages. In most cases there is a clear economic advantage in adopting electric lighting, but

Middlesbrough, I am told, has a reputation for supplying the "cheapest gas in the country," so that the decision in favour of electricity is particularly noteworthy. I confess to some ignorance on the subject of gas charges—few people I've met seem to know what they pay for gas although quite *au fait* with their electricity charges. The 3.5d. per therm for street lighting at Middlesbrough, however, is obviously very low.

Electrical enthusiasm in the young is to be encouraged, but in a case which has come to my notice six Wolverhampton boys seem to have overstepped the mark. They are said to have set up "miniature power stations" in the sheds of their homes with equipment (valued at £100) stolen mainly from Wolverhampton Corporation Electricity Department. Apart from the reprehensible manner by which the equipment was obtained, the danger from electric shock of such experiments is obvious and might well have involved others besides the boys themselves. It is to be hoped that the fine of £2 which was imposed on each of the boys will have the effect of guiding their youthful enthusiasm for electrical experiment into more legitimate channels.

* * *

Stories appeared in the daily press last week of a thatcher who threw a metal-bound tape over a haystack on to an 11-kV line in the course of his duties. He received a shock but was pulled away with no further injury than burns. He is stated to have said that the experience seemed to have improved his asthma. "Kill or cure" certainly appears to be appropriate to a remedy of this kind.

From Australia comes a report that two Melbourne medical students have been working on an "electric anaesthetic." A doctor who took part in a test is alleged to have remarked that "while the current was on patients were put to sleep, from which they awoke without ill effects when the current was switched off." I await further details before my next visit to the dentist.

* * *

A news message from New York is headed "General Mills to Make Home Appliances." The picture thus suggested of a gallant officer beating his sword into an electric kettle is dispelled by the text of the note showing that an American food products company is to use its wartime plant for the production of electrical and other domestic appliances.

—REFLECTOR.

Power-Factor Correction

Calculations for Ascertaining Values for Induction Motors

By H. Neale

WHEN considering power-factor correction by static condensers on individual motors, it is frequently useful to examine three conditions by calculation, instead of employing the graphical method of solution, especially when dealing with vectors of small value. A high degree of accuracy can be attained with six-figure trigonometrical tables. The three cases are:—

A. To ascertain the corrected p.f. at fractional loads for a given corrected p.f. at full load.

B. To ascertain the corrective kVA necessary to maintain approximately the same p.f. from say full load down to half load.

C. To ascertain the corrective kVA necessary to ensure that the p.f. at say half load does not fall below a specified figure.

Taking case "A," use the following notation:—

Cos ϕ , ϕ_1 and ϕ_2 for motor power factors at full, three-quarter and half loads and cos

The wattless kVA at three-quarter load = $\frac{\text{full load efficiency}}{\text{three-quarter load efficiency}} \tan \phi_1$

$$0.75 K \times \frac{\text{full load efficiency}}{\text{three-quarter load efficiency}} \tan \phi_1$$

In the majority of cases, the three-quarter load efficiency is the same as the full load efficiency; hence for simplicity the above may be written: Wattless kVA at three-quarter load = $0.75 K \tan \phi_1 \therefore 0.75 K \tan \phi_1 - K (\tan \phi - \tan \phi_c) =$ wattless kVA at corrected p.f. =

$$0.75 K \tan \phi_{1c} = \tan \phi_{1c} = \frac{0.75 K \tan \phi_1 - K (\tan \phi - \tan \phi_c)}{0.75 K}$$

$$0.75 \tan \phi_1 - (\tan \phi - \tan \phi_c) \cdot 0.75$$

(a) $\tan \phi_{1c} = \tan \phi_1 - 1.333 (\tan \phi - \tan \phi_c)$, or if the three-quarter load efficiency is lower than the full load efficiency:—

(b) $\tan \phi_{1c} = \tan \phi_1 - 1.333 \times \frac{\text{three-quarter load efficiency}}{\text{full load efficiency}} (\tan \phi - \tan \phi_c)$.

Similarly the wattless kVA at half load = $0.5 K \times \frac{\text{full load efficiency}}{\text{half load efficiency}} \tan \phi_2$, and

(c) $\tan \phi_{2c} = \tan \phi_2 - 2 \times \frac{\text{half load efficiency}}{\text{full load efficiency}} (\tan \phi - \tan \phi_c)$.

Example.

A 25-H.P. motor has a power factor of 0.9 at full load, 0.86 at three-quarter load, and 0.79 at half load, and corresponding efficiencies of 88.5, 88.5 and 87.5 per cent. To ascertain the corrected three-quarter load and half load power factors, with full load power factor corrected to 0.95 lag. $\cos \phi = 0.9$, $\tan \phi = 0.483$; $\cos \phi_1 = 0.86$, $\tan \phi_1 = 0.594$; $\cos \phi_2 = 0.79$, $\tan \phi_2 = 0.775$; $\cos \phi_c = 0.95$, $\tan \phi_c = 0.329$.

Taking equation (a) $\tan \phi_{1c} = \tan \phi_1 - 1.333 (\tan \phi - \tan \phi_c) = 0.594 - 1.333 (0.483 - 0.329) = 0.389 \therefore \cos \phi_{1c} = 0.932$.

Taking equation (c): $\tan \phi_{2c} = \tan \phi_2 - 2 \times \frac{\text{half load efficiency}}{\text{full load efficiency}} (\tan \phi - \tan \phi_c) =$

$$0.775 - 2 \times \frac{87.5}{88.5} (0.483 - 0.329) = 0.471 \therefore \cos \phi_{2c} = 0.905$$

Taking case (B) the calculation assumes that the wattless kVA at each corrected load is directly proportional to the kW component of the load. This premise is not

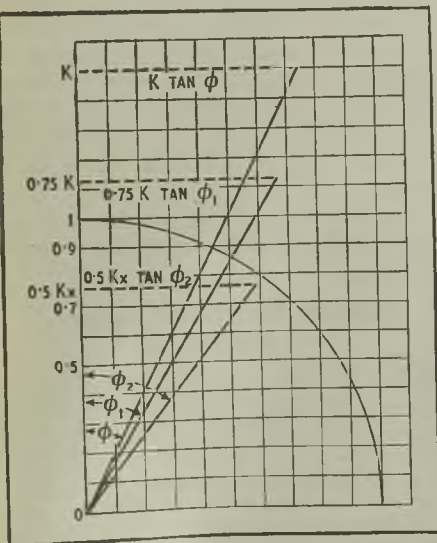


Fig. 1

ϕ , ϕ_{1c} and ϕ_{2c} for corresponding corrected power factors. K = full load kW input. (See Fig. 1). Corrective kVA = $K \tan \phi - K \tan \phi_c = K (\tan \phi - \tan \phi_c)$.

correct, but a formula based on the full load, three-quarter load, and half load characteristics will give a close approximation to the true conditions. Employing the same notation as for case "A":—(1) Full load corrective kVA = $K \tan \phi - K \tan \phi_c$. (2) Three-quarter load corrective kVA = $0.75 K \tan \phi_1 - 0.75 K \tan \phi_c$. (3) Half load corrective kVA = $0.5 K \tan \phi_2 - 0.5 K \tan \phi_c$, where x is the ratio of full load to half load efficiency. Combining (1) and (2): $K \tan \phi - K \tan \phi_c = 0.75 K \tan \phi_1 - 0.75 K \tan \phi_c$, $K \tan \phi - 0.75 K \tan \phi_1 = 0.25 K \tan \phi_c$, $\frac{\tan \phi - 0.75 \tan \phi_1}{0.25} = \tan \phi_c$. (4) $4 \tan \phi - 3 \tan \phi_1 = \tan \phi_c$. Combining equations (3) and (4), substitute $4 \tan \phi - 3 \tan \phi_1$ for $\tan \phi_c$ in equation (3), but for convenience reading: kW at half load, i.e., kW input at half load for $0.5 Kx$; then corrective kVA = kW at half load $\tan \phi_2 -$ kW at half load $(4 \tan \phi - 3 \tan \phi_1) =$ kW at half load $(\tan \phi_2 - 4 \tan \phi + 3 \tan \phi_1)$.

If the three-quarter load efficiency is lower than the full load efficiency, which may occur with small power or relatively low-speed machines, equation (5) becomes:—

(6) kW half load $[\tan \phi_2 -$

$$\left(\frac{\tan \phi - 0.75 \times \frac{\text{full load eff.}}{\text{three-quarter load eff.}} \tan \phi_1}{1 - 0.75 \times \frac{\text{full load eff.}}{\text{three-quarter load eff.}}} \right) \tan \phi_c \Bigg]$$

Example.

Take the 25-H.P. motor figures as for Case A. Then kW at half load =

$$\frac{12.5 \times 0.746}{87.5} = 10.63 \text{ kW and corrective kVA}$$

necessary to maintain approximately the same p.f. lagging from full to half load, using equation (5) = $10.63 (0.775 - 4 \times 0.483 + 3 \times 0.594) = 6.64 \text{ kVA}$.

To check the corrected p.f. at various loads, first establish the kW input, e.g., at full load kW = $\frac{25 \times 0.746}{88.5} = 21.1$, at three-quarter load kW = $0.75 \times 21.1 = 15.82$ and at half load kW = 10.63.

$$\text{From equation (1), } 6.64 = K \tan \phi - K \tan \phi_c = 21.1 \times 0.483 - 21.1 \tan \phi_c; \tan \phi_c = \frac{21.1 \times 0.483 - 6.64}{21.1} = 0.1675$$

$$\therefore \cos \phi_c = 0.986.$$

$$\text{From equation (2), } 6.64 = 0.75 K \tan \phi_1 - 0.75 K \tan \phi_{c1} = 15.82 \times 0.594 - 15.82 \tan \phi_{c1}; \tan \phi_{c1} = \frac{15.82 \times 0.594 - 6.64}{15.82} = 0.174.$$

$$\therefore \cos \phi_{c1} = 0.985.$$

From equation (3), $6.64 = 0.5 Kx \tan \phi_2 - 0.5 Kx \tan \phi_{c2} = 10.63 \times 0.775 - 10.63 \tan \phi_{c2}$.

$$\tan \phi_{c2} = \frac{10.63 \times 0.775 - 6.64}{10.63} = 0.1502.$$

$$\therefore \cos \phi_{c2} = 0.989.$$

Note that in equations (1), (2) and (3), ϕ_c is employed to denote the angle to which the p.f. at full load, three-quarter load, and half load is corrected, since it is primarily assumed that this angle is the same for the three loads. As is subsequently pointed out, however, such is not the case in actual practice, so that in calculating the three corrected angles in the example, I have employed the notation ϕ_c , ϕ_{c1} and ϕ_{c2} to denote the actual corrected angles to avoid confusion.

Taking case C, as applied to the data for the 25-H.P. motor used in the preceding examples, use equation (3), which may be written as half load corrective kVA = kW at half load $(\tan \phi_2 - \tan \phi_{c2})$. Assume that the corrected p.f. at half load is specified not to be below 0.9 lagging, i.e., $\tan \phi_{c2} = 0.483$, $\tan \phi_2 = 0.775$, kW at half load = 10.63, then corrective kVA = $10.63 (0.775 - 0.483) = 3.1$. To obtain full load corrected p.f. use equation (1) and $K = 21.1$. Corrective kVA = $K \tan \phi - K \tan \phi_c$; $3.1 = 21.1 \times 0.483 - 21.1 \tan \phi_c$; $\tan \phi_c = \frac{10.19 - 3.1}{21.1} = 0.336$. $\therefore \cos \phi_c = 0.948$.

To obtain three-quarter load corrected p.f. use equation (2) and $0.75 K = 15.82$. Corrective kVA = $0.75 K \tan \phi_1 - 0.75 K \tan \phi_{c1}$; $3.1 = 15.82 \times 0.594 - 15.82 \tan \phi_{c1}$; $\tan \phi_{c1} = \frac{9.4 - 3.1}{15.82} = 0.398$. $\therefore \cos \phi_{c1} = 0.929$.

The foregoing calculations do not take into account the slight loss in the condenser.

Midland Electrical Engineers' Association

ELECTRICAL engineers throughout the country who have in pre-war years attended the Electrical Engineers' Ball in Birmingham will be pleased to learn that the Committee (president, Mr. F. W. Lawton, city electrical engineer, Birmingham; chairman of Committee, Mr. F. W. Martin) has decided to revive this popular function on November 22nd next at the Grand Hotel, Birmingham. The hon. secretaries are: Mr. H. Hooper, Central Electricity Board, 53, Wake Green Road, Moseley, Birmingham, 13, and Mr. W. J. Bird, General Electric Co., Ltd., Moor Street, Birmingham, 4. Any profit which may be made will go to the I.E.E. Benevolent Fund.

Rural Electrification Costs

American and British Charges Compared

A REPORT published By **W. D. Kennedy**, *B.Sc.Tech.* obtained from English for the Ministry of Agriculture and Fisheries and **G. O. McLean**, *M.Eng.* dairying counties is justified, so that the truth may be made known to our own industry and the Ministry of Agriculture, which must bear responsibility for the false implications in the report.

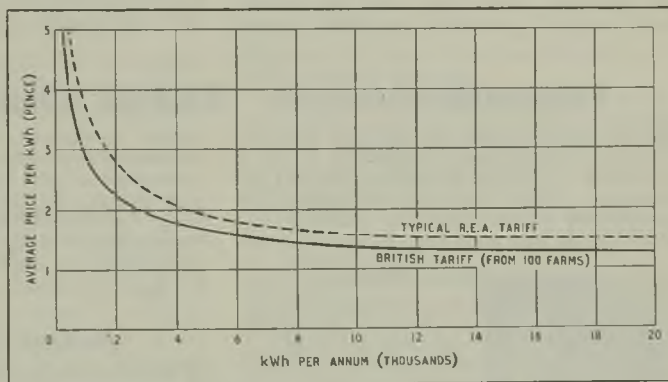
The report quotes an extract from "A Guide for Members of R.E.A. Co-operatives" and sets out the charges to be made to a farmer member for a month's consumption of electricity totalling 296 kWh. The total monthly cost is given as £2 13s. 6d., an average cost of 2.2d. per kWh. The tariff is, of course, a block tariff, commencing with a block of 40 kWh per month at a minimum charge of 16s., an equivalent of 4.8d. per kWh. The next 40 kWh are

be made known to our own industry and the Ministry of Agriculture, which must bear responsibility for the false implications in the report.

The editorial note quotes Mr. Kellogg's statement about Government propaganda making rural electrification the subject of controversy between the Rural Electrification Administration (R.E.A.) and the electric companies and, by implication, belittling what the companies have done. The British mission appears to have swallowed the propaganda hook, line and sinker, as it devotes an appendix of four pages to the R.E.A. and one of the official recommendations (No. 6) is that "Special efforts should be made to provide the dairy farms with an adequate and cheap supply of electricity."

The implication surely is that America has a cheap and abundant supply and this country has not, and that in America the R.E.A. has been the means of providing it. The report states that "There is no doubt but that the service in the United States and Canada gives satisfaction. It is cheap, and as far as we could gather, it is not subsidised apart from loan capital."

While leaving Mr. Kellogg, or his successor, Mr. Grover C. Neff, to defend the company interests against the R.E.A. insinuations and infiltrations, we feel that a comparison between R.E.A. rates of charge, as outlined by Mr. Davies' mission, and some figures]



Comparison of British and American prices for the supply of electricity to farms

sold at 3d., the next 120 at 1½d., all over 200 kWh per month at 1½d. per kWh.

As it is difficult to make direct comparisons between a block tariff and the normal two-part tariff used in this country, the American figures have been put into graphical form, as shown in the figure. The consumption and revenue figures for fifty farms in the Shropshire Company's area and fifty farms in the Wessex Company's area (these include the dairying counties of Hereford and Wilts) were available to the authors and the hundred results were plotted, each as a dot, on the same curve as that showing the R.E.A. tariff. Because of the different fixed charges and

varying consumption up to 25,000 kWh in a year, the dots were scattered so a smooth curve has been drawn to give the nearest fit. It is below the R.E.A. curve all the way.

It may be more convincing to mention the position of the dots with regard to the R.E.A. line. Of the hundred English farms no fewer than 87 would have paid more if they had been billed on the R.E.A. tariff and only thirteen would have paid slightly less. A typical farmer, whose monthly bill is detailed in the Ministry's report, is asked to pay 2.2d. per kWh in America, but the average price for the fifty farmers in Wessex is 1.56d. and for the fifty in Shropshire 1.48d.

As the report points out, steam sterilizing is not used to the same extent in America as in England and therefore the English farmers' consumption of electricity is higher. Instead of the typical American farm figure of 3,500 kWh per annum, the average for the hundred farms considered was 5,000 kWh per annum. Since the American farmer would pay 1½d. per kWh for the additional

energy, his average price would be reduced to 1.91d. which is still considerably higher than the English farmer pays.

The report concludes with an example of an R.E.A. Co-operative Association, and the rates given for this Association are slightly different from the figures quoted by the R.E.A. in its guide. The minimum charge is higher, at £1 for the first 40 kWh per month, but the final block rate is lower, at ¾d. As is well-known, a Co-operative Association borrows money from the R.E.A. in order to pay for the lines which give the supply in its area, and the 2,541 members of this Association had to find £103 per member.

To meet the total expenditure, the average price per kWh to the members is not less than 2.75d. Despite the low final rate of ¾d. the average consumption for this Co-operative Association is only 1,824 kWh per annum. The conclusion must therefore be drawn that not only are British farmers making much more use of electricity than their American cousins, but also that they are obtaining supplies more cheaply.

Commissioners' Tariff Committee

IT was reported some time ago that the Electricity Commissioners intended to set up a committee to examine methods of charging for electricity. They have now announced the appointment of this committee which is "to review in the light of present circumstances the various methods of charge and tariffs offered by authorized electricity undertakers in connection with the supply of electricity for purposes other than bulk supplies to other undertakers and to make recommendations as to forms of tariffs or methods of charge which would be best adapted to promote uniformity and development."



Sir John Dalton is chairman of the Commissioners' Tariff Committee

The members of the committee are as follows: Messrs. J. S. Pickles and R. A. S. Thwaites, representing the Incorporated Municipal Electrical Association; Mr. L. Howles and Lt.-Col. E. H. E. Woodward, representing the Incorporated Association of Electric Power Companies; Messrs. H. Bentham and W. Fennell, representing the Provincial Electric Supply Association; Col. Sir John Dalton, representing the London Electricity

Supply Association (who has been elected chairman); Mr. Leslie Gordon, representing the Conference of Joint Electricity Authorities and Joint Boards; Mr. F. Newey, representing the British Electrical Development Association; and Miss Caroline Haslett, representing the Electrical Association for Women. The secretary is Mr. H. S. Lanphier.

Analysis of Cast-iron

THE method employed in the Staveley/Bradley-Foster Research Department at Darlston for the rapid routine spectrographic analysis of cast-iron is described by Drs. J. E. HURST and R. V. RILEY in a paper submitted to the Iron and Steel Institute.

The authors stress the importance, for the attainment of accuracy, of suitable laboratory lay-out, selection of representative analytical samples and rigid standardization of procedure. The single and multi-spot methods of sparking (illumination) are compared while considerations affecting the choice of excitation and the influence of air blast at the analysis gap on the duplication of results are dealt with. The electrical consumption of the complete spectrographic outfit is small, the spark generator itself being rated at 0.25 kVA. The laboratory was, however, purposely wired with oversize cables for the purpose of minimizing voltage drop.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication.

Responsibility cannot be accepted for correspondents' opinions.

Unsafe Installations

MR. D. H. BRAID expounds the views of a number of supply engineers, but while such views are logical they appear to be unworkable. The sooner the useless arguments as to who is responsible for unsafe installations stop, the better it will be for the whole industry. Surely Mr. Braid does not imply that if all people engaged on installation work were members of the E.C.A. or voluntarily registered all would be well.

Having, unfortunately, been in the installation side of electrical engineering for very many years, I am satisfied that if all existing installations had to comply with the I.E.E. Rules, there would be sufficient work for skilled electricians for the next fifteen years in putting them right.

There is only one solution for the elimination of unsafe installations but having mentioned this so often in these columns, I will leave it at that.

Glasgow.

ALEX. MILNE, SENR.

"A Universal Plug—Now"

FROM "Plain Engineer's" remarks in your issue of July 12th and the subsequent letters it would appear that there is still some confusion with regard to the plug and socket situation and I think it is as well to consider what are the facts of the case; they are these:—

For several years the Electrical Industry Committee of the B.S.I. considered the desirability of one universal standard. During the period concerned it listened to opinions and views and finally came to the decision that one universal plug and socket outlet for all domestic purposes was desirable and essential. A Technical Committee of the B.S.I. was then appointed, whose scope and terms of reference were approximately in line with the Appendix to Post War Buildings Studies No. 11 and it was expected to produce the best possible type of unit, whether the pins were flat, round or any other shape.

Now, having obtained general agreement from the various sections of the industry, and it will be realised that this was by no

means easy, the Technical Committee set to work and I have seen unofficially a prototype as a result of its work which to my mind is excellent.

Some engineers have the impression that all the present variety of plugs in use should be swept away and consumers put to the expense of renewing throughout their premises. This is not so. Some of us would like to see legislation which would make it compulsory for all new installations to be in line with the accepted standard, but all existing installations should be allowed to serve throughout their useful life. With the knowledge that we have now an agreed standard, surely it is high time to sink our differences and to accept the new standard and let the consumers at large know that a standard is coming, although I will agree with some of your correspondents that it is taking rather a long time.

"Plain Engineer" will have noticed in his forty years' career in the industry that 57 or more varieties have grown up. Surely he can wait a few more months and see an agreed standard for all purposes.

Halifax.

A. G. CONNELL,

Engineer and Manager.

Domestic Water Heating

THE article in your issue of July 26th dealing with this subject is not completely accurate. It states that the circulator must extend to the bottom of the cylinder, and goes on to say that "the large majority of complaints of insufficient bulk heating of circulators arises from neglect on this point."

Your correspondent is in error: the trouble is not due to lack of length of the circulator but to lack of length of the thermostat provided with it. The longest thermostat supplied (but rarely) with a standard equipment is 18 in. and the normal length is 12 in., so that irrespective of the length of the circulator, the maximum depth of really hot water is either 18 in. or 12 in.

The only solution is to provide a longer thermostat or, alternatively, a circulator without a thermostat and a separately-mounted thermostat fixed in the tank near the bottom of the circulator unit.

Manchester.

W. HARTLEY.

PARLIAMENTARY NEWS

By Our Special Reporter

Reinforced Concrete Poles

IN the House of Commons on July 30th Mr. Vane asked the Minister of Fuel and Power if he would clarify the Government's policy on the use of reinforced concrete poles for the supply of electricity in rural areas.

Mr. Shinwell said that to supply rural areas with electricity at the earliest possible date the Government was encouraging the use of concrete poles wherever practicable. A technical committee was studying the possibility of reducing the cost of concrete poles which was higher than the cost of wooden poles.

Wooden-Pole Shortage

Colonel Gomme-Duncan asked the President of the Board of Trade whether he was aware that the shortage of wooden poles was still delaying the building of light rural electricity lines in Scotland; and what steps were being taken to secure the necessary material from abroad.

Mr. Marquand, who replied, said that there was a general shortage of wooden poles for electricity and other purposes. All practicable steps were being taken to obtain as many as possible both from our own resources and from countries overseas.

C.E.B.'s Borrowing Powers

On July 31st Mr. Gaitskell, the Parliamentary Secretary to the Ministry of Fuel and Power, moved the approval of the Central Electricity Board (Increase of Borrowing Powers) Special Order, 1946, dated July 9th, 1946, made by the Electricity Commissioners and confirmed by the Ministry of Fuel and Power under the Electricity (Supply) Act, 1919. He explained that the Electricity Supply Act, 1926, empowered the Central Electricity Board to borrow up to a maximum of £33,500,000. But the Act also provided that the maximum could be increased by Special Orders made by the Electricity Commissioners, confirmed by the Minister of Fuel and Power, originally the Minister of Transport, and with Parliamentary approval. In fact, Special Orders of this kind were made in 1930, 1933 and 1941, bringing the total amount which the Board could borrow up to £70,000,000. The Order he was now asking the House to approve raised the figure to £100,000,000. It was necessary because the Electricity Commissioners had already sanctioned the borrowing of sums amounting to £69,875,000.

The increased borrowing was needed for certain extensions of the grid system which would become necessary, and also included the acquisition of the war grid reinforcement lines and some extension of generating stations. No

objection had been lodged against the Order, either with the Commissioners or the Minister.

The Order was approved and it has also received the approval of the House of Lords.

Water-Heater Prices

On August 1st Mr. Driberg asked the Minister of Supply if he was aware that, since the withdrawal of purchase tax on electric geysers, their price had been raised so that they cost the same to the public as when purchase tax was levied; and if he would take steps to stop this exploitation of the public.

Mr. A. Woodburn said he was aware that in certain cases the prices of electric geysers had been increased since the withdrawal of the purchase tax. Steps had been taken with a view to carrying out a cost investigation in order to ensure that electric water heaters were sold to the public at a fair and reasonable price.

Deaths from Faulty Wiring

Mr. Skeffington-Lodge asked the Minister of Works whether he was aware that some fifty persons per year were killed as a result of the inefficient electrical wiring of domestic premises; and whether he would consider the introduction of such wiring regulations as would prevent this loss of life.

Mr. Wilson said he was not aware of the number of fatal accidents resulting from inefficient electrical wiring but he believed these accidents were generally due to the use of portable instruments or interference with an installation rather than to the installation itself. It was the general practice for electricity undertakings to supply current only when installations complied with the rules of the Institution of Electrical Engineers. It would not be practicable to enforce regulations prohibiting the improper use of installations.

S. G. Brown, Ltd.

In a written reply to a question the Financial Secretary to the Admiralty (Mr. S. Dugdale) says that it has been decided that the business of S. G. Brown, Ltd. (which was taken over by the Admiralty in 1942) shall remain in public ownership.

Belgian Congo Scheme

IN order to meet increasing demands for power supply, the Société Générale des Forces Hydro-Electriques du Katanga, "Sogefor", has recently decided to establish a new hydro-electric power station of approximately 40,000 H.P. on the River Lufira to utilize the Koni Falls, about six miles below the plant at the Cornet Falls on the same river at Madingusha.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IT is announced that **Mr. H. C. Spence**, A.M.I.E.E., deputy borough electrical engineer and manager at Croydon, has been appointed borough electrical engineer and manager at Wimbledon in succession to **Mr. N. R. Elliott**, who, as we have already reported, is taking up the appointment of general manager and chief engineer of the London and Home Counties J.E.A.

The Croydon Electricity Department is advertising for a successor to **Mr. Spence** at a salary of £1,350 plus bonus (at present £60) and a special temporary payment of £400 per annum.

Prof. G. W. O. Howe is retiring from the James Watt Chair of Electrical Engineering at Glasgow University at the end of the present session and arrangements are being made to make a presentation to him to mark the occasion. There must be many old students and other friends of **Prof. Howe** who would like to participate in the presentation, and contributions should be sent to **Dr. A. J. Small**, Electrical Engineering Department, the University, Glasgow, 2.

Mr. C. Culmer Hodges, M.I.E.E., A.M.I.Mech.E., who has occupied the position of chief engineer and manager to the St. Austell & District Electric Lighting & Power Co. since 1930, is retiring on pension at the end of this year for reasons of health. Commencing as an articulated pupil with the Bournemouth & Poole Electricity Supply Co. in 1904, he was later with the Dover Corporation and the Dawlish Co. before going to St. Austell. **Mr. Hodges** is a past chairman of the Western Centre and also of the Devon & Cornwall Sub-Centre of the Institution of Electrical Engineers.

Mr. F. Bull, who has been acting manager of the Nottingham Branch of **W. T. Henley's** Telegraph Works Co., Ltd., has been appointed manager of that branch. **Mr. W. L. Willey**, acting manager of **Henley's** Hull Branch has also been confirmed in his position. **Mr. S. L. Crafford** has been appointed **Henley's** local representative at Colchester and will be in charge of the Colchester Branch under the control of **Mr. J. A. Newton**, Norwich Branch manager.

Sir William Griffiths, chairman and managing director of the Mond Nickel Co., Ltd., has been nominated as a representative of that organization to the Council of the Copper Development Association.

In spite of unsettled weather the annual sports meeting of **E. K. Cole, Ltd.**, held on July 27th was very well attended. Numerous entries in the open events from many athletic clubs made competition keen and resulted in some fine

winning times. Two outstanding events were the Essex county championships for the ladies' high jump and 100 yards. **Miss D. M. Endruweit** of Ekco Athletic Club, with a jump of 5 ft 1 in., took first place, with **Miss D. G. Manley**, of Essex Ladies' A.C., second. **Miss J. C. E. Shepherd** won the 100 yards in 11.3 seconds. The prizes, including many cups, were presented by **Mrs. E. K. Cole**.

Mr. M. S. Thaker, B.Sc., M.I.E.E., of the Calcutta Electric Supply Corporation, Ltd., is in London until the middle of October, when he returns to India. Letters should be addressed to him c/o Grindlay & Co., Ltd., 54, Parliament Street, S.W.1.



Mr. M. S. Thaker

his father was Mayor of the old borough of Stoke-upon-Trent.

Mr. J. A. Wykes has relinquished his post as secretary of **Hoover, Ltd.**, and has been appointed deputy managing director. He has been a director of the company since 1928. **Mr. F. H. Bunn**, general sales manager, has been appointed a director and **Mr. H. G. Meads**, the assistant secretary, has been appointed secretary.

Mr. K. R. Plowright, A.M.I. Mech. E., has resigned from **Hope's** Heating & Lighting, Ltd., and joined **Musgrave & Co., Ltd.**, Belfast, as manager in charge of air conditioning and ventilation. **Messrs. J. W. Shepard** and **H. D. Mains**, who were formerly with **Davidson & Co., Ltd.**, have been appointed to the board of **Musgrave & Co.**

New appointments have been announced by **Brookhirst Switchgear, Ltd.**, following the return of members from war service. **Mr. H. R. Renfree**, who has returned to the company, has been appointed assistant to **Mr. F. A. Leonard**, district manager of the Manchester office; **Mr. A. S. Verity**, back from Europe, joins the Leeds office as assistant to **Mr. K. N. Swash**, district manager; and **Mr. E. L. Wilson**, who during the war was Control Gear Advisor to the Directorate of Industrial Electrical Equipment, has been appointed deputy to **Mr. H. W. M. Parker** at the London office.

Mr. C. A. Phillips has been transferred from the Chester works to the Birmingham office as assistant to Mr. J. G. Frater, district manager.

Mr. W. E. Knox has been elected president and general manager of the Westinghouse Electric International Co. He succeeds Mr. J. W. White, who has resigned to become director general of Industria Electrica de Mexico. Mr. Knox has been vice-president of the International Company since March, 1944, and before that was assistant general manager.

Mr. W. J. Vine, F.I.E.S., has joined the Illuminating Engineering Department of Thorn Electrical Industries, Ltd., as a lighting engineer. Mr. Vine has held a similar appointment with Holophane, Ltd., since 1937, dealing with street, flood, industrial, and commercial lighting, and he served from 1944 to 1945 in the Royal Navy Electrical Branch.

Mr. E. H. McConnell, the manager in Northern Ireland for George Cohen, Sons & Co., Ltd., has been awarded the M.B.E. He played an important part in organizing the export from Northern Ireland of scrap for use in the war effort, and also organized the Red Cross salvage scheme in conjunction with the Ministry of Commerce for Northern Ireland.

Edinburgh Corporation has approved the appointment of Mr. W. M. Little as deputy transport manager.

Mr. A. R. Shapley, deputy electrical engineer at Bath Corporation electricity works, has been appointed consulting engineer for three years. He has been with the Department for 47 years.

Sheffield Corporation Electricity Committee recommends the appointment of Mr. A. Hadcock, distribution engineer, as distribution and sales manager at a salary of £1,050 per annum; Mr. W. E. B. Nettleton, deputy distribution engineer, as chief distribution engineer at £794 per annum; Mr. H. Price, station superintendent, Neepsend, as station superintendent, Blackburn Meadows, at £895 per annum; and Mr. D. McFarland, contracts engineer, as station superintendent, Neepsend, at £785 per annum.

Mr. J. Bell, A.M.I.E.E., of Warrington, has been appointed assistant mains engineer with the Stockton-on-Tees Corporation Electricity Department, to fill the vacancy caused by the resignation of Mr. R. W. McOwen, A.M.I.E.E.

Mr. W. Sinclair has been promoted from shift charge engineer at Portishead power station of Bristol Corporation Electricity Department to be assistant station superintendent at the Feeder Road generating station. Mr. C. Cripps, formerly shift charge engineer, has been appointed efficiency engineer at Portishead generating station. Mr. D. H. Keeling, shift charge engineer, Portishead, has retired after twenty-six years' service.

Mr. W. E. Redmayne, of Finchley, has been appointed borough electrical engineer of Redcar

to succeed Mr. R. K. Jenkins who was recently appointed borough electrical engineer of Warrington.

Mr. H. S. Smith, assistant secretary, Southern Area, has been appointed assistant general secretary of the Electrical Power Engineers' Association.

Mr. F. Hampton has resigned from the lamp sales department of Philips Lamps, Ltd., which he had represented in Sussex and southern Surrey, in order to take up the position of managing director of Heene Electrical Products, Ltd., Worthing.

Mr. J. Bailey, electrical engineer to the Barnoldswick, Lancs, U.D.C., has resigned to take up a position with a private concern at Foulridge. The staff of the Electricity Department presented him with a barometer.

Mr. H. Peace, deputy electrical engineer and manager at Scunthorpe, has been appointed electrical engineer and manager in succession to Mr. A. L. Boyle, who is retiring in October.

On his retirement from the position of borough electrical engineer of Southend, Mr. A. C. Johnson was the guest of honour at a dinner when he was presented with a radio set by Mr. J. Linton, deputy electrical engineer, on behalf of the staff.

Mr. R. J. Hall has been elected to the board of British Insulated Callender's Cables, Ltd.

Mr. G. N. Smibert has been appointed an additional director of Richardsons, Westgarth & Co., Ltd.

Mr. C. A. Cross, A.M.I.E.E., of Oldham Corporation Electricity Department, has been appointed mains superintendent with Nuneaton Corporation Electricity Department.

Warrington Corporation Electricity Committee has appointed Mr. F. J. Brown, technical assistant, as mains superintendent.

Obituary

Mr. H. V. Carlisle.—The death occurred recently while on a business visit to London of Mr. Harold Vincent Carlisle, managing director of the Carlisle Electrical Manufacturing Co.

The employees of the Chester Corporation Electricity Department have been given permission to place a plaque on the wall of the hydro-electric works in memory of Mr. S. E. Britton, city electrical engineer for forty-two years, who died in June.

A.S.E.E. Meeting

THE next meeting of the West London Branch of the Association of Supervising Electrical Engineers will be held on August 15th (7.30 p.m.) at the Oddfellows' Hall, Hammer-smith, S.W., when Mr. L. S. Meeks will speak on "Electrical Pyrometry" and "Resistance Thermometry."

Induction-Motor Starters

Characteristics of Types in General Use

SINCE the type of starting gear used with an a.c. motor considerably influences starting conditions, the requirements of the drive must be considered in each case before deciding which pattern to employ. The main requirements are:—To start the motor as often as necessary without dangerous overheating; to limit starting current to the value required by the user or supply authority; to carry full-load current for the required periods without overheating; to be simple in construction and operation; to interrupt fault current automatically without damage to itself; and, in certain cases, to vary the motor speed.

The initial starting torque of a squirrel-cage motor is practically proportional to the square of the applied voltage and, in order to accelerate the motor against the load resistance, sufficient voltage must be applied to the stator windings in the starting position. The torque when switched direct on to the line may be 100 to 150 per cent of full-load value, increasing as the motor accelerates to about 83 per cent of synchronous speed, then falling with further rise of speed. The rate of acceleration will depend on the amount by which the motor torque exceeds the load torque during this period and also on the inertia of the rotor and coupled load. These factors determine the length of the starting period.

The direct-on-line starter is the simplest to install, use and maintain and makes available during acceleration the maximum starting torque of the motor. It has the disadvantage that the initial current from the mains is very high, usually about six times the full-load value, so that in order to prevent a momentary fall of mains voltage and interference with connected lighting, the supply authority stipulates a maximum horse-power for motors started in this way. The limitation on the H.P. of the motor, not on peak starting current, is a disadvantage, as in some cases starting current could be reduced without loss of starting torque by using a particular type of motor,

By "Rotor"

such as the double-cage design. A second disadvantage of the direct-on-line starter is that, in order that it may carry the starting current without tripping, the overload releases may need a high setting, thus reducing the protection when running. This defect can be overcome in most cases by using a slightly more complicated type of starter in which the overload trips are cut out at starting, during which period the motor is protected by fuses or circuit breaker of higher rating on the supply side of the starter.

Another point is that the mechanical power transmission medium coupled to the motor has to deal with the peak torque of the motor during acceleration. A squirrel-cage motor with direct-on-line starter may develop in the region of three times its normal full-load torque at about 83 per cent of synchronous speed, this maximum

VARIAION OF STARTING CONDITIONS OF THREE-PHASE SQUIRREL-CAGE INDUCTION MOTOR FOR DIFFERENT TYPES OF STARTERS

Starting Method	Direct on Line	Line Resistance	Auto-Transformer	Star-Delta
Per cent of mains voltage applied to motor at starting	100	33	33	58
Motor starting current, per cent of direct-on-line starting current	100	33	33	58
Motor starting current, per cent of full-load current	600	200	200	346
Line-starting current, per cent of full-load current	600	200	67	200
Starting torque, per cent of direct-on-line starting torque	100	11	11	33
Starting torque, per cent of full-load torque	150	17	17	50

torque usually being somewhat less in a double-cage motor. The safety factor of the transmission medium is often sufficient to deal with a brief overload of this nature, but trouble is sometimes experienced when driving a heavy load or load of high inertia such as a large fan, which requires considerable power to accelerate to full speed. A driving belt may slip off its pulley during prolonged peak torque. Possible remedies are to use a larger belt or a motor having a lower peak torque or a type of starter which reduces the starting torque.

To reduce the starting current of a given squirrel-cage motor, a type of starter can be used which lowers the initial voltage applied to the stator windings. Such starters are, in general, rather less simple than the plain direct-on-line starter and reduce the starting torque, which may often be undesirable. The torque of an induction motor is proportional to the peak magnetic stator flux produced per cycle, the rotor current and the rotor power factor. Since the induced stator voltage is proportional to the strength of magnetic flux linked with the windings, a reduction of applied voltage automatically reduces the stator flux, the stator magnetizing current falling in almost the same proportion, provided the magnetic circuit is not highly saturated. The voltage induced in the rotor

applied voltage, the stator current having a similar proportion.

After acceleration has ceased the motor speed will depend entirely on the load, the slip being such that the motor automatically takes just sufficient current to produce a torque equal to the load torque at that speed. It is important to realize that if the motor is operated with reduced flux when running at reduced voltage, increased rotor and stator currents will be required to create a given torque, so that overheating may occur with full-load torque.

When a stator-resistance starter is used to reduce the voltage from V to $\frac{V}{X}$, the starting torque will be reduced from T to $\frac{T}{X^2}$, but the

starting current will be reduced only from I to $\frac{I}{X}$ approximately (see table). This method is uneconomical, as power is wasted in heating the starting resistance, but it is suitable for certain small motor drives where smooth starting is required, as any number of steps of starting current and torque can be provided.

A star-delta starter can be used with motors having stator windings delta-connected for running; both ends of each winding are brought out to terminals and six cables are required to connect the motor to its starter. Fig. 1 shows the connections of a typical drum type hand-operated star-delta starter having overload trips (O) and no-volt trip (N) and

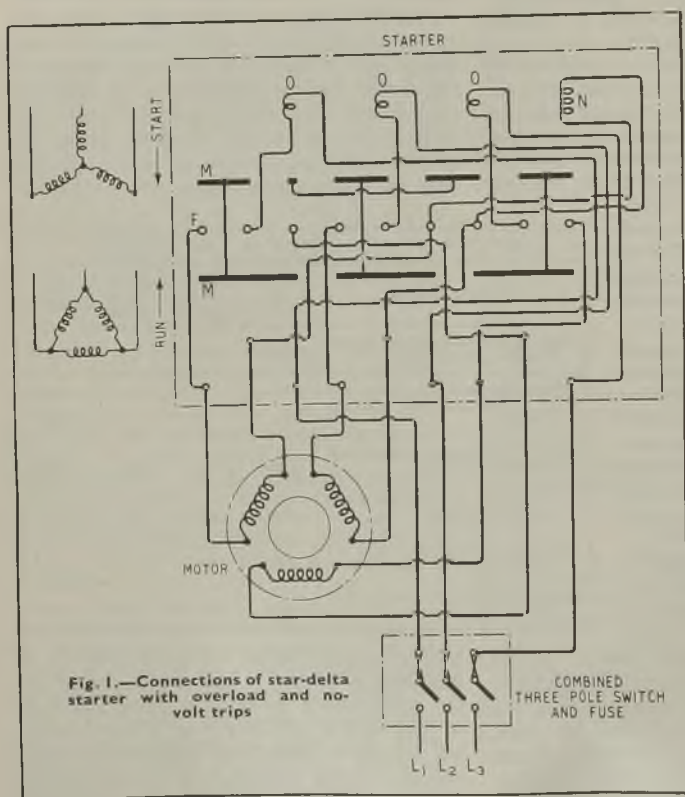


Fig. 1.—Connections of star-delta starter with overload trips and no-volt trips

conductors is proportional to the rate of cutting by the stator flux; at a given speed the rotor voltage and rotor current are thus proportional to the stator flux. It follows that the motor torque at each speed is practically proportional to the square of the

fixed (F) and moving (M) contacts. The no-volt coil is not energized until the starter handle reaches the running position. The stator windings are connected in star in the first position, each phase then receiving 58 per cent of full-line voltage to give starting

torque and current values one-third of those obtained with direct-on-line switching.

The effect of star-delta starting applied to a motor coupled to a centrifugal pump, the load torque of which increases with the speed, is shown in Fig. 2. The motor will

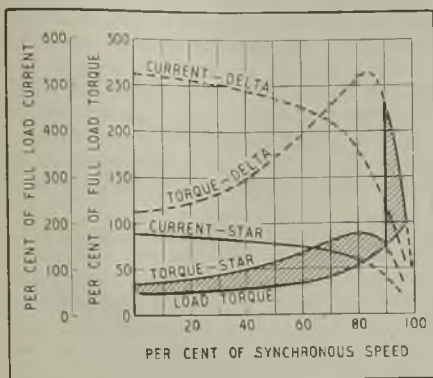


Fig. 2.—Star-delta starting of motor coupled to centrifugal pump

accelerate to about 90 per cent of synchronous speed with the switch in the starting position, at which speed the line current reaches about 80 per cent of full-load current. As soon as this steady speed has been reached the starter should be thrown swiftly to the delta position, in which the stator windings receive full mains voltage. The line current then increases to approximately 240 per cent and the torque to 220 per cent of full-load values. The increased torque causes rapid acceleration to full speed, in this case 97 per cent of synchronous speed. By this means current and maximum applied torque are reduced and the period of high torque is limited. If the starting handle is moved to the delta position before the motor has accelerated to a steady speed in star, the torque and current will be increased.

Limited Starting Torque

With this type of starter the starting torque is limited, but it is suitable for drives where the motor starts against up to 30 to 40 per cent of full-load torque. A slightly higher starting torque may be obtained by using a double-cage motor, which may develop about 75 per cent of full-load torque in star. The possibility of occasional alteration of starting conditions should be borne in mind. The starting load may be increased after prolonged stoppage owing to stiff belts or to the oil having drained from the bearing surfaces;

also a motor which normally starts up unloaded may trip on load and have to be restarted under bad conditions. The motor may then have to be assisted to start by pulling the belts or by moving the starter to the full-on position whilst at a standstill or turning at low speed.

When a motor is required to run for a considerable period on low loads a star-delta starter can be used to run it in star, reducing the magnetizing current and iron losses and increasing power factor and efficiency (Fig. 3). When using a starter in this way protection against overload must be provided by setting the trips at about 60 per cent of normal.

Auto-transformer Starters

Auto-transformer starters can be used with motors having either star- or delta-connected stators and both ends of each phase of the stator windings need not be available. While somewhat similar to the star-delta starter in the arrangement of the contacts and in operation it is more expensive since it incorporates an auto-transformer to give reduced voltage at starting (Fig. 4). Most starters of this type, however, are more flexible than star-delta starters as the auto-transformer often has three sets of tapings, which may give 50, 60 or 75 per cent of line voltage to give starting torques of 25, 36, or 56 per cent of the direct-on-line values, which are adequate for most drives without causing excessive starting currents.

When the load needs a high proportion of full-load torque at all speeds, the ordinary squirrel-cage motor may not develop sufficient

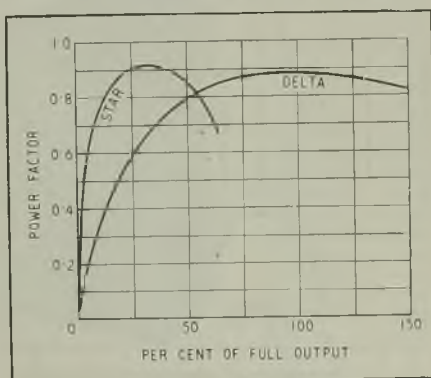


Fig. 3.—Power factor of three-phase motor in star and in delta

torque to start the load direct without employing a type of starter which would

take an excessive starting current. In some cases the load can be applied after the motor has been started by a reduced-voltage starter. Fig. 2 shows that once the full voltage has been applied and the motor is running at speed, the maximum torque is available for accelerating a load, without taking a very high line current. If the motor is started unloaded and then coupled to the load the speed will fall slightly and the motor torque will increase to a high value to ensure acceleration to normal speed once more. This method of starting may entail the use of fast-and-loose pulleys or some form of clutch.

Centrifugal Clutch

A centrifugal clutch on the motor shaft may act as a belt pulley if required. At low motor speeds the portion of the clutch coupled to the motor is free to revolve inside the portion coupled to the load, so the motor can start up light. Friction shoes carried by the motor portion of the clutch are thrown out by centrifugal force as the motor speed

length of the high-current period during starting. The friction shoes can be spring-loaded, preventing their operation until the motor has reached a pre-determined speed. A clutch of the latter type with a two-position starter must be arranged to operate at the correct speed. At too low a speed the load may be applied before the motor torque has reached a high enough value to accelerate

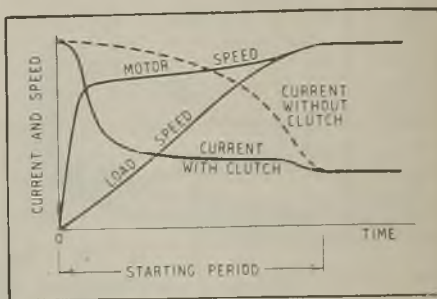


Fig. 5.—Effect of centrifugal clutch in starting three-phase motor

the load, and the motor and clutch may tend to "hunt" or the clutch may slip when the motor speed rises and peak torque is developed. If the clutch operates at too high a speed it may tend to slip on heavy loads when the speed falls slightly. High current peaks may result from the clutch functioning too soon or too suddenly.

Transient Currents

Whilst the handle of a star-delta or auto-transformer starter is being moved from the starting to the running position, the motor is disconnected from the supply and continues to run under its own momentum and that of any coupled load, acting as a generator with a falling voltage. The motor voltage may then be out of phase with the mains voltage when reconnected to the supply in the running position of the starter, and this may result in a momentary rush of high current through the windings.

Such transient surges are avoided in a modified type of star-delta starter which has three starting positions. This starter is slightly more complex than the standard pattern as it incorporates resistance units; but it has the advantages that the maximum line current is only 50 per cent of that usually obtained with a star-delta starter and the transient currents are practically eliminated, as the motor remains connected to the supply during the whole starting period. In a

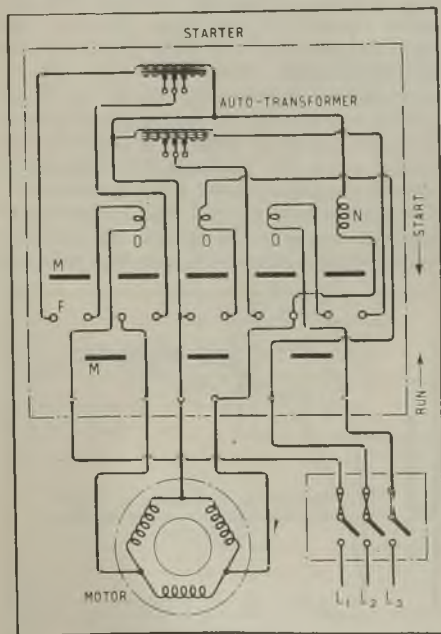


Fig. 4.—Connections of auto-transformer starter with overload and no-volt trips

increases, and exert an increasing force on the load portion so the load is taken up gradually. Fig. 5 shows the reduction in the

modified type of auto-transformer starter the windings of the auto-transformer act as choke coils during the transition period to limit the current.

Where the speed of a large motor has to be controlled independently of the load, a slip-ring motor is generally used with a rotor resistance starter to regulate the rotor current and power factor in order to govern the stator current and motor torque and to enable any torque up to full-load to be developed at any speed within the range of the motor and starter. Greater flexibility is thus obtained, but the motor and control gear in this case are more expensive and less simple.

Heat is generated in the rotor starter at a rate which is proportional to resistance \times current², and a type of starter should be used which gives sufficient torque to accelerate the motor to full speed in a reasonable time in order to reduce the heating period. The generated heat is normally dissipated when the motor is running on load, so that for a

number of starts in rapid succession the cooling period may be inadequate. The purchaser should, therefore, advise the suppliers of the control gear of the starting frequency, especially if this exceeds about five per hour.

When a rotor starter controls the running speed of the motor it should be designed mechanically so that the handle can be left in intermediate positions and thermally so that the resistance units are large enough to carry the current continuously without overheating. As the waste of power caused by heat generated in the starter has to be supplied by the mains, this method of speed control is principally used when short runs at reduced speed are required. A liquid rotor starter can give an infinitely variable speed up to full speed, but fairly rapid evaporation of the liquid may occur at reduced speeds. A liquid starter should have metal-to-metal contacts which are closed in the full-on position, to reduce losses and evaporation.

An N.H.D. Cooker

TO meet the urgent needs of the Ministry of Supply in connection with the National Housing Drive, Parnall (Yate), Ltd., Yate, near Bristol, is now producing an electric cooker employing light alloy die-castings extensively instead of the usual cast-iron and sheet steel. Both from the installation and the cleaning aspect aluminium has advantages. Instead of having the customary vitreous enamel finish, with its proneness to chipping and to abrasion, the hob (for which patents have been applied) presents a surface of lightly fluted design on the bare metal, any wear falling wholly on the tops of the ribs and cleaning becoming a simple matter. Moreover the hob plate may be lifted bodily out of its surrounding frame without screws or other attachments for washing in the sink, if desired. The general exterior finish of the cooker is of grey mottled synthetic enamel which is claimed to be more resistant to damage than vitreous enamel because of the greater yielding power of the aluminium base.

The under-hob construction facilitates plate adjustment and cleaning. The back stretcher bar carries the standard live and earth plug sockets for grill-boiler and boiling plate connections, together with a fuse unit in a central position and the main terminals and hob switches below, the whole forming an extremely simple wiring layout. The switches are coupled to the white bakelite knobs on the cooker front by remote control rods.

The removable sheet-aluminium oven has

embossed runners. Thermostatically controlled plug-in type elements (2 kW) are located behind these pressed walls, louvres in the loose box interior favouring good circulation and even heat distribution. An aperture low down in the back of the oven takes care of ventilation and steam is ultimately discharged through grilles in the low hollow splash-plate which surmounts the hob.

In general appearance modern cabinet lines have been followed and the whole body of the cooker surmounts a plinth of sheet steel which includes the standard toe recess. Overall dimensions excluding 4-in. splash-plate are 21 in. wide by 19½ in. by 36 in. high, while the hot cupboard is 17 in. wide, 14½ in. deep and 6½ in. high.



Parnall N.H.D. cooker

The 10½-in. by 8-in. grill boiler and the 8-in. boiling plate have loadings of 2 kW and 1,800 W respectively. Simmering control is provided as an extra.

South African Trade

General Decline in Imports in 1944

DETAILS of the external trade of the Union of South Africa during 1944 have recently been published in Pretoria. The values of the imports of electrical goods in that year are shown in the accompanying table together with a note of increase or decrease compared with 1939. It will be seen that the trade declined steeply and increases were negligible. The chief of the supplying countries

were the United Kingdom and the United States.

During the war a remarkable increase took place in the export of South African cable and wire. It totalled in value £750,600 in 1944 and went mainly to India. Electrical machinery was exported in that year to the value of £68,500, with Egypt and Southern Rhodesia leading customers; and other material valued at £55,000 with India a good customer.

Class	1944 £ (000)	Inc. or dec. on 1939	Class	1944 £ (000)	Inc. or dec. or 1939
<i>Batteries, primary—</i>	7	— 42	<i>Vacuum cleaners—</i>	3	— 82
From United Kingdom ..	1	— 20	From United States ..	3	— 3
" United States ..	6	— 19	<i>Elec. hand lamps—</i>	9	— 16
<i>Batteries, secondary—</i>	106	110	From United States ..	8	— 3
From United Kingdom ..	55	6	<i>Elec. lamp bulbs—</i>	209	— 20
" Canada ..	5	— 2	From United Kingdom ..	165	+ 9
" United States ..	46	97	" United States ..	33	+ 14
<i>Parts for batteries—</i>	28	*	<i>Shades and reflectors—</i>	4	— 36
From United Kingdom ..	15	—	From United Kingdom ..	3	— 13
" United States ..	12	—	<i>Self-contained elec. lighting outfits—</i>	4	— 36
" Brazil ..	1	—	From United Kingdom ..	2	— 10
<i>Dynamos and generators—</i>	14	— 85	" United States ..	2	— 24
From United Kingdom ..	11	— 54	<i>Elec. meters—</i>	8	*
" United States ..	3	— 13	From United Kingdom ..	6	—
<i>Motors—</i>	204	— 187	" Switzerland ..	1	—
From United Kingdom ..	175	— 93	<i>Radio apparatus for ships, aircraft and</i>	18	*
" United States ..	29	— 26	<i>public radio services—</i>	12	—
<i>Transformers—</i>	86	— 226	From United Kingdom ..	6	—
From United Kingdom ..	81	— 129	" United States ..	12	*
" United States ..	5	— 40	<i>Radio sets—</i>	1	—
<i>Other electrical machinery—</i>	768	— 1,072	From United Kingdom ..	10	—
From United Kingdom ..	579	— 827	" United States ..	18	*
" United States ..	188	— 38	<i>Radio valves—</i>	6	—
<i>Cable and wire—</i>	107	— 775	From United Kingdom ..	12	—
From United Kingdom ..	65	— 684	" United States ..	24	— 654
" Canada ..	1	—	<i>Radio apparatus and accessories—</i>	5	— 75
" United States ..	41	+ 29	From United Kingdom ..	18	— 361
<i>Stoves and parts—</i>	48	*	" United States ..	1	—
From Canada ..	32	—	<i>Instruments and appliances for radio</i>	13	— 7
" United States ..	8	—	<i>telegraphy and telephones—</i>	12	— 5
<i>Other heating and cooking apparatus—</i>	26	— 305	From United Kingdom ..	26	— 10
From United Kingdom ..	20	— 73	<i>Insulators, porcelain—</i>	13	— 1
" Canada ..	2	— 150	From United Kingdom ..	11	—
			" Canada ..	1	— 5
			" United States ..	1	— 5

* Comparative figures not available.

L.C.C. Housing Schemes

LARGE schemes for providing housing accommodation for Londoners were submitted to the L.C.C. for approval at its meeting last week by the Housing and Public Health Committee. The most important provide for the purchase of sites at Borehamwood, East Tilbury and at Oxhey. The three sites at Borehamwood total about 1,200 acres and accommodation could be provided for from 25,000 to 30,000 persons. The site at East Tilbury has an area of 832 acres, and the ultimate population envisaged is 20,000 persons. It is proposed to reserve 120 acres for industry.

The Committee submitted an estimate of £5,690,750 for the development of the Council's housing site of about 925 acres at Oxhey. About 390 acres of woodland and open space would be preserved, whilst provision is made for educational purposes, shops, churches, com-

munity centres, etc., leaving about 329 acres available for housing development.

With these proposals the Committee submitted a report as to seven new types of dwellings for future erection on the Council's housing estates, designed to give effect to the Minister of Health's suggestion for increasing the area of three-bedroom houses and for providing three-bedroom and larger houses. All the proposed new types are planned with standard kitchen fittings. Constant hot water will be provided from a heating unit in the living room, which will also afford background heating to the two larger bedrooms by means of ducts. An electric immersion heater or gas heating element will be provided for summer water-heating, and electric fires or gas fires will be provided in the main bedrooms and there will be points for electric fires in other bedrooms.

COMMERCE and INDUSTRY

Municipalities and Nationalization. Large Overseas Contracts.

I.M.E.A. and Nationalization

AT the annual meeting of the Incorporated Municipal Electrical Association at Blackpool it was announced that an extraordinary meeting was to be called to devise steps to protect the interests of municipal electricity undertakings in the reorganization of the industry. This meeting is to be held at Caxton Hall, Westminster, S.W.1, next Thursday, August 15th, at 10 a.m.

Trade Mission to China

The Government has announced its intention of sending a trade mission to China, probably about the middle of September, to study methods of developing trade between China and the United Kingdom. The leader will be Sir Leslie Boyce, chairman of the Gloucester Carriage & Wagon Co., Ltd., and the members include Mr. D. Maxwell Buist, who was recently given charge of the new B.E.A.M.A. Export Section, and will represent heavy electrical industry, and Mr. A. H. Carmichael, representing light engineering.

Employment in May

The July *Ministry of Labour Gazette* shows that there was a small general decline in the numbers employed in the electrical industries during May. A total of 152,000 is shown for the electrical engineering industry, including 48,400 women, as compared with 152,800 for April (50,100 women) and 133,900 for mid-1939 (28,000 women). For electrical wiring and contracting the total for May was 46,400 (5,400 women), against 46,200 (5,400 women) in April and 41,700 (2,800 women) in mid-1939. For the electrical apparatus, cables, etc., group the total was 235,900 (116,800 women), against 236,100 (118,900 women) in April and 195,900 (79,500 women) at mid-1939.

Unemployment figures for the United Kingdom were as follows:—

Electrical engineering, 2,981; electrical wiring and contracting, 1,036; electrical apparatus, cables, etc., 3,591.

Token Imports from Belgium

Arrangements have recently been made for "token" imports from the United States and Canada at the rate of 20 per cent annually by value of the pre-war imports of the manufacturers concerned. The arrangement has now been extended to Belgium and, as before, includes carbon electrodes, industrial porcelain insulators, cooking and heating appliances,

vacuum cleaners and parts, torch and high-tension batteries and sparking plugs. Applications for import licences must be accompanied by a certificate from the Belgian Office Centrale des Contingents et des Licences to be obtained by the Belgian manufacturers or their agents.

Control of Aluminium and Light Alloys

Government wartime control of the purchase of aluminium and light alloys is removed with effect from August 1st under two Orders made by the Ministry of Supply, namely, the Control of Aluminium (No. 7) Order of 1946 and the Light Metals and Alloys Fabrication (No. 2) (Revocation) Order, 1946 (S.R. & O. 1946 No. 1269 and No. 1270, Stationery Office, price 1d. each). As the Ministry has made a contract for the supply of 215,000 metric tons of virgin aluminium from Canada during the years 1946-1947, it will continue to be the sole buyer and seller of virgin aluminium.

The Ministry is also cancelling directions previously issued to the light alloy industry requiring the segregation of light alloy scrap into various categories, and the making of statistical returns. Arrangements have been made for statistics to be furnished on a voluntary basis by the industry, and totals will be issued monthly by the Ministry of Supply.

Royal Norfolk Show

A feature of the Royal Norfolk Show held at Crown Point, Norwich, on June 20th was a



Norwich Electricity Department's display at the Royal Norfolk Show

comprehensive display of farming equipment and domestic electrical appliances, arranged by the Norwich Corporation Electricity Department, under the supervision of Mr. J. A. Sumner, the city electrical engineer. The electrical apparatus shown on the stand included electric tools, welding plant, farm sterilizing, steam raising and milking plant, pumps and corn grinding equipment. The domestic apparatus included refrigerators, water heaters, clocks, fires, etc., while other exhibits were two electric vehicles.

Visitors to the Show took particular interest in

the electric clock tower, which is appropriately shown in the accompanying picture between the Thorpe power station and a transmission line tower in the background.

Large Portuguese Contract

A British group consisting of the English Electric Export and Trading Co. and the Metropolitan-Vickers Electrical Export Co. has negotiated a contract, valued at one million sterling, covering the equipment of a 200,000-H.P. hydro-electric power station, which is to be constructed to the order of the recently formed hydro-electric company, the Hidro-Electrica do Zezere of Lisbon. The power from this station will be used, via the national grid, to ensure ample electrical supplies to Central Portugal, and will play a great part in the augmentation of Portugal's industrial resources. The station will be situated at Castelo do Bode, 100 km north west of Lisbon, on the Zezere River, a tributary of the Tagus.

Brazil Railway Electrification

An important contract for Brazil has just been placed by the San Paulo Railway with the English Electric Export and Trading Co. It covers the electrification of the San Paulo Railway from Jundiáhy to Mooca, and includes the provision of electric locomotives, rolling stock, substations and associated distribution equipment.

Works Magazines

In April last a conference on works magazines was organized by the Industrial Welfare Society, 14, Hobart Place, Westminster, S.W.1. The Society has now issued a 32-page report (2s.) on the conference reproducing the opening address by Mr. George Isaacs, Minister of Labour, the three papers and the discussion. Three appendices give sample costs, notes on current practice and a list of works magazines.

Australian Electrical Imports

The Australian Bureau of Statistics has issued preliminary figures of the overseas trade of the Commonwealth for the nine months ended March last. Imports of electrical appliances and equipment were valued as follows; the comparative figures for 1944-45 are given:—

Class	July-March	
	1944-45 £000	1945-46 £000
Batteries and accumulators ..	121	64
Cable and wire, covered ..	557	360
Dynamo-electric machines ..	668	815
Lamps, filament ..	85	136
Telegraph and telephone instruments, etc. ..	861	862
Other electrical appliances ..	2,331	1,845

Mining Equipment Exhibition

A mining exhibition was organized by the Ministry of Fuel and Power (Recruitment Branch) and held at Swallownest Miners' Welfare Ground, near Sheffield, on August 3rd at the fete and gala arranged by the National Union of Mineworkers, Waleswood Branch. Various manufacturers of mining equipment were represented, and A. Reyrolle & Co., Ltd., of Hebburn-on-Tyne, exhibited some of their

mining switchgear, including a complete range of fully flameproof and explosion-proof air-insulated switchgear and a complete range of flit-plug cable-coupling boxes.

The range of air-insulated panels defined as the type GA range, from GA1 to GA9, meets mining requirements for the distribution and control of electrical energy at working-places with modern mechanical working. Particular attention was given at the exhibition to the type GA8 and type GA9 panels, which have been developed for use in room and pillar workings where head-room is restricted and mobility is essential. The flit-plug cable-boxes were another interesting feature. They are available for joining cables together or for connecting cables to switchgear and transformers, and are more largely used than before, since the latest mining methods require more frequent movement of underground machinery.

Scroll Light Bed Lamp

E. Dawson (Lamp Factors), Ltd., 10, Grays Inn Road, London, W.C.1, are joint distributors with Underwood (Electric), Ltd., of this lamp which was described in our last issue.

House Wiring Contracts

The Alpha Manufacturing & Electrical Co., Ltd., has received the contract for the internal wiring of 810 B.I.S.F. houses in Aylesbury, Nuneaton, Cheltenham, Bournemouth and Wantage.

Works Visit

The Yorkshire North-West Branch of the Association of Mining Electrical & Mechanical Engineers is visiting the Hydra Steel Works at Ecclefield, Sheffield, of Hall & Pickles, Ltd., on August 21st.

Peruvian Electrical Imports

According to the *Board of Trade Journal*, imports of electrical apparatus into Peru during 1945 were valued at 16,932,000 soles (about £650,000) as compared with 14,036,000 soles (about £540,000) in the preceding year.

Fatal Shock from Cleaner

"One wonders if compulsory expert examination of these machines should be adopted to prove their safety; otherwise, the housewife is carrying out her duties in a state of peril," commented the coroner, recording a verdict of "Death by Misadventure" at Clayton-le-Moors on July 16th, on Mrs. May Gregson (42), who was killed while using an electric cleaner in her scullery. It was stated that a flex from the motor was bare and in contact with a metal sleeve so that the whole machine was alive.

International Flanders Fair

The first International Fair of Flanders will be held at Ghent, Belgium, from September 6th to September 21st. Exhibits will embrace practically the whole of Belgium's industry including mechanical equipment, electrical supplies, textiles, agricultural machinery, building and construction, instruments and chemicals. Very complete arrangements have been made for publicity and it is hoped that many buyers from other countries in Europe

will attend the Fair. British manufacturers who are interested in exporting to the Continent can obtain full details from the United Kingdom agents, the Anglo Continental Market Development Co., 57, Fetter Lane, London, E.C.4.

Coal to Fuel Oil Conversion

In a written answer to a Parliamentary question the Chancellor of the Exchequer stated on August 1st that after consultation with the Minister of Fuel and Power he had decided to propose in next year's Finance Bill that the import duty of 1d. per gallon should be removed from heavy fuel oil and gas oil. In the meantime, from October 1st, until the date when the import duty is removed, a subsidy of £1 per ton would be paid to consumers in this country of such oils, whether imported or home-produced. It was hoped that these arrangements would result in conversions from coal to oil to the maximum extent possible.

The Ministry of Fuel and Power states that steps are being taken to encourage conversion of plant temporarily from coal burning to oil fuel burning where it is clear that this may be done with advantage to relieve the present and prospective pressure on coal supplies. Every assistance will be given to industrialists desiring to make the change and arrangements have been made for ordering in bulk the necessary equipment and oil-burning appliances so that the change, where applicable, may be made as speedily as possible.

Regional Officers of the Ministry of Fuel and Power are now consulting industrial undertakings where plant conditions are suitable for conversions to oil and discussions in this connection are taking place with the gas and electricity supply industries and the railway companies.

Cable for New Houses

Commenting on the position as regards the supply of underground lead-covered cable for new houses, Alderman J. Canon Bardsley told Warrington Town Council, at its July meeting, that sufficient cable had been received to cope with all applications made for individual connections and there was sufficient cable in hand to allow the Corporation to meet a certain number of demands. Alderman D. Plinston said he had it on good authority that there would not be any delay in the completion of houses for the want of cable.

Leeds Power Station Contracts

In connection with the projected new power station to be built by Leeds Corporation at Skelton Grange, a sub-committee has recommended that, subject to the C.E.B. agreeing that in the special circumstances it is undesirable to invite tenders, the quotation of International Combustion, Ltd., for supplying and erecting boiler plant at a cost of £1,782,936 be accepted. It is further recommended that the tender of C. A. Parsons & Co., Ltd., for the supply and erection of two turbo-alternator sets, two condensing plants and auxiliaries, for £798,728, should be accepted, both conditional

on formal consent to the construction of the power station, and the necessary borrowing powers, being received.

Fluorescent Lighting on a Dairy Farm

The dairy farm of Mr. C. D. Notley at Firethorn Farm, Ewhurst, has recently been modernized by the erection of new cowsheds for his T.T. and attested Jersey cows, and a dairy by S. L. Hill, Ltd. An interesting feature is the lighting by "Atlas" fluorescent tubes, made by Thorn Electrical Industries, Ltd. In the cowsheds six 80-W fluorescent tubes have been installed, while in the dairy the installation



"Atlas" fluorescent lighting in the dairy of Firethorn Farm, Ewhurst

includes two 80-W tubes in a new plastic fitting which is unaffected by moisture and steam. The electric milk cooling equipment installed at the farm is by Frigidaire.

German Patents

A conference to consider the question of the future treatment of German-owned patents in Allied countries took place in London from July 15th to 27th. Delegates attended from Australia, Belgium, Canada, Czechoslovakia, Denmark, France, Luxembourg, Netherlands, Norway, Union of South Africa, the United Kingdom and the United States of America. The chairman of the conference was Sir Harold Saunders, Comptroller of Patents in the United Kingdom.

At the conference the representatives of France, the Netherlands, the United Kingdom and the United States of America signed an accord which will have the effect of making all patents of former German ownership now controlled by their Governments, and in which there is no non-German ownership now controlled by their Governments, and in which there was no non-German interest existing on August 1st, 1946, available within their respective territories to all nationals of the countries party to the accord without payment of royalties or without any requirement to manufacture within the country where the patents exist. The representatives of Australia, Canada,

Czechoslovakia, and the Union of South Africa agreed to recommend to their respective Governments that they should also sign the accord.

The accord remains open for signature by other members of the United Nations and by neutral countries until January 1st, 1947. It will come into force as soon as it has been signed by three further countries provided they sign before the end of 1946.

Reports on German Industry

Among further reports on German industry now available are the following:—C.I.O.S. XXXI-43, "Tube-making Plants: Mannesmann Rohrenwerke" (2s. 6d.); B.I.O.S. 408, "Contact Rectifier for Heavy Currents: Siemens-Schuckert, Berlin" (2s.); B.I.O.S. 528, "Reports on Dams and Hydro-Electric Schemes in South-West Germany" (8s.); B.I.O.S. 533, "Electric Furnace Design, Manufacture and Application in Germany" (9s. 6d.); B.I.O.S. 551, "German Wireless Communication: Mainly with reference to Cm, Dm and Pulse Technique" (2s.); B.I.O.S. 564, "Industrial Electronic Measuring Equipment" (2s.); F.I.A.T. 573, "German Air-Conditioning and Refrigeration Industry" (3s. 6d.); B.I.O.S. 413, "Primary Cells," by Professor A. Schmid (6d.); B.I.O.S. 500, "Ljungstrom Turbines in Germany" (9s.); F.I.A.T. 514, "Report on High-Voltage Switchgear" (3s. 6d.); and F.I.A.T. 801, "Industrial Safety in Germany" (13s. 6d.). A few copies are available from the Stationery Office at the prices shown and the reports may also be seen at the leading libraries.

Change of Address

The Mining Association of Great Britain has removed its offices to Bolton House, 61, Curzon Street, London, W.1 (telephone: Grosvenor 4801-5).

Trade Announcement

The General Cable Co., Ltd., has opened a new depot at 54a, Newton Street, Manchester, under the management of Mr. Douglas Baker.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within one month from July 31st:—

WELDCON. No. 640,603, Class 7. Welding machines and parts thereof not included in other classes.—Welding Controls, Ltd., 1a and 24, High Street, Kempston, Beds.

WESTREX STANDARD. No. 640,491, Class 9. Sound reproducing installations, instruments and apparatus.—Western Electric Export Corporation, New York. Address for service: c/o F. C. Tomlins, 5, Mornington Road, Woodford Green, Essex.

FIL-O-MATIC. No. 641,159, Class 9. Electric storage batteries and covers therefor.—Firestone Tire & Rubber Co., Akron, Ohio. Address for service: c/o Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, W.C.2.

Hours and Wages

THE Ministry of Labour and National Service conducted another inquiry into hours and wages in industry during January last. About 52,400 establishments out of 53,600 approached rendered returns suitable for tabulation; these employed over five-million people. The results are set out in the July *Ministry of Labour Gazette*.

The returns covered 122,234 workers in the electrical engineering industry of whom 68,350 were men (21 and over), 14,448 youths and boys, 36,498 women (18 and over) and 2,938 girls. Their average hours with earnings (in parentheses) in the last week of January were as follows:—Men 47.4 (122s. 5d.); youths and boys 43.9 (39s. 4d.); women, excluding part-time workers, 41.8 (62s. 1d.); girls 41.9 (34s. 7d.); all workers 45.2 (92s. 6d.).

In the electrical apparatus, cables, lamps, etc., group there were 48,502 men, 6,090 youths and boys, 48,976 women and 4,130 girls whose hours and earnings were as follows:—Men 48.9 (120s. 1d.); youths and boys 43.5 (40s. 3d.); women 42.1 (63s. 2d.); girls 42.5 (35s. 10d.); all workers 45.4 (86s. 6d.).

Returns from the electrical contracting industry included 4,464 men, 2,384 youths and boys, 68 women and 36 girls. Hours and earnings were as follows:—Men 49.8 (125s. 9d.); youths and boys 47.2 (35s. 5d.); all workers 48.8 (93s. 9d.). No particulars were available for women and girls.

Of 68,984 people dealt with in the case of the electricity supply industry 61,559 were men, 4,342 youths and boys, 2,899 women and 184 girls. Their hours and wages were:—Men 49.4 (110s. 7d.); youths and boys 45.3 (35s. 7d.); women 41.8 (70s.); all workers 48.8 (104s.). No particulars are given for girls.

Average hourly earnings for adult male workers were as follows:—Electrical engineering 31d.; electrical apparatus, etc., 29.5d.; electrical contracting 30.3d.; and electricity supply 26.9d.

Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references:—

India.—Manufacturing firm requires three-phase furnaces for the production of carbon plates and brushes. It also wishes to import carbon products, radio sets, refrigerators, accumulators and dry batteries, etc. (X.162.)

Edinburgh Extensions

Intensive Development in Existing Station

BRIEF reference was made in our last issue to the new plant which is to be installed in the Portobello station of the Edinburgh Corporation Electricity Department. Mr. J. F. Field, the engineer and manager of the Department, has now sent us some further information on the subject.

It is pointed out that the Portobello station is extremely well placed for the supply of coal and condensing water and although the same advantages would be available to a station built anywhere near the coalfields on the Forth Estuary the erection of this and the duplication of auxiliary services already available at Portobello would be costly. It is estimated that a new station with two 50,000-kW sets and services would cost at least £4½ million.

Careful examination was made of the possibilities of the present site. Suitable adjacent land is already occupied and could not be taken over, it is stated, without great discomfort to the people concerned. The question therefore arose as to the possibility of accommodating new plant in the existing building. The possibility was encouraged by the fact that the original plant, installed in 1922, has reached the end of its useful life and is in a poor state of repair and grossly inefficient, even compared with new plant at the same steam pressure at the other end of the building. There was accordingly much to be said for scrapping this old plant and installing new plant with the most modern steam conditions, provided that this resulted in a substantial increase in capacity.

The turbine room is about 460 ft long and 57 ft wide with gantry columns at 21-ft centres. Consideration was first given to steeple compound machines of the (Ford) River Rouge type with two standard 30-MW generators, one on top of the other, both running at 3,000 r.p.m. with h.p. and l.p. steam cylinder heat drops arranged to suit, but

further investigation showed that a cross-compound machine with similar cylinders side by side could easily be accommodated.

The proposed new machine will therefore be about 45 ft long overall and will be placed athwart the turbine room similar to the machine it displaces, and since the 60-MW unit comes comfortably within two gantry column centres of 42 ft no fewer than ten of these machines with a total capacity of at least 600,000 kW could be accommodated. The last few stages of the low pressure end will probably be quadruple flow into a single



The Portobello power station, Edinburgh

condenser shell, one half of which can be cleaned while on full load at slightly reduced vacuum.

Actually this design of cross-compound machine need only be a foot or two longer when designed for capacities up to 100,000 kW, the difference being almost entirely in the length of the 3,000 r.p.m. generators. The blading would be somewhat longer, making the steam casings only slightly more bulky in diameter, and both from the electrical and steam points of view such an arrangement should be easy to build, only comparatively small parts and forgings being necessary for the steam and electrical ends.

While it is comparatively easy with suitable designs to get much larger plant capacities into existing turbine houses it is generally a much more difficult problem with boiler plant. Indeed, it would be impossible to make any substantial improvement in space utilisation without adopting the unit boiler-turbine layout. The Portobello boiler house is about 89 ft wide, excluding annexe, by

440 ft long, and it was found that a maximum of eight 540,000 lb per hr pulverized fuel boilers could be accommodated in this space at 54-ft centres, which is admitted to be fairly close spacing for the size of unit considered. This arrangement would have admitted of the installation of about 480 MW or so in the existing building. The main chimney flue and 360 ft chimney are of just about sufficient size at the thermal efficiency envisaged to accommodate the gas from this number of boilers, admittedly with rather high draught losses at maximum rating.

Eventually, however, it was agreed with the Central Electricity Board that the best development would be six 60-MW sets, the first two boilers to be at 68-ft centres, and this is the arrangement now to be adopted. No alteration whatsoever is required in the turbine room, apart from removing the foundation block of the existing machine, but the roof of the boiler-house will have to be raised by about 40 ft.

Choice of Steam Conditions

In choosing the steam conditions, it was essential to consider availability first and to go only so far in the search for thermal efficiency as this main consideration would permit. The unit boiler arrangement with pulverized fuel firing has already shown, particularly in the United States, about equal availability as between the boiler and the turbine it serves, thus justifying the unit arrangement. Furthermore, American and British experience has indicated that there is no inherent disadvantage in very high pressures as such. The problems are almost entirely a matter of inlet steam temperature.

The cost and complication of reheating, however, and particularly the governing difficulties which might ensue in Scotland when operating in parallel with hydro-electric plant and possibly isolated from the remainder of the grid are such that this type of plant could not be seriously considered at present. The question therefore was how far to go with a standard steam cycle. Pressure of 900 lb at 900 deg F was considered absolutely safe with present technique, but it was felt that recent progress both in the United States and in this country justified taking the further step of 1,350 lb at the throttle with 950 deg F total temperature, with feed heating at 450 deg F at maximum rating and with the highest vacuum consistently possible, namely 29.1 in. Hg. The improvement in fuel rate over the

900-lb plant would be of the order of 4.5 per cent and if equal reliability could be achieved it was certainly well worth having.

It was finally decided therefore to go ahead with the 1,350 lb 950 deg initial condition, but to ensure availability by the device of deliberately catering for removal of blading in a prearranged manner so that the turbine could give its full output at 900 lb 900 deg F with substantially reduced feed water heating temperature, thus enabling the turbine to pass the required weight of steam without any prejudice to its efficiency at the design conditions of 1,350 lb with 450 deg F feed water. Temporary alteration to the boiler for such a change in steam conditions is a rather more difficult problem, particularly in the balance of latent heat to superheat under the two separate conditions, and also in the problem of taking away the much larger volume of steam involved at the lower pressure, but it is felt that this problem will also be successfully overcome.

It is not intended that the efficiency ratio of the plant should be quite as good at the reduced pressure of 900 lb since the need for operation at reduced pressure will probably only be of a temporary character, if indeed it is required at all. The provision of reduced pressure operation has been made because the plant situation in the country is so acute that no hold-up or restriction in output capacity on account of "teething troubles" with high steam conditions could be tolerated for any length of time.

The cost of the first part of the new plant is put at £1,250,000, the second set will cost the same, giving a total of £2½ million against the estimated cost of £4½ million for a new station with an initial installation of two 50-MW sets. The annual saving is calculated at nearly £200,000 per annum for twenty years. It is hoped that the first set will be in operation in two and a half years; the building of a new station would require about four years. The consulting engineers are Kennedy & Donkin.

Baile Memorial Prize

AN annual prize of two guineas is to be awarded to the reader of the most meritorious paper (not otherwise awarded a Council premium) at the North Midland Students' Section of the I.E.E. It is to be known as the Baile Memorial Prize and will be provided from a fund created for the purpose some years ago in memory of the late Mr. J. D. Baile, a former hon. secretary of the Leeds Centre.

ELECTRICITY SUPPLY

Tidal Power Scheme. Finchley Rate Relief Explanation.

Bedford.—**NEW SWITCH-HOUSE.**—The foundation stone of a new switch-house at Austin Canons was recently laid by Alderman W. E. Sower, M.B.E. He said that it had been decided to take a supply at 33 kV from the switch-house and to interconnect with the Prebend Street generating station by three 33-kV underground feeders through three 15,000-kVA 33/11-kV transformers. Later, substations would be installed at other strategic points, to reinforce the existing high-voltage network. The rate of the increase in consumption was such that sales were doubling every nine years, without taking into consideration the special loads anticipated in the future (such as the Thurleigh aviation research station and the Cranfield Aeronautical College).

Berkshire.—**NEW CABLES AND LINES.**—The Highways and Bridges Committee of the County Council has received particulars of proposals by electricity undertakings to erect 26 overhead lines and lay three underground cables.

Blackburn.—**FACTORY SUPPLY.**—The Electricity Committee has authorized the provision of a supply of electricity to J. H. Haydock & Sons' Eclipse Mill, Fenisowles. The cost will be £3,172.

Bournemouth.—**COOKING AT SANATORIUM.**—The Corporation Health Committee is to provide electric cooking facilities at a cost of £237 at the sanatorium.

Brighton.—**DOMESTIC APPLIANCES.**—The Electricity Committee is seeking sanction to borrow £25,000 for domestic electrical apparatus.

Bushy.—**STREET LIGHTING.**—The U.D.C. has arranged for the Watford Corporation Electricity Department to erect 50 street lamps on the Hall Farm estate.

Cheltenham.—**ELECTRICITY FOR ESTATE.**—The Electricity Committee is to provide a supply to the New Barn estate, Prestbury, at a cost of £4,777.

Coventry.—**HIGHER CHARGES PROPOSED.**—The Electricity Committee recommends increasing electricity tariffs by 20 per cent.

Croydon.—**LOANS SANCTIONED.**—The Electricity Committee has obtained sanction to borrow £2,000,000 for the new power station, £15,000 for mains and services and £5,000 for substations.

Dalton-in-Furness.—**TIDAL POWER PLAN.**—A £6,500,000 scheme for a hydro-electric tidal power station and causeway over the Duddon estuary from Askam-in-Furness, N.W. Lancs, to Hodbarrow, West Cumberland, has been put forward by Mr. C. Frobisher, surveyor and engineer to the Dalton-in-Furness Council, and submitted to the Government and Lancashire County Council. The plan provides for a 50 ft wide highway and double track railway linking the two counties.

Eccles.—**SERVICE UNITS.**—On the recommendation of the electrical engineer the Electricity Committee has decided that standard house service units shall be installed free of cost

in all new Council houses and supplied on the same basis for new property erected and wired by private contractors, provided that consumers agree to take, in addition to a supply for lighting, etc., at least two of the following power services: power plugs, cooker, washboiler or water heater. Consumers not taking the minimum power supply must pay a proportionate part of the cost of the service unit.

Finchley.—**RATE RELIEF "BECAUSE OF UNCERTAINTY."**—From the net profit of £23,234 on the past year's working of the Electricity Department, £5,731 is being contributed to rate relief. The chairman of the Electricity Committee (Councillor P. Lawrence) said that it would not be possible to reduce tariffs owing to the increased cost of labour and materials. He deplored the delay which was taking place in the announcement of definite proposals regarding the terms upon which undertakings would be acquired, and said that it was because of this uncertainty that the Committee decided to recommend to the Council that a portion of the past year's profit should be used for rate aid. It was not known whether the acquiring authority would be empowered to take over liquid balances, and there seemed to be no purpose in building up their reserve fund to an unnecessarily high level.

Friern Barnet.—**ELECTRIC WATER HEATING RECOMMENDED.**—Owing to the high capital cost of gas water heating installations in flats on the Alexandra Road estate, the difficult position with regard to the supply of such heaters and bearing in mind that 60 per cent of people have asked for electric cookers, the Housing Committee has considered the question of installing electric water heaters. The Northmet Power Co. has offered favourable rates for electricity consumed, on the basis of the Council paying a fixed charge for the whole of the flats, which can be reclaimed in the rents, the occupiers paying direct for the electricity consumed. In view of the benefits to the tenants under this scheme the Committee recommends its adoption.

Gourock.—**SODIUM LIGHTING.**—The Town Council has adopted the sodium system of electric street lighting which is at present in use in parts of the neighbouring burgh of Greenock.

Guildford.—**HIRE OF APPARATUS.**—At a meeting of the Electricity Committee the electrical engineer reported that moderate supplies of electrical domestic apparatus would be available in the course of the next three months and the Committee decided to put the hire and hire-purchase schemes into operation the moment apparatus can be obtained.

Lichfield.—**ELECTRICITY CHARGES.**—As there was a loss of £1,969 on the past year's working of the undertaking and it is anticipated that there will be a deficit this year of about £5,731 if prices are not adjusted, the Electricity Committee recommends an increase of 10 per cent, which is estimated to yield £3,898 in a year.

London.—**ELECTRIC PUMPING PLANT.**—The Metropolitan Water Board is to remodel the Cricklewood pumping station and install

electric pumping plant at a cost of £21,190. The Board also proposes to install electrical plant at the Crayford pumping station at a cost of £13,500.

Reading.—**INCREASE IN TARIFF.**—The Electricity Department has issued notices to consumers stating that, in consequence of the heavy increase in the cost of coal and other expenses, the tariff will be increased after the third quarter of 1946, subject to the concurrence of the Ministry of Fuel and Power. The published scales show that under the domestic two-part tariff it is proposed to increase the standing charge by 50 per cent, the running charge being 0.75d. where an electric cooker or thermostatically controlled water heater is used, or otherwise 0.95d.

St. Pancras.—**REFRIGERATORS.**—Recently the Electricity Committee authorized the purchase of 500 built-in domestic type refrigerators for use in connection with rehousing schemes. After considering whether the cost of installation should be met by adding a charge to the rent, the Committee has agreed with the Housing Committee that a hiring charge would be a more suitable method of meeting the cost as each refrigerator will be installed in a cupboard and can be removed if not wanted.

REVISION OF CHARGES.—The Electricity Committee recommends various tariff revisions estimated to yield additional revenue of £17,666 for the financial year.

Salford.—**H.V. SYSTEM REORGANIZATION.**—The Light Heat & Power Committee is to reorganize the 33-kV network system at a cost of £225,570.

Stafford.—**ESTATE DEVELOPMENT.**—A substation, mains and services costing £15,000 are to be provided on a new housing estate at Rising Brook.

Stockton-on-Tees.—**FLUORESCENT LIGHTING.**—At the July meeting of the Town Council a report was submitted by the general manager and engineer of the Electricity Department (Mr. N. Hunter), on the advantages of fluorescent lighting, particularly the new types of tubes and fittings, and it was resolved that arrangements should be made for a demonstration of all types of fluorescent fittings at the showrooms.

SUPPLY TO HOUSING ESTATES.—The general manager reported that to afford a supply of electricity to the Fairfield and Newham Grange housing estates it would be necessary to extend from the 11-kV system, and to install two new substations, at a total estimated cost of £8,095 and £9,060 respectively. It was decided to apply to the Electricity Commissioners for the necessary sanction.

Twickenham.—**IMMERSION HEATERS.**—At a meeting of the Corporation Health Committee a marked increase in the consumption of electricity was reported. It was felt that the increase was partly due to the considerable use of immersion water heaters and the Committee decided to make inquiries as to the advisability of supplying a new and more economical type of immersion heater.

Warrington.—**SUPPLY TO NEW WORKS.**—Terms have been arranged by the Electricity Committee with Lamporres for a 1,400-kVA supply to their new works with a consumption of 11,000,000 kWh per annum, subject to the cost of the supply being not less at any time

than independent operation costs plus 2½ per cent, the capital cost of the cables, switchgear, etc., to be paid by the firm.

COAL HANDLING.—The Electricity Committee has obtained sanction to borrow £193,430 for the coal handling scheme.

Watford.—**BAN ON ERECTION OF KIOSKS RELAXED.**—After the Town Planning Committee had refused to allow the Electricity Department to place kiosks in Horseshoe Lane and St. Albans Road the electrical engineer made representations as to the difficulties that would arise if permission were not granted. The Committee has now agreed to sanction the kiosks as a temporary measure only so that electricity may be made available to new housing estates.

Overseas

Egypt.—**ASSUAN DAM SCHEME.**—Egypt plans to widen the Assuan Dam considerably so that it will produce electric power for the neighbouring iron mines. In addition a large power station is to be erected in the northern part of the country which lacks waterfalls. This was announced by the president of the Egyptian Hydro-Electric Commission on his arrival at Stockholm after concluding an inspection tour of Swedish power stations. The president said that an agreement had already been concluded and the first two turbines from Sweden were to be delivered to Egypt in September. When completed the power station at Assuan will develop 350,000 kW.—*Reuter.*

Eire.—**PEAT POWER STATION.**—The construction of the Electricity Supply Board's peat power station at Portarlington, which is expected to be ready for working towards the end of 1948, has now begun. The building contract has been obtained by the Irish Engineering & Harbour Construction Co., Ltd., Dublin. Contracts were previously placed in England for two 12,500-kW turbo-generators, three boilers, transformers and switchgear. The question of building further turf-burning stations is being studied.

START ON RURAL SCHEME.—It is reported that the Electricity Supply Board is starting work shortly, north of Finglas, Co. Dublin, on the first area under the rural electrification scheme. Similar areas of 20 to 25 sq miles in other counties are being examined with a view to a start being made next year.

TRANSPORT

Bournemouth.—**TROLLEY-BUS ROUTE EXTENSIONS.**—The Transport Committee is to make preparations for the extension of trolley-bus routes.

Brighton.—**YEAR'S SURPLUS.**—The Corporation Transport Committee reports a net surplus on the trolley vehicles of £31,499 and on the motor buses of £9,982.

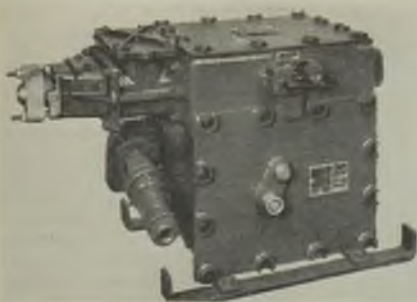
Southend-on-Sea.—**EXTENSION OF TIME.**—The Minister of Transport has made the Southend-on-Sea Corporation (Trolley Vehicles) (Extension of Time) Order, 1946 (S.R. & O. 1946 No. 1220). This extends for three years the time for the operation of trolley vehicles upon the whole of the route authorized by Section 4 of the Corporation's Order of 1934.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Room-Drill-Switch

SINCE the introduction of their flameproof room-switch for coal conveyors in mines, A. REYROLLE & CO., LTD., Hebburn-on-Tyne, have produced a similar room-drill-switch of 1.75 kVA at 615/125 V three-phase for separate



Mining room-drill-switch

single circuits, or for forming part of a multi-panel board controlling conveyor, loader and drill circuits. Within the skid-mounted welded steel main enclosure are two entirely separate flameproof compartments. The upper accommodates three 300-A air-insulated copper busbars, which terminate at each end of the panel in flameproof bushing-type terminals, and a triple-pole air-break reversing isolator capable of breaking full load current and fully interlocked so that it must be in the "off" position before the lower compartment becomes accessible. All connections from the busbar enclosure to the lower compartment are taken through flameproof bushes, which are near the front of the panel to allow easy access.

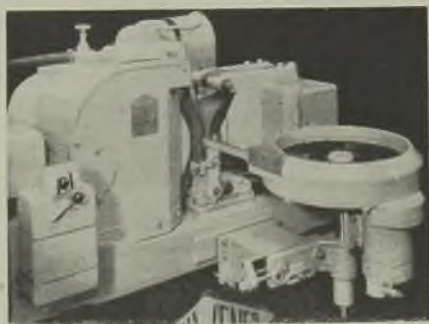
The lower compartment contains a three-phase main transformer of 1.75 kVA and a ratio of 625, 600, 550, 500 or 440 to 125 V; a single-phase auxiliary transformer for the control-circuit with primary taps as for the main transformer and a 25-V secondary; a triple-pole main cartridge fuse-board to protect the primary circuit against short circuits; a triple-pole electrically-operated contactor in the primary circuit, the operating coil acting as an under-voltage release; earth-fault protective equipment for the 125-V circuit and to open and lock out the primary contactor on the occurrence of an earth fault; and a three-pole thermal time-lag over-current relay, which also has an electromagnet action giving instantaneous short-circuit protection, connected in the secondary circuit but arranged to open the primary contactor.

So long as both pilot and earth connections are continuous the operation of the switch on the drill closes the main contactor. The latter can then be opened by the release of the switch on the drill, by the operation of the over-current or earth-fault equipment, by opening the isolator, or by any attempt to disconnect the plugs and sockets connecting the trailing-cable to the panel or machine.

Standard detachable cable boxes may be jointed and compounded, if required, away from the switchgear, which can be added to or removed very quickly.

Grinding Dry Battery Carbons

The productive capacity of a centreless grinding machine upon such work as the finishing of carbon sticks for dry batteries has hitherto been limited to a very considerable extent by the ability of the operator to keep the machine supplied with work. The process is materially speeded up by a new type of automatic feeding hopper recently developed by ARTHUR SCRIVENER, LTD., Tyburn Road, Birmingham; the illustration shows the hopper working in conjunction with a centreless grinder. By means of this combination standard carbon sticks of 6 mm diameter by 54 mm long are



Automatic feeding hopper and centreless grinder for dry battery carbons

ground to a tolerance of 0.001 in. at the rate of 30,000 per hour, which is probably from twelve to fifteen times the rate obtainable by hand.

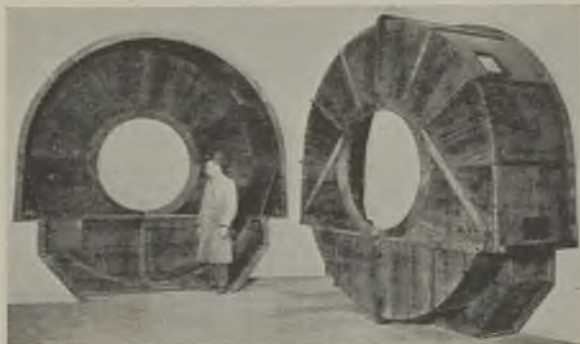
Domestic Appliances

To the range of household appliances offered by BRITISH DIAMIX, LTD., Metrum Works, Beatty Street, Camden Town, London, N.W.1, has been added a "Streamline" clothes iron which is nickel plated or enamelled in various

pastel shades of colour. An improved version of the open type boiling ring, loaded to 750 or 500 W, has a mottled enamel top-plate and coloured base. There is also a double-ring model of similar loading with a switch mounted centrally in the base for separately controlling one of the two elements.

Laminated Insulating Material

As a result of the activities of the research department of the NEW INSULATION CO., LTD., Bristol Road, Gloucester, a number of new uses have been found for "Permali" which is an



Large diameter end cover in fabricated "Permali"

impregnated laminated densified wood with high dielectric and mechanical strength. It is being used for components of transformers, low-voltage distribution and fuse gear, and railway signalling track circuit joints, as well as for high-voltage switchgear.

In electrical machines "Permali" has been used for rotor and stator packing blocks and slip-ring barriers, and the illustration shows an alternator end cover which has been produced. This large-scale fabrication in a non-metallic material eliminates eddy-current losses. The curved panels are moulded to shape in the pressing operation and all joints are completely airtight.

Many of the company's products are a combination of "Permali" with bakelized paper tubes, as for instance such assemblies as busbar spout insulators, through type terminal boards and similar insulators.

Welding Current Control

An automatic method of adjusting welding current from a distance without the operator having to leave his work to attend to the machine is announced by MUREX WELDING PROCESSES, LTD., Waltham Cross, Herts. Additional cables are not needed since adjustment is effected by the short circuiting of the electrode holder to the work.

The device can be fitted to standard a.c./d.c. motor-generator equipment and comprises a small steel box containing relays, electric motor

and mechanism, which is mounted on the end of the cubicle after removing the current control hand wheel. The latter is later fitted to the spindle of the automatic device so that control can also be carried out by hand if desired.

By short circuiting the electrode holder with "earth" the current is reduced. If it is required to increase the current the electrode holder is momentarily short circuited with "earth," broken and immediately short circuited again, which is the equivalent of a "dash" for lowering and a "dot" and "dash" for raising current.

Reflector Fires

The range of movable radiant fires being manufactured by FERRANTI, LTD., Hollinwood, Lancs, includes the "Minera" models with loadings of 750 W, and 1, 1.5 and 2 kW, which are made in two sizes embodying 10 and 14 in. elements. A useful feature is that they can be adjusted to any angle by means of spring feet. The reflector is made of polished chromium, but a "Solium" alternative is expected in the near future. The 2-kW "Corona" is a decorative type intended to be set into the opening of a tiled surround.

A flame coloured glow from the base floods the whole reflector and surround; it can be switched on independently of the heating element. Although designed in 1939, this model is not yet being made in bulk, but will soon become available fitted with chromium oxy-silver and "Solium" oxy-copper reflectors in addition to the new "Ambronze" finish.

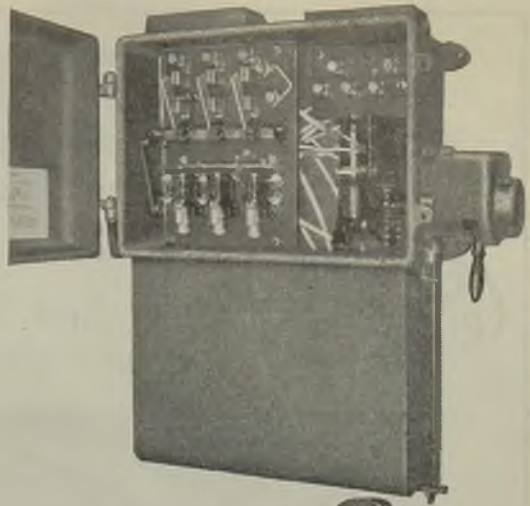
Wash Boiler

The sole Midlands distributors of the "Verona" wash boiler for home laundry purposes are FRANK WESTERMAN (WHOLESALE) LTD., 94, Dale End, Birmingham, 4. The tinned copper interior tank is of 10 gallons capacity, loaded to 3 kW; two switches recessed into the right-hand side provide three-heat control while the draw-off tap is semi-recessed. The square body of the wash boiler, galvanized steel or vitreous enamelled, is 30 in. high. The aluminium top, 19½ in. square, is fitted with a hinged lid which is recessed to form a flat top.



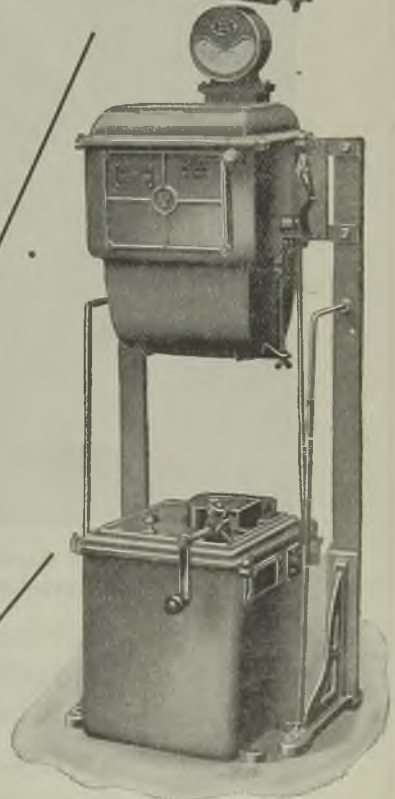
Three-heat clothes wash boiler

*control
for
slip-ring
motors
from*



Oil immersed combined rotor
and stator starter with or
without isolator up to 90 H.P.
400/440 V.

Oil immersed rotor and
stator control panel for
motors up to 250 H.P.
400/440 V.



WORKS: ASTON, BIRMINGHAM 6

Sales Headquarters: BRETENHAM HOUSE, LANCASTER PLACE, W.C.2

BURDETTE

STONHOUSE WORKS CLAPHAM
LONDON S.W.4



DAY and NIGHT
FOR RELIABLE SERVICE

MACaulay
4555



STATOR OF AUTO-SYNCHRONOUS MOTOR
REWOUND AT OUR WORKS

WE REPAIR · REWIND · REDESIGN A.C. and D.C.
MOTORS · ALTERNATORS · ROTARY CONVERTERS
CONTROLLERS

NOTHING TOO SMALL — NOTHING TOO LARGE

WE COLLECT AND DELIVER

Established over 35 years

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

C. A. Parsons & Co., Ltd.—The annual meeting was held recently when Sir Claude Gibb (chairman and managing director) said that they had always relied on export orders to maintain a steady works load factor. Total orders received last year exceeded £3,000,000 in value, and the export orders received for turbo-alternators were greater in value than home orders for similar equipment. During the year plant had been shipped to Australia, Canada, India, Russia and South Africa, while at home still another 50,000 kW turbo-alternator had been started up at Hams Hall "B," Birmingham, and another 40,000 kW unit at Earley, near Reading. With the falling off in searchlight mirror orders there had been a marked increase in cinematograph mirror inquiries and they had decided to install special plant to cope with the anticipated demand for such mirrors.

They had decided to bring their works up to the necessary maximum efficiency by spending £1,000,000 at Heaton and Walkergate works. The effect of this improved plant would be felt partly during 1946 and would make possible the large output to which they were committed in 1947. Their research staff had been augmented and greatly strengthened. Careful attention had been given to the internal combustion or gas turbine for many years, and the commercial size experimental unit, now under test, was shaping well and teaching their designers a great deal. In association with A. Reyrolle & Co., Ltd., who designed and built the manoeuvring and control gear, Heaton works designed and built the turbo-alternators and large synchronous motors for the turbo-electric propulsion of the four new Canadian Pacific "Beaver" boats.

The Revo Electric Co., Ltd.—In his speech at the recent annual meeting of the company, Mr. B. Silcock (chairman) said that practically the whole of the production area of their factory, formerly occupied by redundant Government plant, was now available for peacetime production. A new building had been erected to augment the housing fittings programme, and other extensions were contemplated in the iron foundry and fittings sections. In addition new plant for specialized production had been installed with mechanical tracks for the assembly of domestic cookers, and the tool room equipped to meet the demands of mass production technique. They were heavily engaged on the production of electric cookers, i.v. switchgear and other products for the national housing programme, and they now had in full production a new consumers' service unit. They also looked forward to increasing demands for their street lighting equipment and their fluorescent lighting equipment.

Aberdare Cables, Ltd.—Expansion of the company's business and its entry into new fields were referred to by Sir George Usher (chairman) at the annual meeting held recently. The subsidiary, Aberdare Cables (Overseas), Ltd., had been voluntarily wound up, and the forma-

tion of Aberdare Cables of South Africa, Ltd., was impending. A site had been acquired at Port Elizabeth and a new factory would shortly be in course of erection. In addition to cables, other electrical devices developed by their subsidiary company, South Wales Switchgear, Ltd., would be manufactured at the Port Elizabeth works.

The volume of business, both for the home and export markets, continued to rise and they were re-establishing their pre-war connections with a number of countries, substantial orders having been received from Finland, Norway and many other countries. During the war a section of the works was engaged on the manufacture of drawn copper wire for the G.P.O. to whom they supplied over 10,000 tons. With the cessation of hostilities they had to find other markets and substantial orders from many territories had been received. The shortage of steel tape for armouring cables, and of lead and other materials hindered the flow of production, and they had many miles of cable partly finished due to the lack of some material or other.

They were now engaged in entering new fields, the factory space for which had been allocated and plant was being installed. The new factory at Blackwood of South Wales Switchgear, Ltd., was in operation and was engaged in the production of wash boilers, electric cookers and immersion heaters. The Treforest factory was fully extended in the manufacture of switchgear and transformers.

Ultra Electric (Holdings), Ltd.—In the course of his speech at the annual meeting held on July 24th Mr. E. E. Rosen (chairman) said that their radio products were on the market again before the end of 1945, and they had continued production at a rate which compared favourably with the rest of the industry. During the war they expanded their activities in the development and production of both radio location and electronic equipment of a specialized technique. It was their intention to continue in this new branch and development work in association with the Government and leading aircraft manufacturers was proceeding. Their electrical and radio communications apparatus was already being fitted in the latest and most up-to-date British civil aircraft in this country and overseas.

The British Vacuum Cleaner & Engineering Co., Ltd., reports a net profit for the year ended September 30th last of £44,752, as compared with £83,954 for 1943-44. The final ordinary dividend is 13½ per cent (against 17½ per cent), making 20 per cent for the year (against 30 per cent).

The London Electric Supply Corporation, Ltd., has declared an interim ordinary dividend of 2 per cent, less tax. No interim dividend was paid last year, the final payment being 3 per cent, together with a further 3 per cent drawn from reserve.

Richardsons, Westgarth & Co., Ltd., report a net profit for the year to March 31st, after providing for tax, of £87,333, as compared

with £62,880 for the preceding year. The ordinary distribution for the year is raised from 8 per cent to 12 per cent by a bonus of 4 per cent.

A. C. Cossor, Ltd., report that the net trading profit for 1945-46 was £225,054, against £335,691 in the preceding year. To this is added £55,000 representing one year's dividend from the Sterling Cable Co.; last year £90,000 (three years' dividend) was received from this source. The net profit was reduced from £179,430 to £129,001. The ordinary dividend is maintained at 12½ per cent free of tax and the balance carried forward is raised by £51,501 to £162,826. Last year £110,000 was written off goodwill.

Pye, Ltd., report net profits of £120,077 for 1945-46, an increase of £4,270, after providing for E.P.T. and deferred repairs. To meet other taxation £65,000 is set aside and £5,000 is put to staff pension fund. No allocation is made to general reserve (£33,766 last year from reserves no longer required in respect of subsidiaries). The 8 per cent. cumulative participating preferred ordinary stock again receives 10 per cent. and the deferred ordinary dividend is maintained at 25 per cent. The balance carried forward is raised from £129,583 to £142,076.

Calcutta Tramways Co., Ltd.—It is reported that the Bengal Government is to introduce a new Bill (in the place of the previous one which has lapsed) to enable the Calcutta Corporation to raise a loan for the acquisition of the company's undertaking.

Gabriel, Wade & English, Ltd., are maintaining their dividend at 10 per cent (including 4 per cent bonus). The net profit was £99,341 (against £94,701).

The City of London Electric Lighting Co., Ltd., is again paying an interim ordinary dividend of 2½ per cent.

New Companies

London Electric Firm, Ltd.—Private company. Registered July 24th. Capital, £50,005. Objects: To acquire the business carried on as the London Electric Firm and to carry on the business of manufacturers of, and dealers in, searchlight projectors, floodlights, spotlights, headlights, etc. Directors: Elsie V. Hughes, 99, Purley Downs Road, Purley, Surrey; and Gwen S. Smith, 97, Eyre Court, St. John's Wood, N.W. Registered office: Brighton Road, South Croydon.

Ariel Electric Co., Ltd.—Private company. Registered July 11th. Capital, £100. Objects: To carry on business as indicated by the title. Directors: D. Singer and Mrs. Daphne Singer, both of 57, Queen's Drive, N.4. Secretary: H. Whitaker. Registered office: 11 Argyll Street, W.1.

Fluorescent Lighting Equipment Co., Ltd.—Private company. Registered July 23rd. Capital, £100. Objects: To carry on the business of manufacturers and repairers of, and dealers in, fluorescent lighting equipment, electric and quartz lamps, reflectors, etc. Registered office: 168, Victoria Street, S.W.1.

Baker & Hadgkiss, Ltd.—Private company. Registered June 28th. Capital, £500. Objects: To acquire the business of an electrical, radio and mechanical engineer and electrical con-

tractor carried on by Albert Baker at Malcolm Road, Shirley, Warwickshire. Directors: A. Baker, 43, Malcolm Road, Shirley, Warwickshire, and C. L. Hadgkiss, 39, Malcolm Road, Shirley. Registered office: 159, York Road, Hall Green, Birmingham.

P. A. Ridgers, Ltd.—Private company. Registered July 5th. Capital, £5,000. Objects: To acquire the business of electrical and radio engineering carried on by P. A. Ridgers at Electric House, Bracknell, Berks. P. A. Ridgers, Chaddlesworth, Church Road, Bracknell, is permanent governing director. Secretary: Mrs. Florence E. Ridgers. Registered office: Electric House, High Street, Bracknell.

Dawn Electric Construction Co., Ltd.—Private company. Registered July 4th. Capital, £1,000. Objects: To carry on the business of electricians, mechanical engineers, etc. Solicitors: Lipton & Jefferies, Princess House, 39, Jermyn Street, S.W.1.

Press & Head (Electrical Contractors), Ltd.—Private company. Registered June 27th. Capital, £100. Objects: To carry on business as indicated by the title. Directors: C. E. Press, 18, Highbury Place, Ely, Cardiff, and three others. Registered office: 15, Dumfries Place, Cardiff.

Permelectric, Ltd.—Private company. Registered June 28th. Capital, £500. Objects: To carry on business as electrical manufacturing and mechanical engineers, etc. Directors: C. V. Stead, 8, Grove Street, Didsbury, Manchester, and two others. Secretary: W. M. Ashton. Registered office: 8, Grove Street, Didsbury, Manchester, 20.

B. French (Eire), Ltd.—Private company. Registered in Dublin June 26th. Capital, £4,500. Objects: To carry on the business of electricians and electrical contractors, electrical, mechanical and general engineers, etc. B. French, of Kidderminster, is the first director.

Standard Electric Co., Ltd.—Private company. Registered June 28th. Capital, £2,000. Objects: To acquire the business of a dealer in electrical equipment carried on by John M. Beaumont at Standard Buildings, Huddersfield, as Standard Electric Company. Secretary: Ida Maynard.

Epsom Electrical Equipment Co., Ltd.—Private company. Registered June 24th. Capital, £2,000. Objects: To carry on the business of electricians, etc. Directors: T. A. Purdom, 146, Stonecot Hill, Sutton, Surrey, and two others. Registered office: 66, Buttesland Street, N.1.

Liquidations

United Electric Tramways Co. of Caracas, Ltd.—Winding up voluntarily. Liquidator, Mr. J. D. Barber, 117, Old Broad Street, London, E.C.2.

Bankruptcies

A. W. Schofield and D. Tanner, formerly trading together in co-partnership at 673, Manchester Road, Denton, under the style of Schofield & Tanner, electrical and radio engineers.—Supplemental dividend of 4s. 6½d. in the £ payable August 23rd at the Official Receiver's Office, 20, Byrom Street, Manchester.

STOCKS AND SHARES

STOCK EXCHANGE markets are dull and prices somewhat depressed. Cessation of buying on the one hand, and a mild selling pressure on the other, are the chief, if humdrum, explanations for a fairly general decline in prices. Holiday influences and the conflicting currents that have appeared at the Peace Conference are factors in the situation, to which must be added the competition, already mentioned here, of new issues. Business has fallen off to a considerable extent. The award made to the coal companies caused an improvement in their share quotations.

The Central Electricity Board has obtained a Special Order authorizing it to raise another £30 million, mainly for extension work. The money will be spent by degrees, of course, and as opportunity offers. Its expenditure will give much employment to companies engaged in the type of work required by the Central Board, but the programme is at present too nebulous for share prices to be affected.

Cables and Transport

Cable & Wireless ordinary at 109½ is 4 points and the preference at 111½ is 2 points lower on the failure—so far—of the opposition to defeat the Bill for the nationalization of the operating company. The chairman told the House of Lords Select Committee that the future policy of the holding company had received no consideration whatever, the board having been "wholly engaged on dealing with the situation at present before us."

Globe Telegraph ordinary are 1s. 6d. down at 42s. 6d. British Electric Traction deferred has fallen 20 points, to 110s, and the 8 per cent preferred 4, to 178, on nationalization possibilities. Thomas Tilling are easier at 52s. and Home Railway stocks, allowing for ex-dividend markings, are also lower, Transport "C" at 56½ and Southern 5 per cent preferred at 69½. The Indian disturbances led to a drop of 5s. to 70s. in Calcutta Trams, and of 4s. to £3 in Calcutta Electrics. Madras Electrics at 40s. are down a florin and Cawnpore Electrics 3s. to 56s. 3d.

Radio Shares

In a weak radio share market, A. C. Cossor have declined further to 35s. since the declaration of the final dividend and bonus, which again bring the total for the year up to 12½ per cent tax-free. The price is ex-dividend and ex rights to the new shares, which are changing hands at 1s. 6d. premium. Profits for the year ended last March are down, according to the preliminary statement, from £179,000 to £129,000, but the former figure included three years' dividends from the Sterling Cables interest, against one for the last period. Decca 1s. shares have moved against the tide with a pronounced recovery to 3½; later, the price relapsed to 58s. 9d. Rumour credits the

company with the intention of writing up its capital to a figure more in keeping with the assets and earnings position, if and when the ban on such transactions is relaxed. E.M.I. are easier at 32s. 6d.

Fluctuations in Prices

Home electricity supply shares have held their ground with conspicuous firmness. County of London are better at 42s. 6d. and Newcastle Electrics gained 1s. at 31s. Southern Areas went back to 21s. 9d. The equipment and manufacturing list shows a good many falls. Amongst others are British Insulated 45s. 6d., Associated British Engineering 55s., Brush 10s. 6d., Revo 54s. 6d., Ever Ready 47s., Cromptons 32s. 6d., De la Rue 12, and Walsall Conduits 57s. Thorn Electrics are 30s. ex rights. Hopkinsons are ½ up at 5½ and Heatrae hardened to 8s. H. J. Baldwins recovered to 12s. 9d. British Vacuum Cleaner fell 2s. 6d. to 25s. on reduction of the dividend from 30 to 20 per cent.

Company Meetings

In the dull state of markets, General Electrics have slipped back to 98s. 9d. This is 11s. 3d. below the recent best, and brings the yield on the last dividend to £3 11s. per cent. Sir Harry Railing's address at the annual meeting left impressions of the financial strength of the undertaking, the breadth of the business, the great present demand for the products and the difficulty of supplying it because of shortages in men and materials. On the subject of nationalization, the chairman urged that the practical matter of production should have first consideration. The report of the Chloride Electrical Storage annual meeting gives another indication that shortage of materials is among the chief obstacles to a large expansion of production in the electrical equipment field. At the Revo Electric meeting, the chairman stressed the fact that the present seller's market would not last indefinitely.

New Capital

British Thermostat has announced a proposal to double the present authorized capital of £150,000 and to offer 100,000 new 4½ per cent preference shares to ordinary shareholders at 21s. in the ratio of one for every six ordinary held. British Rola directors have cleared up a misapprehension about the respective dividend rights of the old and the newly-issued ordinary shares. No dividend, other than the 15 per cent already declared, will be recommended for the year ended in March. As soon as the old shares are quoted ex-dividend, the new will rank equally with them for all dividends to come. New shares recently issued at 27s. 6d. by Thorn Electrical Industries are quoted at 1s. 3d. premium. The new English Electric 3½ per cent preference, offered at 20s. and promptly subscribed, were quoted at 1s. premium on the opening of the market in them.

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.

A. K. T.-GES. Brown, Boveri & Cie.—**A.** "Protective device for ball and roller bearings." 13338/45. May 26th, 1944. (578989.)
G. B. Banks and N. Levin.—"Electric tuned oscillatory-circuit devices." 6280. May 8th, 1942. (578877.)

British Insulated Cables, Ltd., and J. F. Cowen.—"Resinous lacquers or enamels and products therefrom." 13963/43. January 8th, 1942. (Divided from 576384.) (578882.)

British Insulated Cables, Ltd., R. Blackburn and C. H. M. Thorpe.—"Terminal connectors for electric cables." 14441. July 28th, 1944. (578938.)

British Thomson-Houston Co., Ltd., and T. H. Kinman.—"Circuit arrangements for use at ultra high frequencies." 51. January 1st, 1942. (578876.)

British Thomson-Houston Co., Ltd., and H. W. C. Liddiard.—"Protection of synchronous electric motors." 22325. November 13th, 1944. (579026.)

British Thomson-Houston Co., Ltd., and K. J. R. Wilkinson.—"System of charging pulse shaping networks." 15797. December 8th, 1941. (578875.)

British Thomson-Houston Co., Ltd., L. J. Davies and H. K. Bourne.—"Signalling apparatus." 16409. June 1st, 1938. (579034.)
"Electric lamp signalling apparatus." 30148. October 18th, 1938. (579038.)

British Thomson-Houston Co., Ltd., H. K. Bourne, L. J. Davies and H. R. Ruff.—"Shutters for signalling and like lamps." 35586. December 6th, 1938. (579039.)

Callender's Cable & Construction Co., Ltd., L. G. Brazier and D. T. Hollingsworth.—"Sealing ends for high voltage electric cables." 15410. August 12th, 1944. (578902.)

Callender's Cable & Construction Co., Ltd., L. G. Brazier, R. M. Fairfield and D. T. Hollingsworth.—"Electric cables." 14380. July 27th, 1944. (579018.)

Eaton Manufacturing Co.—"Thermoelectric generators." 5415/44. April 22nd, 1943. (578923.)

Evershed & Vignoles, Ltd., and W. T. Marchment.—"Electrical control systems for aircraft." 4925. March 16th, 1944. (578970.)

Ferranti, Ltd., and H. Easton.—"Electric rotary switches." 24732. December 9th, 1944. (579028.)

General Electric Co., Ltd., and A. Bloch.—"Tracking arrangements for electrical circuits of variable resonance." 14899. October 23rd, 1942. (578960.)

General Electric Co., Ltd., and D. C. Espley.—"Electrical apparatus adapted to operate at very high frequencies." 10860. August 26th, 1941. (578911.)

General Electric Co., Ltd., and E. Friedlander.—"Generators of large pulses of electric current." 13317. July 12th, 1944. (578901.)

General Electric Co., Ltd., and R. M.

Pitcher.—"Manufacture of air-cooled vapour electric arc converters." 7182. June 6th, 1941. (579049.)

General Electric Co., Ltd., and R. S. Rivlin.—"Mounting of piezo-electric crystals." 13925. October 29th, 1941. (578955.)

General Electric Co., Ltd., and J. W. Ryde.—"Wireless receiving apparatus." 16833. November 23rd, 1940. (578952.)

H. W. Hastings-Hodgkins and Kinetours, Ltd.—"System for the electrical transmission of correspondence control and torque." 10523. June 29th, 1943. (579056.)

International Combustion, Ltd., and W. F. Harlow.—"Steam boiler plants and other heat exchange apparatus." 11788. June 21st, 1944. (Addition to 566108.) (578935.)

J. Lucas, Ltd., E. A. Watson and C. E. Robinson.—"Dynamo-electric machines." 11223. June 12th, 1944. (578934.)

H. Newsam and Metropolitan-Vickers Electrical Co., Ltd.—"Control systems for power-driven apparatus." 13417. October 17th, 1941. (579050.)

E. P. Newton (Baker & Co., Inc., and American Platinum Works).—"Electrical contacts." 12961. July 6th, 1944. (578936.)

J. H. Runbaken.—"Electrical testing instrument." 862. January 10th, 1945. (579065.)

Siemens Bros. & Co., Ltd., and D. P. Long.—"Automatic telephone systems." 30. January 1st, 1945. (578984.)

Sperry Gyroscope Co., Inc.—"Radio apparatus for measuring distance and direction." 3265/41. March 8th, 1940. (578953.)

Standard Telephones & Cables, Ltd.—"Selection controlling circuits." 6902/44. May 6th, 1943. (579010.) "Selection controlling circuits." 7236/44. May 6th, 1943. (Addition to 579010.) (579011.) "High frequency oscillators." 19668/43. October 8th, 1942. (579062.)

Standard Telephones & Cables, Ltd., and A. A. New.—"Electric insulating materials." Cognate applications 9206/42 and 10153/42. July 3rd, 1942. (578915.)

Standard Telephones & Cables, Ltd., C. W. Earp, I. R. J. James and R. F. Cleaver.—"Radio direction finding equipments." 2538. February 9th, 1940. (579042.)

Walsall Conduits, Ltd., and E. Gough.—"Electric plug-and-socket connectors." 24780/45. February 21st, 1945. (Divided out of 575705.) (578949.)

Wandsworth Electrical Manufacturing Co., Ltd., and T. Batchelor.—"Electric plug connectors." 15699. August 17th, 1944. (579019.)

Waymouth Gauges and Instruments, Ltd., and H. Waymouth.—"Electrical condensers for liquid volume indicators." Cognate applications 21867/43 and 2600/44. December 30th, 1943. (578886.)

M. P. Winther.—"Cooling of eddy-current apparatus." 13546/42. April 13th, 1942. (579053.)

W. A. Woodeson, H. L. Thomas and Clarke, Chapman & Co., Ltd.—"Searchlights and light beacons." 2987. December 13th, 1938. (579030.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

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

Adwick-le-Street.—August 23rd. Electricity Department. Cables, switchgear and transformers. (August 2nd.)

Australia.—October 17th. 15,000-kW steam turbine and accessories. Spec. 412 (£22 first copy, others 10s. 6d.). H. Baskerville, City Electric Light Co., Ltd., Boundary Street, Brisbane. (Tenders).

Bury.—August 16th. Borough Council. Electricity meters for one year. (August 2nd.)

Devizes.—August 19th. Rural District Council. Electric lighting installation at Browfort House. P. R. Trapp, clerk, Maryport Chambers.

Lerwick.—August 14th. Town Council. Electrical work for 82 houses to be erected at various sites. Alex. A. Foote, architect, 9, York Place, Edinburgh, 1.

Manchester.—August 22nd. Electricity Department. Pipework, supports, valves, and four motor driven pumps for Stuart Street power station. Two 10,000-kVA transformers for Sale substation. (July 26th.)

August 23rd. Public Health Department. Electric pumps. (July 26th.)

August 14th. Town Council. Supply and erection of one 10-cwt passenger lift at the Central Library (deposit, £1 1s.). City architect, Town Hall.

Morecambe and Heysham.—August 12th. Borough Council. Three 750-kVA transformers. (August 2nd.)

Oldham.—August 31st. Electricity Department. Cable, earthenware ducts and cable covers. (August 2nd.)

Portsmouth.—August 19th. City Council. Steel poles and fluorescent industrial type fittings. (See this issue.)

Stoke Newington.—August 27th. Borough Council. Conversion of radio apparatus on consumers' premises to d.c. (See this issue.)

Stoke-on-Trent.—August 15th. Town Council. Electric lamps for the six months ending March 31st, 1947. City surveyor, Town Hall.

Wilton.—August 31st. Town Council. Public lighting installation. Borough surveyor, Municipal Offices, Fugglestone House.

Yeovil.—August 22nd. Borough Council. Poles and electrical equipment in connection with trunk road lighting. (July 26th.)

Orders Placed

Bradford.—Electricity Committee. Accepted. Air conditioning plant, Valley power station offices (£1,462).—Davidson & Co. 33-kV switchgear, Dudley Hill and Four Lane Ends.—Met-Vick. 10,000-kVA transformer, Dudley Hill.—C. A. Parsons. 7,500-kVA transformer, Four Lane Ends.—English Electric.

Middlesex.—Health Committee. Recommended. Electrically heated food trolleys (£1,725).—Food Conveyors, Ltd.

St. Pancras.—Libraries Committee. Accepted. Sound film apparatus (£188).—B.T.H. Co.

Electricity Committee. Cables for three years.—Metropolitan Elec. Cable & Constrn. Co.; Standard Telephones & Cables. Switchboard (£3,899).—A. Reyrolle & Co. Polyphase testing equipment: excluding N.P.L. test of instruments and current transformers, estimated at £93).—Foster Transformers & Switchgear.

Salford.—Light, Heat and Power Committee. Accepted. Electric vehicle (£329).—Crompton Parkinson.

Transport Committee. Accepted. Electrically operated shutter gates at depot (£919).—Bolton Gate Co.

Southwark.—Electricity Committee. Recommended. Switchgear (£2,163) and erection (£151).—G.E.C.

Todmorden.—Electricity Committee. Accepted. 600-kVA transformer (£500).—Yorkshire Electric Transformer Co.

Twickenham.—Housing Committee. Accepted. Electrical installation at Milton House (£153).—R. Langston Jones & Co.

Contracts in Prospect

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

Alnwick.—Houses (34), for the R.D.C.; J. G. Green & Son, builders, Warkworth.

Bangor.—Permanent houses (140), Coed Mawr housing estate; borough surveyor, Town Hall.

Bath.—Houses (42), at Whitechurch, near Bristol for Bathavon R.D.C.; Grayson and Goldsmith, Council's architects, 7, Bridge Street.

Bexley.—Three-storey flats (138), "John Newton" Court, High Street, Welling, and an office block; G. A. Joy, borough engineer and surveyor, Council Offices, Bexleyheath.

Bilston (Staffs.).—Permanent houses (66), Stowlawn estate, section C; borough architect, 20, Wellington Road.

Birkenhead.—Gymnasium and dining room; B. Robinson, borough surveyor, Town Hall.

Birmingham.—Houses (128), The Grove estate, Harborne; H. J. Manzoni, engineer and surveyor, Council House.

Houses (124), Chestnut estate (£134,817); J. Simms, Sons & Cooke, Ltd., builders, Haydn Road, Sherwood, Nottingham.

Boldon (Co. Durham).—Houses (14), Burnham Grove; E. S. Westcott, builder, Rudland Terrace, Sunderland.

Bolton.—Nursery School, Mere Hall; C. Herbert, borough surveyor, Town Hall.

Bullington.—Houses (36), at Littlemore, Ewelme, Stanton St. John and Holton for R.D.C.; H. W. Smith, Council's architect, 29, George Street, Oxford.

Bury.—Flats (16), and 34 bungalows, Huntley Mount estate; J. Chadwick, borough surveyor, Municipal Offices, 28, Bank Street.

Coventry.—Houses (136), Monks Park estate (£139,220); city engineer.

Crook and Willington.—Houses (50), at Willington for the U.D.C.; R. G. Finlay, builder, West Sunnyside, Sunderland.

Crosby (Lancs.).—Houses (24), Church Road housing site, Seaforth; J. R. Fothergill, borough engineer and surveyor, Town Hall, Waterloo, Liverpool, 22.

Dagenham.—Houses (44), Dagenham Road estate; borough engineer, Civic Centre.

Deptford.—Prefabricated Council offices, New Cross Road (£11,410); Greenaway & Son.

Durham.—Houses (68), at Belmont; R.D.C. surveyor, Byland Lodge.

Glasgow.—Houses (60), Cowden Street housing scheme; Town Clerk's Office.

Gosforth.—Permanent houses (100), in Broadway; Cussins (Contractors), Ltd., Jesmond, Newcastle.

Hackney.—Primary school and small nursery school, King's Mead estate; L.C.C. architect.

Hexham-on-Tyne.—Electric lighting installations, Abbeygate House, for Ministry of Labour; O. R. Porteous & Co.

Hull.—Offices, workshops and stores, Anlaby Road and Wilberforce Street; Globe & Simpson.

Jarrow.—Municipal restaurant; borough engineer.

Ludlow.—Houses (24), at Cleobury Mortimer; J. Brian Cooper, architect, 177, Corporation Street, Birmingham.

Manchester.—Flats (138), Ardwick (£180,382); city architect.

Shops and flats (20), Baguley Hall estate (£88,350); city architect.

Middleton.—School buildings, Durnford Street; W. Fearnley & Son (Salford), Ltd., builders, Clarence Works, Eccles New Road.

Moffat.—Houses (24), for Town Council; town clerk.

Newcastle-on-Tyne.—Houses (24), Beaufront Gardens; 50 houses, Harnham Gardens; 36 houses, Acomb Gardens; Dryden & Shaw, 6, Market Street.

Works extensions, Pressed Steel Co., Elswick Road, Newcastle; C. Solomon, 187, Osborne Road.

Northampton.—Houses (96), Delapre estate (£115,200); T. Wilson & Sons, Ltd., builders, 65, Sheep Street.

Nottingham.—Partial completion, County Hall and offices (£40,000); county architect.

Oswestry (Salop).—Houses (102), Shrewsbury Road site; S. Fox-Davies, architect, Memorial Hall.

Penrith.—Houses (80), Scaw housing site; R. E. Reay, builder, Wilson Row.

Rochdale.—Branch library (£5,100) for Libraries Committee; S. H. Morgan, borough surveyor, Town Hall.

Rochford.—Houses (24), The Drive; A. N. Box, surveyor, Council Offices.

Sevenoaks.—Houses (12), Bough Beech and Four Elms; engineer and surveyor, Inglewood, Oak Hill Road.

Sherborne (Dorset).—Houses (26), for U.D.C.; P. O. Clark, deputy surveyor, Council Offices, South Street.

South Shields.—Houses (50), Marsden Road; G. Bailey, Ltd., builders, King Street.

Houses (56), for aged people, Quarry Lane; borough engineer.

Southwark.—Dwellings (71), St. Agnes Place area; borough engineer.

Stockton-on-Tees.—Additions to Egglecliffe Foundry for Head, Wrightson & Co., Ltd. (£160,000); direct labour.

Sunderland.—Houses (372), Thorney Close estate; borough engineer, Athenæum Buildings, 27, Fawcett Street.

Additions, Royal Infirmary; J. Huntley & Son, builders, Marion Street.

Thorne.—Houses (40), Lands End Road housing site; Johnson & Crabtree, architects, 20, Priory Place, Doncaster.

Thurrock.—Houses (40), and eight bungalows, Hall Road site, Aveley; G. F. Andrassy, engineer and surveyor, Council Offices, Whitehall Lane, Grays.

Upholland (Lancs.).—Permanent houses (100), Hall Green estate; Gornall and Wainwright, chartered architects, 8, Hardshaw Street, St. Helens.

Winlaton (Co. Durham).—Houses (100), for Blaydon U.D.C.; Stephen Easten, Ltd., Westgate Grange, Newcastle-on-Tyne.

Technical Information

Need for Comprehensive Service

THE outcome of the recent Royal Society Empire Scientific Conference has been the preparation by Dr. B. J. A. Bard, secretary, Industrial Research Committee of the Federation of British Industries, of a memorandum on the dissemination of scientific and technical information to industry in the United Kingdom and the British Commonwealth. It deals with the primary sources of new knowledge, the accumulation of working data within industrial establishments and the links (which form too long a chain) between the supply, absorption and application of fresh information.

No organization in Great Britain covers the whole field and, moreover, the very numerous journals and other publications as well as the compilation of abstracts and bibliographies, being for the most part not co-ordinated, frequently overlap one another. There is much room for improvement and rationalization in these respects, particularly in engineering spheres.

Dr. Bard thinks there is scope for a comprehensive national technical information service to link (loosely) the various existing organizations, thus providing a recognized channel through which the seeker after information can speedily get into touch with whichever constituent can best cater for his needs. Dr. Bard's ideas on how information should flow is set out in diagrammatic form and fully explained in his memorandum.



FAMOUS HYDRO-ELECTRIC STATIONS.


The Wheeler Dam is the first of the main river dams on the Tennessee River. It is nearly $1\frac{1}{4}$ miles long, 72 ft. high and is of gravity concrete structure. Altogether 700,000 barrels of cement and 700,500 cubic yards of aggregate were used in its construction. This colossal dam has an output of 348,060 h.p.



MEASUREMENT LIMITED

Electricity and Water Meters of Quality

TERMINAL HOUSE, LOWER BELGRAVE STREET, LONDON, S.W.1



A new era of brightness in the home, office and factory! Brightness, cheerfulness, cleanliness, fresh air, good health and good lighting are the order of the day. Good lighting is a tonic—especially with Osram!

GOOD LIGHTING IS A TONIC

ESPECIALLY WITH OSRAM



Osram
THE WONDERFUL LAMP

A G.E.C. PRODUCT

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. 7 words) per insertion; **ONLY OFFICIAL AND GOVERNMENT ANNOUNCEMENTS CAN NOW BE DISPLAYED**—30/- per inch. Where the advertisement includes a Box Number this counts as six words and there is an additional charge of 6d. for postage of replies.

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

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES, TENDERS, ETC.

CITY OF PORTSMOUTH

TENDERS are invited for the supply and delivery of the following: (1) 100 Steel Poles for public lighting and 50 Light Traction Type Steel Poles; (2) 12 Fluorescent Industrial Type Fittings, complete with Tubes.

Forms of tender may be obtained upon application to the Contracts and Supplies Section, City Treasurer's Dept., 48-51, Clarence Parade, Southsea, and tenders must be delivered to the undersigned in the envelope provided not later than 10 a.m. on Monday, 19th August, 1946. The envelope must not bear any name or mark indicating the sender.

V. BLANCHARD

City Council Chambers, Town Clerk.
1, Clarence Parade, Southsea, 2024

METROPOLITAN BOROUGH OF STOKE NEWINGTON

TENDERS are invited for the conversion to A.C. of D.C. wireless apparatus on consumers' premises in the Metropolitan Borough of Stoke Newington as the Council proceeds with the change of its D.C. system to A.C.

Tender forms and specification can be obtained from the Borough Electrical Engineer, Electricity Department, Edwards Lane, Stoke Newington, N.16. Tenders must be delivered not later than Tuesday, 27th August, 1946, to the undersigned.

C. KENT WRIGHT,

Town Hall, Town Clerk.
Stoke Newington Church St., N.16. 2019

SITUATIONS VACANT

COUNTY BOROUGH OF EASTBOURNE ELECTRICITY DEPARTMENT

Appointment of an Assistant Consumers' Engineer

APPLICATIONS are invited for the above position, with salary and conditions of employment in accordance with the N.J.B. Agreement, Class G, Grade 8b, at present £408 per annum.

Applicants should have had a sound technical and practical training in electrical engineering and be experienced in the preparation of specifications and estimates for all classes of wiring installations, and in the supervision of such work. Experience in the supervision of testing, inspecting and connecting consumers' installations, including meter fixing, is necessary. A thorough knowledge of the Regulations of the Home Office, the Electricity Commissioners and the Institution of Electrical Engineers is essential. Some experience of hiring schemes, maintenance of domestic appliances, development of load and change-over work is desirable.

Candidates must be at least Graduate Members of the Institution of Electrical Engineers, or possess equivalent qualifications. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination. Forms of application may be obtained from the undersigned. They should be completed in the candidate's own handwriting and returned in a plain sealed envelope, endorsed "Assistant Consumers' Engineer," so as to be received not later than Monday, 2nd September, 1946.

N. BOYDELL, M.I.E.E., A.M.I.Mech.E.,
Borough Electrical Engineer

Electric House, Grove Rd., Eastbourne, and Manager
July, 1946. 1907

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.

BOROUGH OF MAIDENHEAD ELECTRICITY DEPT.

Appointment of Lady Demonstrator

APPLICATIONS are invited for the above appointment at a salary of £252 per annum, rising by annual increments of £12 to £288 per annum, plus cost of living bonus, at present £48 2s. The salary will be subject to adjustment to conform with any National Scale which may be introduced at a later date.

Candidates must have had a good general education and hold a recognised Diploma in Domestic Science and/or the E.A.W. Electrical House-craft Diploma. They must be competent to arrange and conduct lectures, demonstrations and exhibitions, and to advise consumers on the selection and use of electrical appliances of all types.

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

Applications, stating age, qualifications and full details of experience, accompanied by copies of not more than two recent testimonials, should be addressed to the undersigned not later than 24th August, 1946.

J. D. MARKLAND,

Electricity Department, Borough Electrical Engineer.
Braywick Road, Maidenhead. 1939

COUNTY BOROUGH OF BARNSELY ELECTRICITY DEPARTMENT

Mains Engineer

APPLICATIONS are invited for the position of Mains Engineer, with charge of substations, in accordance with the National Joint Board Schedule of Salaries and Conditions, Grade 3, Class F, commencing £640 per annum. A car allowance on a mileage basis is paid. Corporate membership of the Institution of Electrical Engineers, or equivalent, is considered a desirable qualification.

The appointment will be conditional upon the successful applicant passing a medical examination for purposes of the Local Government Superannuation Act, 1937.

Applications, stating age, details of education, training and experience, accompanied by copies of three testimonials, should be delivered to the Borough Electrical Engineer and Manager, Queens Road, Barnsley, endorsed "Mains Engineer," by Monday, 26th August, 1946.

A. E. GILFILLAN,

Town Hall, Barnsley, Town Clerk.
31st July, 1946. 2009

SWITCHBOARD ATTENDANTS

APPLICATIONS are invited for the position of Switchboard Attendant at the Nelson, Corporation Power Station. This station is a "selected" station running in parallel with the C.E.B. system. Preference will be given to applicants who have had experience in parallel running with the C.E.B. Applicants should have had a recognised training and experience in similar duties. Salary in accordance with National Joint Board Schedule, Class F. Apply, stating age, training, experience and present position, not later than Wednesday, 14th August, 1946, to T. Dawson Martin, A.M.I.E.E., Borough Electrical Engineer and Manager, Electricity Works, Charles Street, Nelson, Lancs. 2014

CITY OF NOTTINGHAM

Appointment of Chief Engineer and General Manager,
Electricity Undertaking

THE Nottingham City Council invite applications from qualified Electrical Engineers for the position of Chief Engineer and Manager of their Undertaking at a salary of £2,250 per annum.

Applicants must be Members or Associate Members of the Institution of Electrical Engineers. The person appointed will be responsible to the Electricity Committee and the City Council for the control and management of the Undertaking, and he will be required to devote his whole time to the duties of the office, and will not be allowed to engage, either directly or indirectly, in private work of any kind. He will be expected to have, in addition to high technical qualifications, a considerable capacity for business, and to show proof of an enterprising disposition. 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. He must live within the City.

Applications, stating age, previous experience and present position, and accompanied by not more than three recent testimonials, and endorsed "Chief Engineer and General Manager, Electricity Department," to be delivered to me not later than Saturday, the 14th day of September, 1946. Canvassing members of the Council, either directly or indirectly, will be an absolute disqualification.

J. E. RICHARDS.

Guildhall, Nottingham.
23rd July, 1946.Town Clerk.
1901TRINIDAD & TOBAGO ELECTRICITY COMMISSION,
TRINIDAD, B.W.I.

APPLICATIONS are invited for the post of Shift Engineer at the Commission's Power Station in Port-of-Spain, which contains 15,000-kW of steam-driven and Diesel-driven generating plant. Applicants must be qualified mechanics, not more than 35 years of age, who have served an apprenticeship of at least four years in a recognised workshop and have had subsequent experience in the operation of steam plant, preferably with high pressure boilers and steam turbines. Applicants must be capable of taking charge of a Shift in the Commission's Power Station above-mentioned.

The commencing basic salary will be in the scale \$1,920.00 (£400) per annum, increasing by increments of \$120.00 (£25) per annum to \$2,880.00 (£600) per annum according to qualifications and experience, and having an efficiency bar at \$2,400.00 (£500) per annum. In addition to the basic salary there is a temporary cost of living bonus amounting to between \$25.00 and \$30.00 per month.

Applicants must submit copies in the first instance of at least three testimonials. The selected candidate must pass a medical examination by the Commission's Medical Adviser for fitness to be admitted to the Commission's service and must enter into a three-years' contract with the Commission.

Applications must reach the undersigned not later than 12 noon on the 2nd September, 1946, and must be endorsed on the upper left-hand corner of the envelope "Shift Engineer, Trinidad."—Preece, Cardew & Rider, 8, Queen Anne's Gate, Westminster, S.W.1. 1974

COUNTY BOROUGH OF HUDDERSFIELD
ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the position of Mains (Substations) Assistant on the staff of the Mains Department in accordance with the National Joint Board Schedule.

Candidates must have had experience in the design, erection, maintenance and operation of E.H.T. and L.T. O/H and U/G cables and static substations and protective systems, and be Graduates or Corporate Members of the Institution of Electrical Engineers.

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

The present grade is 8B/1, Class G. £408-£422. (It is anticipated the undertaking will be raised shortly to Class H.)

Applications endorsed "Mains (Substation) Assistant," should give age, education, details of training and experience and technical qualifications, and be accompanied by copies of recent testimonials, and should be addressed to the undersigned not later than Monday, August 19th, 1946.

F. A. ELLIS, M.I.Mech.E., M.I.E.E., M.Inst.F.,
Market Street, Huddersfield. Borough Electrical Engineer and Manager. 1945

CITY AND COUNTY OF THE CITY OF CHESTER

Appointment of Electrical Engineer and Manager

APPLICATIONS are invited for the appointment of Engineer and Manager of the Council's Electricity Undertaking from persons experienced in the management and administration of such an undertaking.

The salary will be in accordance with the Agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers dated the 9th July, 1941, but in pursuance of Clause 10 of this Agreement 85% of the salary will be paid in the first year and 92% in the second year, the full salary being paid in the third and subsequent years. On the present unit assessment of the undertaking this will be £1,323, £1,440 and £1,557, respectively.

Applicants must be corporate members of the Institution of Electrical Engineers. Recent experience in Electricity Supply Undertakings is essential, and applicants must have a thorough knowledge of design and operation of 33-kV, 6.6-kV and L.T. underground and overhead Distribution Networks and Substations. Applicants must also be thoroughly conversant with the management of Showrooms, Hire and Hire Purchase, Assisted Wiring Schemes, and the general administration of an Electricity Department. The appointment will be terminable by three months' notice in writing on either side, and will be subject to the Local Government Superannuation Act, 1937, and to a satisfactory medical examination.

Applications, on forms to be obtained from the Town Clerk, and accompanied by copies of three recent testimonials, must be delivered to the undersigned not later than Monday, the 2nd September, 1946. Canvassing, directly or indirectly, will disqualify, and any relationship to officers or members of the Council must be disclosed.

G. BURKINSHAW,

Town Hall,

Town Clerk.

Chester.

1966

BOROUGH OF HESTON & ISLEWORTH
ELECTRICITY DEPARTMENT

Assistant Consumers' Engineer

APPLICATIONS are invited for the position of Assistant Consumers' Engineer. The salary will be in accordance with the National Joint Board Schedule, Grade 9, Class G, at present £399 per annum.

The appointment is subject to the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination. Applicants must have had similar experience with municipal or supply companies and a thorough knowledge of the I.E.E. rules and regulations, including installation of all types of electrical apparatus and control of wiring and consumers' maintenance staff.

Applications for the position must be made on a form to be obtained from the Borough Electrical Engineer and Manager, 11, Staines Road, Hounslow, and addressed to the undersigned endorsed "Assistant Consumers' Engineer," accompanied by not more than three recent testimonials, to be received not later than 12 noon, 31st August, 1946.

HAROLD SWANN,

Council House,

Town Clerk.

Treaty Road, Hounslow.

1999

CITY OF PORTSMOUTH ELECTRICITY SERVICE

APPLICATIONS are invited for the following positions:
(a) CIVIL ENGINEERING ASSISTANT at a salary in accordance with Grade 8, Class J, of the N.J.B. Schedule, at present £521 rising to £544 per annum in the 4th year. Applicants must have had a sound technical training and experience in the preparation of drawings, specifications and bills of quantities, etc., and preferably hold qualifications admitting to membership of one of the professional Institutions.

(b) ASSISTANT SHIFT ENGINEER at a salary in accordance with Grade 8b, Class J, of the N.J.B. Schedule, at present £456 per annum. Applicants should be in possession of technical qualifications admitting to corporate membership of a recognised professional Institution, have had previous experience in a large modern generating station, and preferably have had manufacturing works experience.

Forms of application may be obtained from the Engineer and Manager. The latest date for the return of applications is the 27th September, 1946. Canvassing, either directly or indirectly, will be a disqualification.

R. H. COATES,

111, High St., Portsmouth.
July, 1946.Engineer and Manager.
1992

NORTH-WEST MIDLANDS JOINT ELECTRICITY AUTHORITY

Meaford Generating Station

APPPLICATIONS are invited for the following Technical Staff appointments at the Meaford Generating Station, which is to be commissioned early in 1947 and will contain four 30,000-kW Turbo-Alternators, six 240,000 lbs. per hour pulverised fuel fired Water Tube Boilers and two 3,000,000 galls. per hour Cooling Towers.

- (a) One Works Superintendent, Class J, Grade 3, £785-£821 per annum.
- (b) One Assistant Works Superintendent, Class J, Grade 5, £651-£682 per annum.
- (c) One Mechanical Maintenance Engineer, Class J, Grade 6, £616-£644 per annum.
- (d) One Electrical Maintenance Engineer, Class J, Grade 7, £563-£589 per annum.
- (e) Four Shift Charge Engineers, Class J, Grade 7, £563-£589 per annum.
- (f) Four Shift Efficiency Engineers, Class J, Grade 8, £521-£544 per annum.

The conditions of service and salary will be in accordance with the N.J.B. Schedule for the Electricity Supply Industry. Application forms, together with conditions of employment and list of duties, may be obtained from the undersigned, and must be returned not later than Monday, August 26th, 1946.

F. FAVELL, M.I.E.E., M.I.Mech.E.,
Chief Engineer and Manager.
York Chambers,
Kingsway, Stoke-on-Trent.
24th July, 1946. 1923

BOROUGH OF SWINDON ELECTRICITY DEPT.

Appointment of Stores Supervisor

APPPLICATIONS are invited for the appointment of Stores Supervisor in the above Department, at a salary in accordance with Grade I of the Miscellaneous Division of the National Scales (£255 to £300), plus such cost of living bonus as may from time to time be paid by the Corporation (at present £59 16s. per annum).

Preference will be given to applicants who have had experience in storekeeping, timekeeping, clerical work and supervision of staff in the stores department of an electricity supply undertaking. The appointment, terminable by one month's notice on either side, is subject to the provisions of the Local Government Superannuation Act, 1937, and the successful applicant will be required to pass a medical examination.

Applications, stating age, qualifications and experience, with particulars of past and present employment, and accompanied by copies of three recent testimonials, must be delivered to me not later than Saturday, 24th August, 1946, in envelopes endorsed "Stores Supervisor, Electricity Department." Canvassing in any form will be deemed a disqualification and applicants must state whether to their knowledge they are related to any member of the Council or to any Senior Officer of the Corporation.

D. MURRAY JOHN,
Town Clerk.
Civic Offices, Swindon.
23rd July, 1946. 1905

BOROUGH OF MAIDENHEAD ELECTRICITY DEPT.

Appointment of Assistant Mains Engineer

APPPLICATIONS are invited for the above appointment at a salary in accordance with Grade 7, Class E of the National Joint Board Schedule, at present £449 per annum for 2 years, £459 per annum for 3rd and 4th years and £469 per annum after the 4th year.

Candidates must have passed the Graduateship examination of the I.E.E. or hold equivalent qualification, and had practical experience in the construction, maintenance and operation of overhead and underground 3-phase E.H.T. transmission systems; L.T. distribution, transformers, switchgear and substations. Experience in rectifier substations, and the change-over of supply networks from D.C. to A.C. would be an advantage.

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

Applications, stating age, training and experience, with dates and accompanied by copies of not more than three recent testimonials should be addressed to the undersigned not later than 24th August, 1946.

J. D. MARKLAND,
Borough Electrical Engineer.
Electricity Department,
Braywick Road,
Maidenhead. 1038

ST. AUSTELL & DISTRICT ELECTRIC LIGHTING & POWER CO. LTD.

Appointment of Chief Engineer and Manager

APPPLICATIONS are invited from suitably qualified persons for this appointment. The salary will be on a similar basis to the scale set out in the Agreement, dated 9th July, 1941, made between the National Joint Council for Local Authorities and Chief Engineers. The supply of electricity dealt with by the company is primarily taken in bulk, and the "unit assessment" based on the year ended 31st December, 1945, is 10 millions. The maximum salary under the above Agreement would be £314 per annum, and the commencing salary will be between 85% of the full salary and that maximum, according to the qualifications and experience of the successful candidate. A cost-of-living allowance will also be paid, together with a car allowance.

Applicants should be corporate members of the Institution of Electrical Engineers and be not more than 45 years of age. Recent experience in electricity supply undertakings is essential, and applicants must have a thorough knowledge of design and operation of E.H.T. and L.T. distribution networks and substations. Applicants must also be thoroughly conversant with the management of showrooms, hire and hire purchase, contracting department and the general administration of an electricity undertaking. The successful applicant will be required to enter into a Service Agreement and to join the Company's Contributory Pension Scheme.

Applications, stating age, experience and qualifications, together with not more than three recent testimonials, should be addressed to the Company's London Office at Balfour House, 119/125, Finsbury Pavement, London, E.C.2, in an envelope endorsed "Chief Engineer and Manager," not later than 31st August, 1946. Canvassing, either directly or indirectly, will be a disqualification, 2018

COUNTY BOROUGH OF CROYDON ELECTRICITY DEPARTMENT

Deputy Chief Engineer and Manager

APPPLICATIONS are invited for this appointment from men not over 45 years of age who are Corporate Members of the Institution of Electrical Engineers experienced in the management and administration of a large electricity undertaking.

Salary £1,350 per annum, plus bonus (at present £59 16s. per annum). Subject to his executing an agreement with the Corporation for certain work connected with the proposed new generating station, the person appointed will also receive a payment—not subject to superannuation—of approximately £400 per annum until December, 1949. Other payments may be made after that date as further sections of the new station are put in hand.

Terms and conditions of appointment may be obtained from the Chief Engineer and General Manager, Electric House, Wellesley Road, Croydon, and should be returned to him completed by Tuesday, September 10th, 1946. Canvassing will disqualify.

E. TABERNER,
Town Clerk.
Town Hall, Croydon.
July, 1946. 2023

CROWN AGENTS FOR THE COLONIES

Colonial Government Appointments

APPPLICATIONS from qualified candidates are invited for the following post: Meter Superintendent required by the Nigerian Government Electricity Undertakings for one tour of 18-24 months, with prospect of permanency.

Salary £630 rising to £720. On salary of £630 there is a local allowance of £24 and for married men a separation allowance of between £60 and £180 a year according to number of dependants. Free passages and quarters. Candidates, not over 35 years of age, must be fully conversant with the fixing, testing and maintenance of all types of A.C. and D.C. (single and polyphase) meters, and with protective systems and the testing and maintenance of operative and protective gear. They should also have had good general administrative experience.

Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M/N/16840. 2011

ARMATURE Winders and Improvers required, A.C. and D.C., top rates, good working conditions.—Electrical Power Repairs (Gillingham) Ltd., Strover Street, Gillingham, Kent. 9365

AN opportunity for an Electrical Engineer conversant with machinery installation, house and factory wiring, estimating and control of work. Partnership offered to suitable applicant. Must be a willing worker. Write, stating age, experience and salary required.—Box 9373, c/o The Electrical Review.

APPPLICATIONS are invited for the position of Mains Foreman. Applicants must have experience of laying and jointing E.H.T. and L.T. cables, maintenance of distribution systems and control of labour. Wages and conditions of employment will be in accordance with the Council's grading scheme. Rate of wages at present £7 10s. per week, rising by five equal annual increments to £9 10s. per week. The successful applicant will be subject to the provisions of the Local Government Superannuation Act, 1937. Applications to be made in writing, stating age, training and experience, together with copies of not more than three recent testimonials, to the Borough Electrical Engineer, 1, West Street, Bromley, Kent, and to be received by him not later than Monday, August 26th, 1946. 2027

ARMATURE Winders required for steelworks in North Lincolnshire, must be experienced in repairing and rewinding from 5-h.p. to 150 h.p. A.C. and D.C. machines. Reply, with full particulars, to—Box 2026, c/o The Electrical Review.

ARMATURE Winders wanted, experienced on A.C. and D.C. repair work.—The Midland Electric Installation Co. Ltd., Cyprus Works, Upper Villiers Street, Wolverhampton. 1898

ASSISTANT Chief Engineer required for large iron and steel works in the North of England. Applicants should have had extensive experience of mechanical and electrical plant installation and maintenance, and preferably some design experience as applicable to iron and steel works practice. The duties will involve appreciable responsibility, for which an adequate salary will be paid. Please reply indicating previous experience, technical training and present salary to—Box 1786, c/o The Electrical Review.

ASSISTANT Superintendent required for domestic appliance repair shops at Burford, near Dorking. Commencing salary £8 per week inclusive. Applicants should have had workshop experience and have passed either Higher National or I.B.E. Graduate examinations or equivalent standard. Full conditions of service and duties can be obtained on application to—Area Officer (Consumers), London & Home Counties Joint Electricity Authority, Burford, Dorking, Surrey. 9369

BRTISH Engine Boiler & Electrical Insurance Co. Ltd., 24, Fennel Street, Manchester, 4. The company has a number of vacancies for Electrical Plant Inspectors. Permanent positions carrying progressive salary scale and non-contributory pension. Candidates, age 30/35, with apprenticeship and experience in the manufacture, repair and industrial use of electrical machinery and technical education at least Higher National Certificate standard, are invited to apply in own handwriting, stating age, qualifications and experience. 1979

CABLE Sales Engineer Representatives required for North-West, Midlands, Yorkshire and North-East areas, to develop sales of rubber insulated cables, manufactured by well-established independent rubber cable manufacturing company in North-West. Applicants must have an intimate knowledge of rubber cable technique and preferably a good connection with industrial, colliery and municipal undertakings. Applications will be treated in strict confidence and should state age and salary required to—Box 1912, c/o The Electrical Review.

CAMERAMAN. Large engineering firm in the Midlands require experienced Industrial Photographer. Must be capable of taking first-class photographs in the Company's works, and prepared to travel to different parts of the country to take photographs of the Company's plants and apparatus installed in all types of industrial undertakings. Experience of press work a considerable advantage. Full time services only considered. Write stating age, full particulars of experience and salary expected to—Box 1969, c/o The Electrical Review.

CHEMIST. A firm of electric lamp manufacturers require for their factory a man aged 20 to 30 who possesses chemical training up to about B.Sc. standard, and preferably some industrial experience. In addition to chemical work the selected applicant would be required to carry out other technical duties for which he would be trained. Give full particulars by letter to—Cryselco Limited, Kempston Works, Bedford. 1894

CHIEF Electrical Engineer required by switchgear specialists in North-West. Must be familiar with H.V. insulation practice. Progressive position for young engineer prepared to accept responsibility. Reply, stating age, experience, salary required, and include testimonials. —Box 1962, c/o The Electrical Review.

CVIL Service Commission. Applications are invited for posts at the Military College of Science, Shrivvenham, near Swindon, Wilts, of permanent and temporary Principal Lecturers, Senior Lecturers and Lecturers. Vacancies in one or more of these grades exist in the following subjects: Ballistics, Chemistry, Applied Chemistry, Electrical Engineering, Heat Engines, Instruments, Machines, Materials and Structures, Mathematics, Mechanics, Metallurgy, Physics, Radar and Telecommunications. Applicants must have a university degree in an appropriate scientific subject, with first or second class honours, or an equivalent qualification. Experience in research or design as applied to military needs would be an advantage. The inclusive scales of salary are (Principal Lecturer) £840-£1,125, (Senior Lecturer) £610-£800, (Lecturer) £333-£560. Full particulars of the posts, together with a statement of the conditions of service and the intentions of the War Office regarding the Military College of Science, and a form of application, may be obtained from the Secretary, Civil Service Commission, Burlington Gardens, London, W.1, quoting No. 1575. Application forms must be returned to him by 26th August, 1946. 1988

CVIL Service Commission. Applications are invited for the post of Bashforth Professor of Mathematical Physics at the Military College of Science. The post will be filled by competitive interview of suitable applicants at the Civil Service Commission on 16th September, 1946. The College is at Shrivvenham, near Swindon, Wilts. If, owing to the housing shortage, accommodation is unavailable, War Department quarters may be allotted at a fair rent until such time as other accommodation becomes available. Applicants should be mathematicians of high standing with a good knowledge of Physics; the professor will be required to exercise general supervision over the three branches, Mathematics, Physics and Gunnery and the theory of weapons. The salary offered is £1,500 x £50 to £1,700. Under present arrangements an additional payment of £190 attaches to the minimum of the scale. In the case of higher rates this addition is reduced by 12s. for each complete £1 by which the salary exceeds £1,500. Full particulars of the post, together with a statement of the conditions of service and the intentions of the War Office regarding the Military College of Science, and a form of application, may be obtained from the Secretary, Civil Service Commission, Burlington Gardens, W.1, quoting No. 1517. The envelope should be marked "M.C.S." in the top left-hand corner. Application forms must be returned to him by Monday, 19th August, 1946. 2004

COMPETENT Shorthand-Typist required for electrical engineers' office, Victoria St., S.W.1. Salary approx. £5; 5-day week. Apply, with full details, to—Box 2005, c/o The Electrical Review.

COMMERCIAL Correspondent and Technical Estimator required to take charge of office of factory commencing manufacture of small motors in South Wales. Excellent opening for young energetic man. Previous experience essential. Give full details of training and salary required.—Box 1873, c/o The Electrical Review.

CONSULTING engineers in the London area require an Engineer with university degree capable of assisting in the preparation of reports to clients on large-scale electric power generation and supply. Experience of the technical and economic aspects of steam power generation is necessary, but some electrical experience is desirable. Ability to prepare clear and logical drafts is essential. Salary £600/£900 p.a. according to qualifications. Applications in writing, stating age and experience, to—Merz & McLellan, Milburn, Esher, Surrey. 2000

CONTRACTORS require Assistant Engineer for overhead and underground electrification to eventually take control: knowledge of surveying desirable but not essential; good prospects. State age, salary required and experience.—Box 1986, c/o The Electrical Review.

DEVELOPMENT Engineer required for electrical and mechanical engineering company in London area. Good practical knowledge of F.H.P. motor production and development with suitable technical education and qualifications essential. Post requires a man with initiative and ability to pursue line of development, with energy and determination. Write, stating age, qualifications and salary required.—Box 1853, c/o The Electrical Review.

DOMESTIC appliance manufacturers require Commission Representatives for the following areas: South Coast, East Coast, Northern Counties, South Wales, South-West England, Midlands. Full details to—Box 1925, c/o The Electrical Review.

DRAUGHTSMEN (Electrical and Jig and Tool): One Senior Electrical Draughtsman accustomed to design of motors up to 5 h.p. and one Jig and Tool Designer-Draughtsman. Salaries according to qualifications and experience, progressive posts. Full particulars to—Personnel Manager, Small Electric Motors Ltd., Churchfields Road, Beckenham, Kent. 1991

DESIGNER-Draughtsman required for work on test equipment and measuring instruments. Write, giving full particulars of experience and salary required, to—Taylor Electrical Instruments Ltd., Slough, Bucks. 9324

ELECTRICAL Engineer required to take charge of test room. Must have previous experience in testing all types of accurate moving coil instruments. Degree man preferred. Factory situated in Home Counties. State age, experience and salary required.—Box 9311, c/o The Electrical Review.

ELECTRICAL Fitters, thoroughly experienced A.C./D.C. motor repairs, 1 to 50 h.p., and attendance on breakdown jobs. Also Chargehand for similar work and bench hand, experienced manufacture and assembly motor starters. North London district. Good wages and working conditions. Give details experience to—Box 1989, c/o The Electrical Review.

ELECTRICAL Research Engineer required by company engaged on H.V. switchgear production. To be capable of dealing with insulation problems relative to air insulated and compound filled switchgear, up to 132 kV. References together with details of experience, salary required and age, are required.—Box 1963, c/o The Electrical Review.

ELECTRICAL Wiremen required for Brighton/Hove district. Apply—Troughton & Young Ltd., 6, Basil Street, Knightsbridge, S.W.3. 1806

ELECTRICIAN (Working) for electrical maintenance contracts on all classes of A.C. and D.C. industrial motor installations in London area. Only men with previous experience on automatic control gear, lifts and similar equipment need apply. Permanency and good wages and conditions to selected applicant. Write, stating age and experience, to—Box 1987, c/o The Electrical Review.

ELECTRICIANS, experienced in first-class electrical installation work. District rate. Applications, stating experience, etc., to—J. E. Goundry, Electric House, Reigate. 1995

ELECTRICIANS, good, used first-class work, installations, jobbing, maintenance.—Oakes & Foster, 29, St. John's Wood High St., N.W.8. Pri. 1786. 9372

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

ESTIMATING and Costing Clerk required for electrical contracting. Apply in writing, stating previous experience and salary required to—Giles (Electrical Engineers) Ltd., 11, Victoria Colonnade, Southampton row, London, W.C.1. 1968

ESTIMATING Electrical Engineer required by electrical contractor. Must be able to prepare own lighting and power schemes and specifications. Responsible progressive position. Particulars and salary required to—Frank Burton, 266, Corporation Street, Birmingham, 4. 9329

EXPERIENCED Draughtsmen are required by large electrical firm in Midlands. Must be familiar with mechanical design and construction of medium and large A.C. and D.C. machines. Reply with full particulars to—Box 289, 8, Serle Street, London, W.C.2. 1951

EXPERIENCED Fitter and Erector of electrical coil winding machinery. Apply—Universal Winding Co., Saville Street, Oxford Road, Winchester. 1924

FIRST-class Designer-Draughtsman, interested in an opportunity to work in close touch with an up-to-date electrical and mechanical research dept. engaged on a wide range of interesting work, are required by—The English Electric Co. Ltd., Queens House, Kingsway, W.C.2. 1920

FOREMAN Armature Winder and two extra Winders.—Box 1992, c/o The Electrical Review.

FOREMAN wanted to take charge of small factory, Kingston area, producing light electrical and mechanical units. Should have knowledge of press tools, all types of machining and be capable of controlling mixed staff. Good prospects for experienced man. Write, giving full particulars and salary required, to—Box 1950, c/o The Electrical Review.

GIRLS for clean light assembly work. Full pay during training, bonus after. Good conditions, welfare, canteen, etc., free lunches if under 17 years of age.—Taylor Electrical Instruments Ltd., 419, Montrose Avenue, Slough, or 148a, High Street, Slough. 1791

HEATING and Air Conditioning Controls. Young Technician required with degree or equivalent, preferably with experience in space and process automatic control. Considerable scope for development to right man. Apply with details education, experience and salary in writing, to—Watford Electric & Mfg. Co. Ltd., Whippendell Road, Watford, Herts. 1959

JUNIOR Draughtsman for electrical and mechanical engineers, North London. Expanding concern offering good opportunity to young man keen to train on. State age, experience and any technical qualifications.—Box 1904, c/o The Electrical Review.

LABORATORY Assistant wanted, Inter B.Sc. standard, if possible with experience on small electrical and thermal mechanisms. S.W. London area.—Box 2029, c/o The Electrical Review.

LARGE electrical firm in London area requires two experienced Radio Set Designers; 5 years' experience essential.—Box 2007, c/o The Electrical Review.

LIFT and Crane Inspectors. Applications invited from engineers, age 30/35, with sound training in lift or crane construction and having electrical and mechanical experience. Progressive salary scale and non-contributory pension. Candidates should apply in own handwriting, stating age, qualifications and experience, to—British Engine Boiler & Electrical Insurance Co. Ltd., 24, Fennel Street, Manchester, 4. 1980

PLUMBER-Joiners and Overhead Linesmen required in Berks and Wilts. Permanent employment. Wages and working conditions in accordance with Joint Industrial Council schedules. Apply—Wessex Electricity Co., Oxford Road, Newbury. 1888

PRODUCTION Engineer for works in South Wales manufacturing small electric motors. Knowledge of planning and costing with experience of similar work essential. Full details of previous experience, salary required and when free to—Box 1872, c/o The Electrical Review.

PURCHASING Manager required for important manufacturing concern in Greater London area. Must be fully experienced in controlling purchasing in light electrical engineering, radio, domestic appliances, etc. Knowledge of supplies and market prices, modern buying methods and routine essential. Good salary and prospects. Write, stating age, experience and salary required, to—Box 1995, c/o The Electrical Review.

RADIO Design Engineer required for domestic receivers. Applicants preferred with degree in engineering, experience in home and export design and knowledge of production economics. Salary according to qualifications and experience. North London.—Box 1936, c/o The Electrical Review.

RADIO Engineer. Large radio firm in London area requires an engineer to act as deputy to the head of its radio design section. The engineer concerned should have theoretical and practical experience of radio set design, preferably for the Services.—Box 2028, c/o The Electrical Review.

REPRESENTATIVES required to introduce new exclusive lines to corporations, wholesalers and retailers. Please state territory covered. Commission basis.—Box 2013, c/o The Electrical Review.

REQUIRED, two fully experienced Supervising Engineers and Estimators, fully conversant with estimating and supervising internal wiring and power contracts, cables and switchgear. Applications together with copies of references and details of experience. Only first-class men need apply.—T. Clarke & Co. Ltd., 129 Sloane Street, S.W.1. 9354

SOUTH Wales Switchgear Ltd., Treforest, Glam., have a vacancy for a Design Engineer for 33,000-volt switchgear. Apply in writing, giving age, experience and salary required. 1863

STOREKEEPER/Clerks, preferably familiar with small electrical or radio parts, raw material and small tools. Good wages, canteen facilities, etc.—Taylor Electrical Instruments Ltd., 419, Montrose Avenue, Slough. 1789

TECHNICAL and Sales Engineer. Experienced industrial electric motor sales and service, particularly repairs and rewinds, fractional to 50 h.p. To take charge, after few months in London, of West England new branch of well-known firm. State salary required. The appointment presents a fine opportunity to the right man.—Box 1887, c/o The Electrical Review.

TURBINE Driver, experienced with Brush-Ljungstrom turbines, required for shift duties in municipal power station. Wages, D.J.I.C. rate, at present 28 6s. 1d. for 48-hour week. Applications, in writing, to—A. W. Barham, Chief Engineer and General Manager, Electricity House, The Parade, Watford, Herts. 1990

WANTED, assistance of Scientific Electrician to develop incalculable invention.—Box 1926, c/o The Electrical Review.

WOMEN or Girls with experience of radio wiring, good wages and bonus. Clean light work, welfare, canteen, etc., facilities for free medical advice.—Taylor Electrical Instruments Ltd., 419, Montrose Avenue, Slough, or 148a, High Street, Slough. 1790

THE Hong Kong Electric Co. Ltd. Applications are invited for the position of Shift Engineer in the above company's power station at Hong Kong. Applicants should have had a good technical education and practical experience in a modern generating station (6.6 kV), should be 25-30 years of age and preferably unmarried. First engagement would be for three years with prospect of permanent employment at increased rates of pay after the third year. Salary for first year, 400 Hong Kong dollars per mensem, with exchange compensation when dollar is valued at less than two shillings. Free quarters or allowance in lieu. Provident fund. Free passage out and home with half salary during outward voyage; 8 months' leave with passages and full pay after 5 years' service. The selected applicant will be required to pass a medical examination. Applicants should apply in writing to the London Representative, The Hong Kong Electric Co. Ltd., 122, Leadenhall Street, London, E.C.3, and should state their age; if married, and if so how many children; training and experience, and send copies of testimonials. 1900

WELL-known electrical manufacturers opening new works in South Wales for manufacture of small motors require young, capable and energetic General Manager to take control. Must have good commercial and engineering knowledge of the industry. State previous experience and salary required.—Box 1871, c/o The Electrical Review.

£500 per annum. Joint Manager required for transformer department. Must be capable and with organising ability.—Box 1945, 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.

A. J. Evans & Son—Storekeeper; Borough of Bridport—Commercial Assistant; Borough of Nuneaton—Mains Supt.; Box 1735—Two Engineers; City of Nottingham—Chemist and Asstnt. Chemist, Senior and Junior Relief Shift Engrs. and Asstnt. Control Engrs.; Corporation of Kendal—Meter Tester and Repairer; Scottish Southern Electric Supply Co. Ltd.—Senior Assistant. All applicants are thanked.

SITUATIONS WANTED

A capable Electrical Engineer with exceptionally wide experience covering all phases of A.C. and D.C. motor construction, application and installation, estimating and labour control, seeks situation where originality and organizing ability have full scope.—Box 9356, c/o The Electrical Review.

A position is required by an Executive Engineer, elect./mech., 28 years' exp., age 43. Fitting, machining, assembly, etc., administrative, manuf., repairs, dynamos, switchgear, radio compts., precision work, engine manuf.—Box 9331, c/o The Electrical Review.

ABOUT Production. The Sales and Commercial field of the Electrical Industry are starved for want of supplies. Those who are interested in production are invited to communicate with the advertiser who is an Electrical Engineer and production expert. Experience covers the production of all manner of Electrical equipment from a lampholder to a Turbo-Alternator, from the raw material stage to the final product. Methods are not harsh and results are guaranteed without disturbances or increased costs. Remuneration by salary (to be agreed) and production bonus.—Box 9317, c/o The Electrical Review.

ABOUT £550 will secure the services of a versatile and enterprising engineer with over 15 years' experience of electrical contracting and manufacturing, including 5 years in administrative positions. Graduate I.E.E., E.C.A. Silver Medallist, City and Guilds triple finalist, excellent refs. Would suit architect or consulting engineer or as works engineer, etc.—Box 9262, c/o The Electrical Review.

ADVERTISER, 20 years' Sales/Technical Radio experience with principal companies, including Marconi's Wireless Telegraph Company, requires appointment as Sales Engineer or Liaison between manufacturing company and trade. Experience includes Broadcast Radio Trade Director, Radio Instrument Company, Radio Officer during war, appointed Admiralty 1944. Salary £400-£500 according prospects. Write—Box 9312, c/o The Electrical Review.

AM.I.E.E., A.M.I.Mech.E., age 38. Experience entirely on factory maintenance and power generation. Adaptable and practical. Any situation within London area considered.—Box 9321, c/o The Electrical Review.

ADVERTISER (30) desires appointment with electrical engineering organization as an Engineering Representative or Manager. Familiar with Southern Counties. Fourteen years, manufacture, estimates, contracts, labour management, in electrical engineering. Practical, technical and managerial experience. Accustomed to using initiative. Free one month notice.—Box 9342, c/o The Electrical Review.

ELECTRICAL ENGR., M.A., A.M.I.E.E., single, B.T.H. apprentice, 7 yrs. power co., 6 yrs. H.T. and L.T. transmission, 2 yrs. ordering and estimating elec. equipment, offers services.—Box 9360, c/o The Electrical Review.

ELECTRICAL Engineer, University honours graduate, ex-Serviceman, age 33, seeks position, with preference for development and research work. Box 9295, c/o The Electrical Review.

ELECTRICAL Engineer, age 48, D.C. armature winder, repairs or rewinds, full knowledge of A.C. and D.C. maintenance and installation, would consider partnership. London area.—Box 9345, c/o The Electrical Review.

ELECTRICAL Engineer (22), having Ord. and Higher National Certificates and served indentured apprenticeship, seeks progressive post with lighting contractors.—Box 9323, c/o The Electrical Review.

ELEC. Foreman, 20 yrs' exp., large installations and maintenance, requires progressive position, London area.—Box 9348, c/o The Electrical Review.

ELECTRICIAN (30) with diesel exp., 7 yrs. charge electrician, Merchant Navy, seeks maintenance post, Southern England.—Box 9335, c/o The Electrical Review.

ELECTRONIC Engineer (25) desires progressive position, preferably in Yorkshire. Graduate I.E.E., National Ordinary Diploma, Higher National Certificate, City and Guilds Final; 6 years' experience in design and maintenance of thermionic equipment for H.F. and L.F. measurements.—Box 9343, c/o The Electrical Review.

ENGINEERING Executive, A.M.I.E.E., Int. A.M.I.P.E. (31), desires position as Works Manager in small or medium size progressive electrical company. Good technical and administrative experience.—Box 9353, c/o The Electrical Review.

EX-Electrical Contractor, life experience, practical, seeks responsible post, good knowledge men and materials, keen (56). Please give general requirements.—Box 9303, c/o The Electrical Review.

EX-Major (40), Royal Engineers 4 years, is anxious to obtain suitable post away from London (south of) 20 years' civil experience in electrical and mechanical engineering, unimpeachable references. Desires post as Chief Engineer in large factory or group of factories or workshops. Experienced all types electrical power plant and distribution, steam and diesel, internal lighting and power installations. Installation of new mechanical plant and machinery, maintenance and repairs. Salary immaterial. Job and surroundings more essential.—Box 9341, c/o The Electrical Review.

EX-R.E.M.E. officer (38) requires Technical, Administrative or Commercial post. Experienced production and development radio, precision electrical instruments, etc.—Box 9362, c/o The Electrical Review.

EX-W.O. (Elect.), R.E.M.E., desires position Maint. Eng. Exp. A.C., D.C. gens, rectrs., power plant, est. and contracting, or Lecturer and Instructor. E.C.A. member pre-war. Home or abroad.—Box 9344, c/o The Electrical Review.

FURTHER experience sought by Electrical Engineer. Higher Nat. Inter-B.Sc. Nat. Certificate, proceeding to Higher Nat. Two years laboratory testing exp. Good references. Testing preferred but not essential.—Phone Syd. 4576 or write 71, Tansfield Road, S.E.26.

GRAD.I.E.E. (26), ex-Armt. Q.M.S., R.E.M.E., 4 yrs. instructor electronics, servo-mechanisms, synchronous transmission, motors, power plants, installation. Electronics, U.S.A.; 18 months' tropical research, Nigeria. Capable, steady, ability to supervise. Seeks development work or sales. Salary £550-£600.—Box 9357, c/o The Electrical Review.

KEEN young Engineer (28), disengaged Sept., desires progressive position. Six years' experience production and testing all types H.T. and power transformers, T.C.O.L., auxiliary gear, etc. Five years' mechanical experience boilers, prime movers, etc. N.E. Coast area preferred, but not essential.—Box 9352, c/o The Electrical Review.

MAINTENANCE Electrician, disengaged, comprehensive knowledge all installations.—Box 9368, c/o The Electrical Review.

RADIO Engineer (29) seeks post, preferably abroad. Apprenticed, C. & G. final radio communication, 6 yrs. radar, 4½ commissioned R.E.M.E. Maintenance or work of non-static nature preferred.—Box 9305, c/o The Electrical Review.

SALES Representative (53), technical, wishes to contact manufacturer, London and South. Connections supply authorities and trade.—Box 9386, c/o The Electrical Review.

SUPERVISING and Estimating Engineer (44) requires position with London firm catering for first-class work. Will take complete control of contracts and labour. Would consider consultants' assistant or engineer to multiple concern or property owners. Car.—Box 9349, c/o The Electrical Review.

SUPERVISING Engineer (35) seeks post of complete London area. Sound knowledge of electrical contracting industry. Would like to submit full application.—Box 9303, c/o The Electrical Review.

WHOLESALEMAN'S Manager (Electrical) seeks position, Southern Counties. Fully exp. in sales, purchases and accounts.—Box 9363, c/o The Electrical Review.

YOUNG man, ex R.A.F. Eng., intelligent, seeks position or partnership (small capital). Knowledge radio, electrical. Capable driver.—Box 9355, c/o The Electrical Review.

YOUNG man (28) requires position as Elect. Serviceman or similar. Service and civilian trade training. Own car if req.—Box 9334, c/o The Electrical Review.

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COMPLETE Power Station Plant for sale, consisting of 4 H. & W. Rollers, 30,000 evaporation, 250 lb. w.p.; 2 Turbos, 5,000 kW Pumps, Motors, etc. Erected or f.o.b.—Burford Taylor & Co. Ltd., The Boiler Specialists, Middlesbrough. 85

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ELECTRIC Motors, etc. We supply all types and sizes, etc., of electrical machinery. Send your enquiries to—Be. Eng. Engineering, 3, Retreat Close, Kenton, Middx. Wordsworth 4928. 84

ELECTRIC Motors, 1/3 h.p., 3,000 r.p.m., D.C. 110 volts. Also 220 volts. Stock delivery, £6 each.—John Steel, Clyde Mills, Bingley, Yorks. 84

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HEAVY duty Arc Welding Plants, 200 amps. Price £31 10s. complete. Also Spot Welders, 21 15s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 50

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KETTLE Elements, Mica Elements and Spiral, all voltages, all wattages, highest quality, competitive prices. Enquiries to Irish Domestic Electrical Appliances Ltd., 34 South Frederick Street, Dublin, Eire. 70

LADDERS, single and extension, from—Ramsay & Sons (Forfar) Ltd., Forfar. 9004

LARGE quantity Galvanized Conduit Fittings, $\frac{3}{4}$ to $1\frac{1}{2}$ inches. 15, Kingsley Grove, Audenshaw. 1891

LARGE range of toasters, fans, portable and wall electric fires, radiators, convactor heaters, floor standard and table lamps, electric irons (heat controlled and others), vacuum cleaners, hair dryers, novelty bowl fires, boiling rings, electric kettles, immersion heaters. (Radios very shortly available.) Large range of torch cases, cycle lamps and all types of lighting and H.T. batteries, etc. Detailed list and catalogues available. Place your orders in good time.—Brooks & Bohm Ltd., 90, Victoria Street, London, S.W.1. Phone, Victoria 9550/1441. Inland Telegrams, "Beebats, Sowest, London." 46

LESLIE Dixon & Co. for Dynamos, Motors, Switchgear, Chargers and Telephones.—214, Queenstown Road, Battersea, S.W.8. Telephone, MACaulay 2159. Nearest Rly. Sta.: Queen's Road, Battersea (S.E.). 18

MONOMARK. Permanent London address. Letters re-directed, 5s. p.a. Write—BM/MONOS3, W.C.1. 68

MOTOR Generator Sets and Convertors, all sizes and voltages from $\frac{1}{2}$ 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 $\frac{3}{4}$ Bench Drilling Machine, 13 speeds, $\frac{1}{2}$ to 2s. 6d.—John E. R. Steel, Clyde Mills, Bingley, Phone 1066. 51

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

ONE-ton Short Wheel Base Open Trucks by Guy, Morris, Ford, etc., new in 1941/43, ex M.O.S., all in excellent condition. New batteries, good tyres, rugged construction and will withstand considerable hard wear. Prices from $\frac{1}{2}$ to $\frac{1}{2}$ ton.—Mathew Brothers, Mathro Works, Sandy Lane North, Wallington. Phone, Wallington 4050. 1899

ONE 150-kW, 1,500-volt, 100-volt, 900-r.p.m. Dynamo, by "E.C.C.", 2 pedestal bearing.—Newman Industries Limited, Yate, Bristol. 1459

PACKING Cases, all sizes and descriptions, for home and export trade; also S/H Cardboard Cartons, all sizes.—L. Goldser & Sons, 14a, Rectory Sq., London, E.1. Phone, Stepney Green 2550. 73

PHONE 98 Staines. 400-kW Belliss Steam Set, 440 v. D.C., with condenser; 60-kW Allen Crude Oil Set, 220 v. D.C.; 9-kW Ruston Crude Oil Set, 110 v. D.C.; 5-kW Diesel Set, 400/150 (Ruston); several Weir Pumps.—Harry H. Gardam & Co. Ltd., Staines. 60

PLAGING Generators, unused, several ranging from 350 to 700 amps, 6 to 12 volt, plain or with A.C. or D.C. motor drive. Particulars from—Stewart Thomson (Liverpool) Ltd., Fort Road, Seaforth, Liverpool, 21 (Abbeey 2697); or 28, Victoria Street, London, S.W.1 (Bottle 2101). 63

PV.C. and Cotton-Covered Bell Wire, single, twin, triple, and four core, in beautiful assorted colours, from 6s. 6d. per 100 yds.; send 6d. for samples and lists. We also have in stock irons, fans, extension speakers, etc.—Northern Industries, Dept. 8, 199 Broughton Lane, Salford, 7. 1678

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 Phoenix Works, Belgrave Terrace, Soho Road, Handsworth, Birmingham (Telephone, Northern 0898). 26

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

ROTARY Converters, 200-kW, 6,600/3/50 input 230 volts 2-wire D.C. output, complete with Transformer and switchgear, seen running in Liverpool. 2,000-kW, 6,600/3/50 input, 418/462 volts, three-wire D.C. output, complete with transformers, starting panels, D.C. machine panels. First-class condition. Two sets available.—Stewart Thomson & Sons (Liverpool) Ltd., Fort Road, Seaforth, Liverpool, 21 (Abbeey 2697); or 28, Victoria Street, London, S.W.1 (Abbeey 2101). 72

SACKS and Bags in excellent condition for all commodities, as low as 4d. each. Write—John Braydon Ltd., 230, Tottenham Court Road, W.1. Tel. No. Museum 6972. 79

SELF-Priming Electric Pumps, 300 g.p.h., $\frac{1}{2}$ to 100 g.p.h.—E. R. Steel, Clyde Mills, Bingley. Phone 1066. 53

SEVERAL unused Portable Grinders (Black & Decker), 5" and 6", for 110 volts, for sale ex stock.—Box 2015, c/o The Electrical Review.

SPIRAL Elements for electric fires, boiling rings, and other appliances, supplied to order.—Electrothermal Engineering Ltd., 270, Neville Road, London, E.7. 34

SPIRALS, first quality, 500, 600, 750 and 100 watt, all voltages, for immediate delivery.—Box 59, c/o The Electrical Review.

STAFF Time Checking and Job Costing Time Recorders (all makes) for quick cash sale. Exceptional condition. Write—Box 528, Smiths, 100, Fleet Street, London, E.C.4. 31

STEAM Generating Plant. The following is a selection of sets available in our comprehensive stock: 2,000-kW B.T.H. Turbo-Alternator, 6,600/3/50, 180/210-lbs. pressure, complete with surface condenser and all auxiliaries, seen running. 1,250-kW Brush Ljungstrom Turbo-Alternator, 400/3/50, 200-lbs. pressure, complete with surface condenser and all auxiliaries, seen running. Three 15-kW Steam Generating Sets, each consisting of vertical single-cylinder Steam Engine with steam pressure between 100 and 160 lbs., direct-coupled to 110/115-volts D.C. Generators, new 1942/3. Full particulars from Stewart Thomson & Sons (Liverpool) Ltd., Fort Road, Seaforth, Liverpool, 21. Tele. No. Bottle 2697; or 28, Victoria Street, Westminster, London, S.W.1. Tele. No. Abbeey 2101. 93

STEAM Turbine-Electric Generator Set, complete with condensing plant, 350 kW, 400 v., 50 cycles, steam pressure 180-200 lbs., pass-out press. 25 lbs. Can be seen running on load. Further particulars can be had from—Chief Engineer, George Lee & Sons Ltd., Wakefield. 1984

SUPERIOR Type Builders' Ladders now in production: also Steps, Trestles and Extension Ladders. Phone—Shafesbury Ladders Ltd., 453, Katherine Road, E.7. Granewood 3363/4. 15

TELPHONES, complete units in aluminium clad cases with control panels for 4, 8 and 12 stations. New Hand Sets with press key, 201 and 301 Jack plugs, Carbon insets, Retardation coils and other telephone material. These are new Ministry surplus goods, suitable for Ships, Factories and Mines. Enquiries and inspection invited for home and export trade.—Jack Davis, 30, Percy Street, London, W.1. Museum 7960. 1933

TESTING Sets, 500 v. (Record), new, imm. dly.—49 St. 9d.—Robins Electric, 222, West End Lane, N.W.6. Phone, HAM. 0879. 83

USSED Double Flanged Bobbins, good condition, 2,000 gross approx. Measurements $3\frac{1}{2}$ " overall, $3\frac{1}{2}$ " traverse, $3\frac{1}{2}$ " diameter flange. Will sell all or part.—Joseph Harari, 42, Whitworth Street, Manchester. 99

VACUUM Cleaner Parts. Hoses, braided, all diameters. Commutators, bearings, fans, carbon brushes, driving belts, brushes, attachments and fittings for all makes. Wholesale only.—Vacuum Cleaner Supplies, 543, Moseley Road, Birmingham, 12. 80

WATER Tube Boilers in stock. Two 25,000 lbs. evap., 250 lbs. W.P.; One 25,000 lbs. evap., 175 lbs. W.P.; Two 20,000 lbs. evap., 175 lbs. W.P.; Two 16,000 lbs. evap., 190 lbs. W.P.; One 12,000 lbs. evap., 200 lbs. W.P.; One 9/10,000 lbs. evap., 200 lbs. W.P. 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

WELDING Equipment from stock. Portable Welders by English Electric, complete with accessories, 12 kVA, single-phase, 50 cycle, primary volts 440/200, secondary volts 80, secondary amps. 150 continuous, 250 amps. maximum; welding current, min. 32 amps., max. 253 amps. D.C. Welding Controllers by Quasi-Arc Ltd., 80 volts, 30-90 amps., ratings 4 minutes in 5, suitable for conversion to heavy industrial resistances. Prices on application.—Cox & Danks Ltd., Plant Dept., Langley Green, Oldbury, Birmingham. 1983

YELLOW Varnished Silk Tape: 40 gross yds. 1-5/16" width \times 6 mils. thickness; 40 gross yds. $1\frac{1}{2}$ " \times 6 mils.; 40 gross yds. 2-5/16" \times 6 mils.; 45 gross yds. $3\frac{1}{2}$ " \times 6 mils.; 45 gross yds. $4\frac{1}{2}$ " \times 6 mils. Varnished Cambric Tape: 30 gross yds. $1\frac{1}{2}$ " \times 10 mils., straight cut; 30 gross yds. $1\frac{1}{2}$ " \times 5 mils., bias cut; 130 gross yds. $1\frac{1}{2}$ " \times 10 mils., bias cut; 30 gross yds. $1\frac{1}{2}$ " \times 10 mils., straight cut; 150 gross yds. $2\frac{1}{2}$ " \times 5 mils., bias cut; 150 gross yds. $2\frac{1}{2}$ " \times 10 mils., bias cut; 30 gross yds. 2-5/16" \times 10 mils., straight cut; Varnished Paper Tape, 2.5 mils. thickness; 15,000 yds. 27 m/m width; 524 m/m. Leatheroid; 6 cwt. .010" thick in 1 cwt. rolls 50" wide; 45 lbs. .012" on roll 54" wide; 1 cwt. .032" thick in sheets 80" \times 54"—Hirst, Ibbetson & Taylor Ltd., 47, Chapel St., Salford, Manchester, 3. 1997

5 to 20 kW D.C. and A.C. Petrol & Diesel Generating Sets, some packed for shipment.—Box 87, c/o The Electrical Review.

1 5-panel Test Board; 1 5-kVA Transformer, 440/2,000 volts, for high tension test; 1 30-kVA Testing Transformer. All for carrying out tests on domestic electrical cooking and heating appliances during course of development and when completed. Apparatus can be seen and offers made to—Lane & Girvan Ltd., Caledonia Stove & Iron Works, Bonnybridge, Stirlingshire, Scotland. 2016

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3 Cambridge 6-point Temperature Recorders up to 1,200 deg. C.; 3 C. (2 Recorders by Cambridge Instrument Co.; Murex 22.5-h.p. Arc Welding Sets, 440 volts, 3-ph., 50 cycles, 50, 150, 400 and 450 amps.; Murex 8.5-h.p. ditto, 80, 100 and 150 amps.; 2-ton Herbert Morris Electric Lifting Blocks, 400 volts, 3-phase, 50 cycles, for 6" hoist, six 1-h.p. English Electric Geared Motors, 1,440 to 350 r.p.m., 400 volts, 3-phase, 50 cycles; Eight 3-h.p. Shurtivant Geared Motors, 1,440 to 61 r.p.m., 440 volts, 3-phase, 50 cycles; Ten 1 1/2-h.p. Double Worm Reduction Gears, 1,440 to 65 r.p.m. Croft's gears, English Electric motor, 440 volts, 3-phase, 50 cycles; 23 3-kV Diesel Generating Sets, 220 volts D.C.; Two Mather & Platt 1 1/2-h.p. Centrifugal Pumps, 30 galls. per min. to 64 ft. head, with 2 1/2-h.p. E.E.C. Motor, 440 volts, 3-phase, 50 cycles, 1,420 r.p.m.—Reed Brothers (Engineering) Ltd., Bevis Marks House, London, E.C.3. Phone, Avenue 1901/4. 2017

40 kW Glass Bulb Mercury Arc Rectifier, incoming 6,600 volts, 3-phase, 50 cycles, outgoing 110 volts, D.C. with Spare Bulb. Purchased 1940. Perfect condition. Inspection invited.—Box 1955, c/o The Electrical Review.

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100 unused 4-h.p. R.T.H. 119-volt D.C. Motors, comp. wound, 1,425 revs.—Electric Machinery Co., Union Works, Ancoats, Manchester, or 28, Victoria Street, London, S.W.1. 95

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200 kW Reversible Motor Converter Set, English Electric Co., input 440 volts, 3-phase, 50 cycles, output 440 volts D.C., with switchgear. Can be run to generate either A.C. or D.C. For details write—Box 800, Mason Peacock Ltd., 184, Strand, W.C.2. 2002

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290 h.p. D.C. Motor by G.E.C., 500 volts, 750 r.p.m.; 230-h.p. D.C. Motor by Lanc. Dynamo Co., 400 volts, 500 r.p.m., with Ignic automatic starter, 30-h.p. D.C. Motor by G.E.C., 500 volts, 630 r.p.m. ball bearings and starter—Reed Brothers (Engineering) Ltd., Bevis Marks House, London, E.C.3. 1843

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M ANUFACTURERS of domestic electrical appliances require supplies of Rod Type Elements, Boiler Rinz Elements, Bowl Fire Elements, Toaster and Iron Elements. Offers are also invited for the supply of 23/36 3-core Flexible.—Box 1985, c/o The Electrical Review.

O NE 5-h.p., one 3-h.p., 220-v. D.C. Motors; one 2-h.p., three 5-h.p., 440-v. D.C. Motors.—Gwalia Relay Service, Holton Road, Barry, Glam. 9364

O NE 70-h.p., 400/350-cycle Auto Transformer Starter with overloads and no-volt.—Box 1860, c/o The Electrical Review.

R EQUIRED: Mica Electric Iron Elements; Toaster Elements; Sials; nichrome wire; Cotton-covered Flexes; Brass, Copper and Steel Sheets, min. size 9" x 6"; Am. Strip, 3" x 1/2". Machinery, new and used; Timber; Glazing; Rubber Grommets; Asbestos; Switches; Iron Connectors, etc., etc. Offers to—British Diamix Ltd., Metrum Works, Beatty Street, N.W.1. Euston 5551. 44

R OTARY Converter, 2 kVA, input 240 volts D.C., output 230 volts A.C.—Dukes Electrical Service, 8, St. Mary-at-Hill, E.C.3. 9350

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W ANTED, Rotary Converters, any size.—Universal, 221, City Road, London, E.C.1. 22

1 h.p., 230-v. A.C. or D.C. Motor.—Universal Electrical, 221, City Road, London, E.C.1. 25

1 to 3-kW Steam-driven Generating Sets, 110 volt, compound wound.—Box 1796, c/o The Electrical Review.

2 18" or 24" Flame-proof Fans, 230 volts, A.C.—Jack Stone & Co. Ltd., 221, Upper Richmond Road, Putney, S.W.15. Putney 8241 9316

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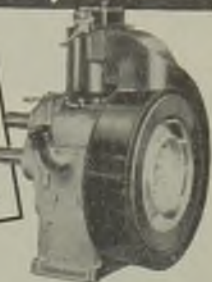
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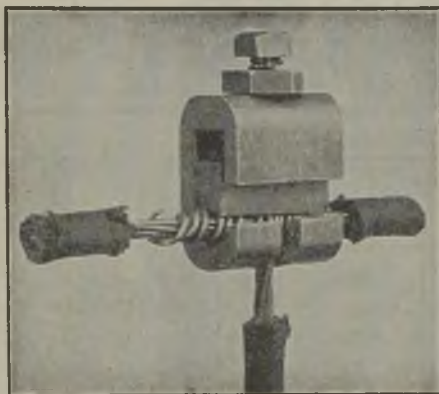
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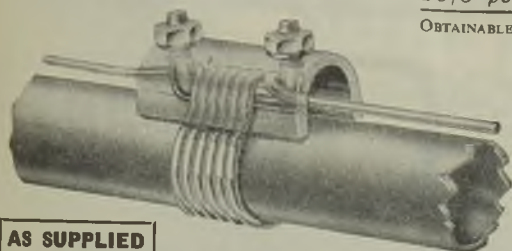
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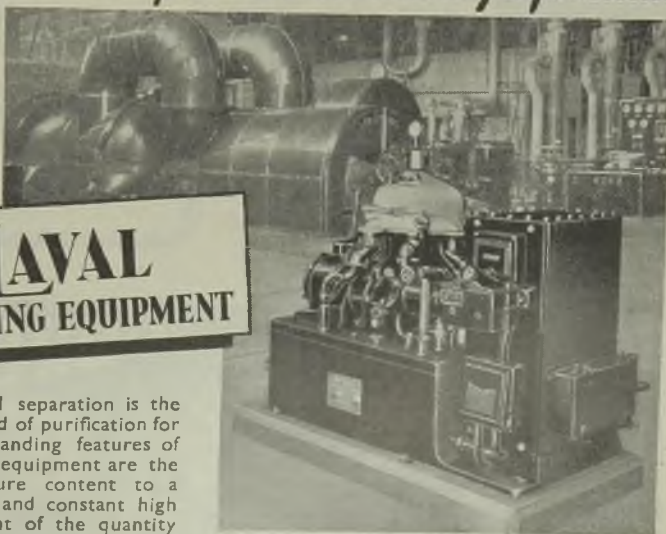
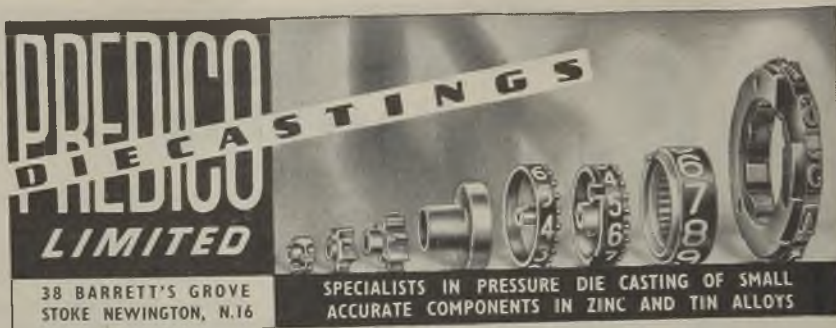


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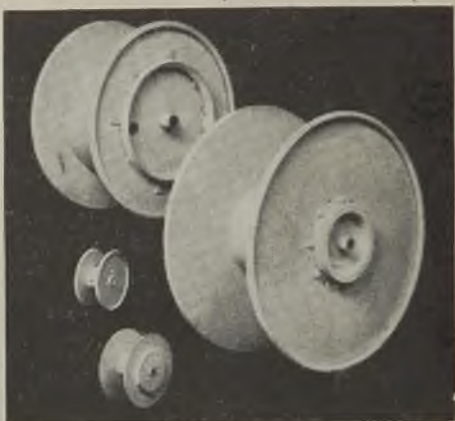
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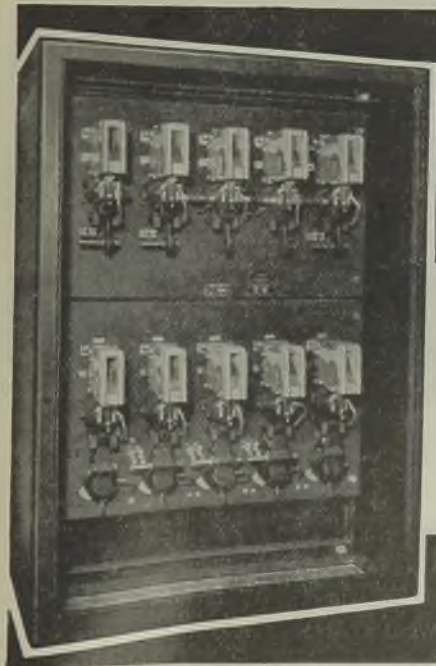
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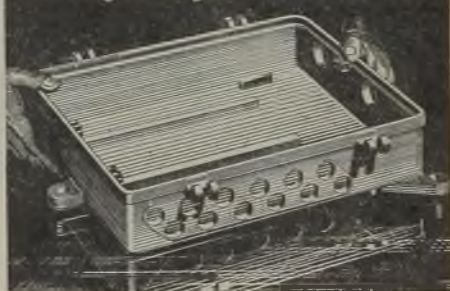
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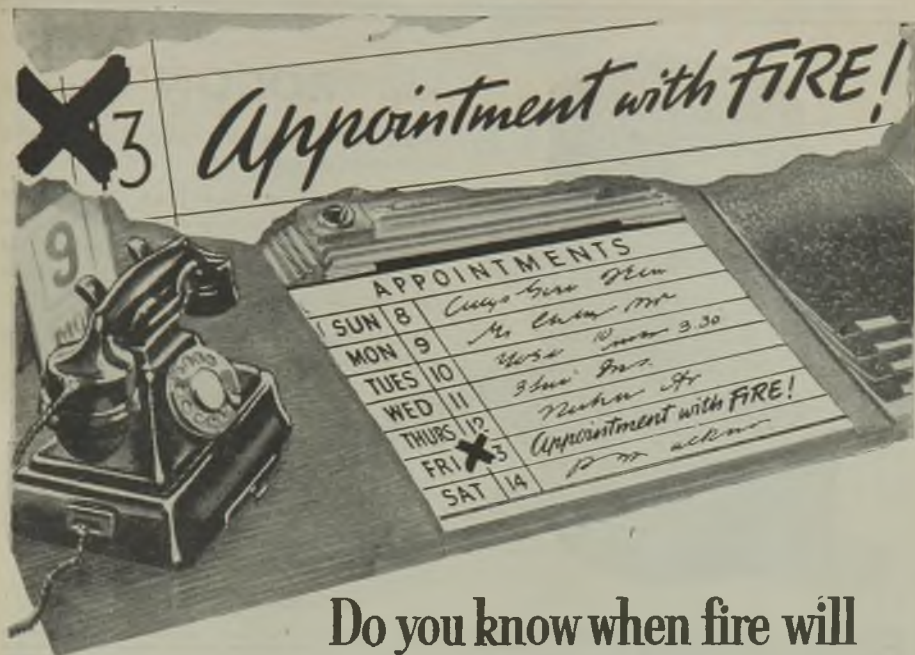


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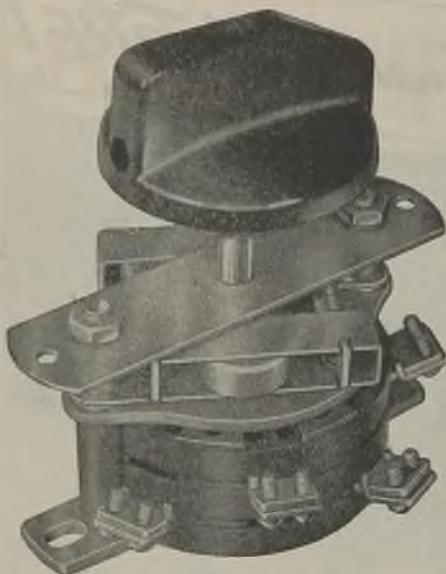
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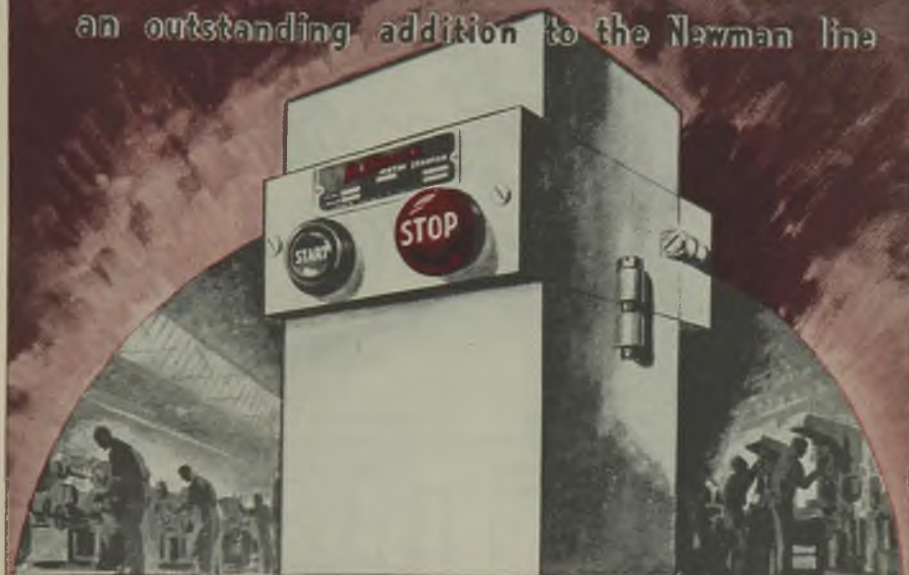
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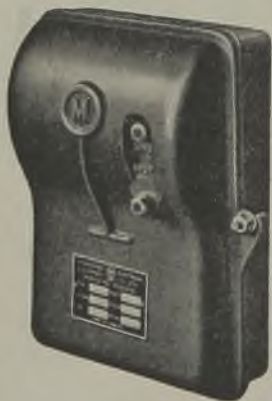
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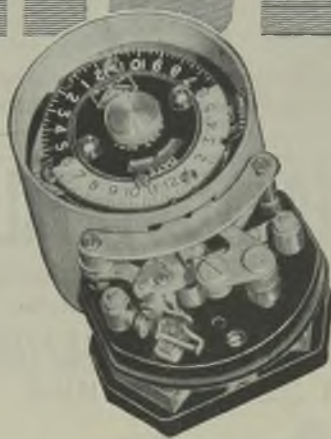
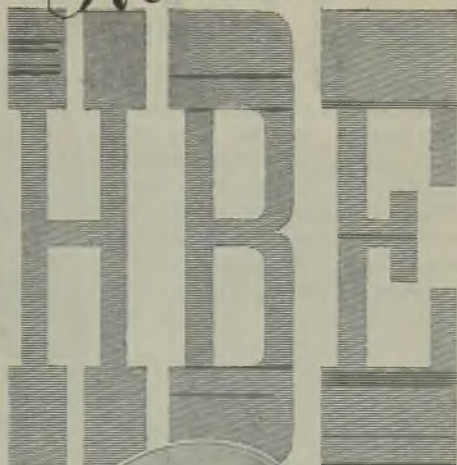
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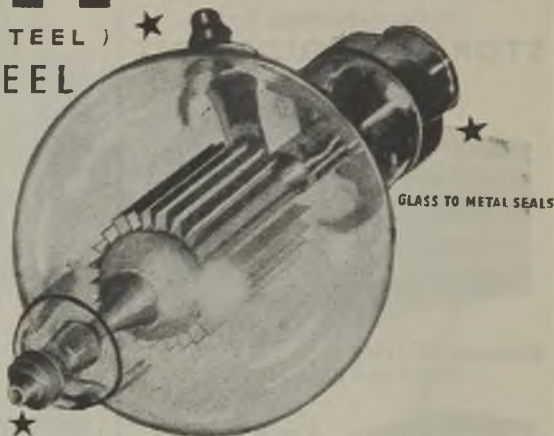
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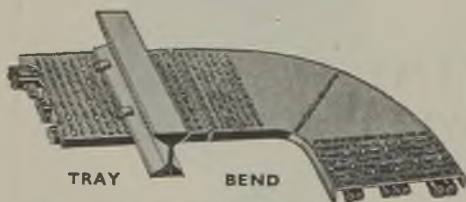
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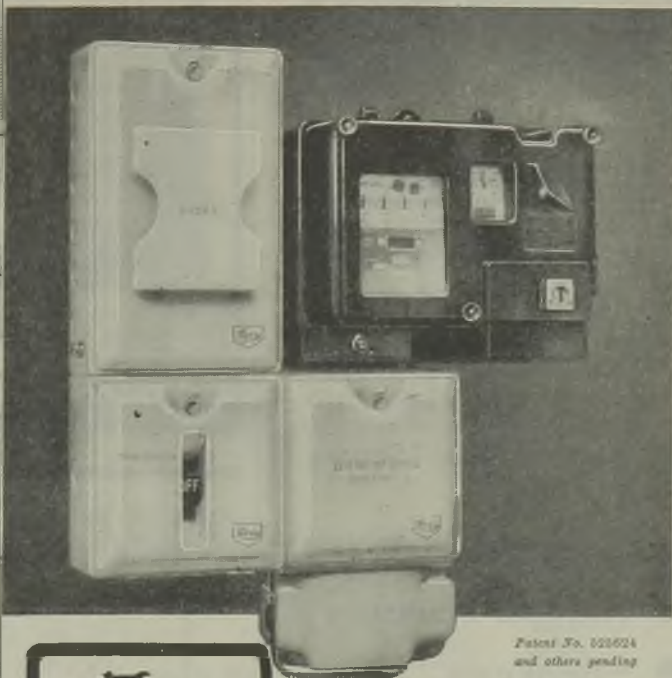
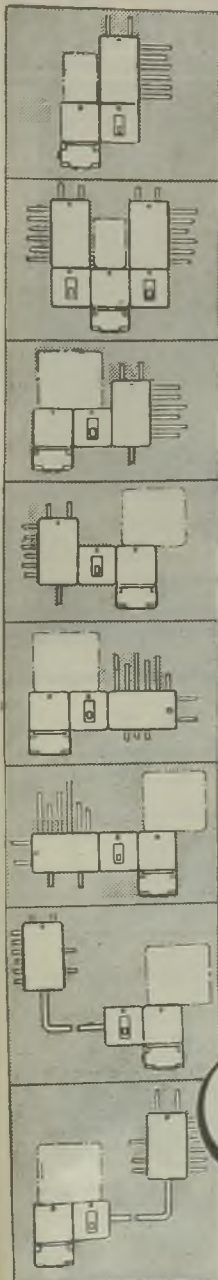
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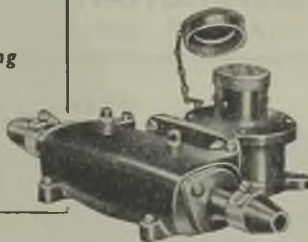
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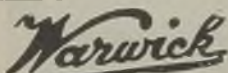
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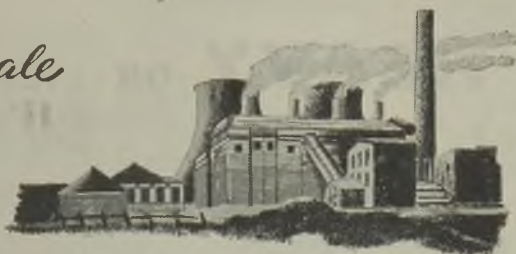
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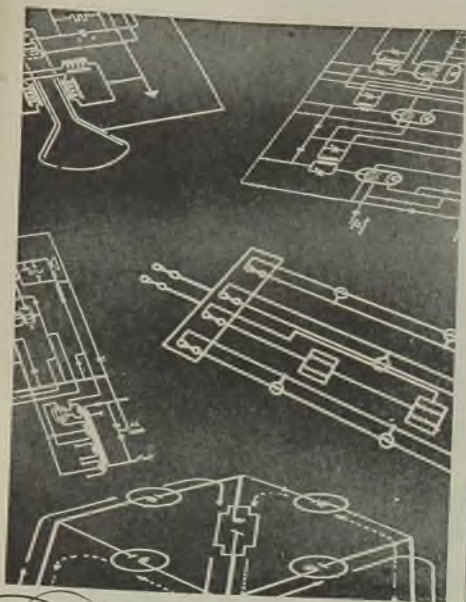
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There's no corrosion of the connections in the Solon Electric Soldering Iron. Tucked neatly away at the end of the handle, the heat can't get at them! Efficient rubber sleeve cord grip prevents sharp bending of the flexible. The heating element is inside the copper bit—giving constant heat; no waste of current; features that make Solon soldering quicker, cleaner, safer! All Solon irons are supplied with 6 ft. of Henley 3-core flexible. Made for the following standard voltages—
200/220, 230/250

Illustration shows standard 240-watt model. Other types and sizes for various specialised jobs.



SOLON
Electric
SOLDERING IRON FOR INDUSTRIAL USE

Made in England

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.

Engineering Dept.

51-53 Hatton Garden, London, E.C.1



***The capital Sigma,
in mathematics, is a symbol
meaning "the sum of"***



***The Philips emblem,
in everyday life, is a symbol
meaning the sum of expert design,
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