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THE TECHNICAL NEWSPAPER OF THE ELECTRICAL INDUSTRY

24 OCTOBER 1947
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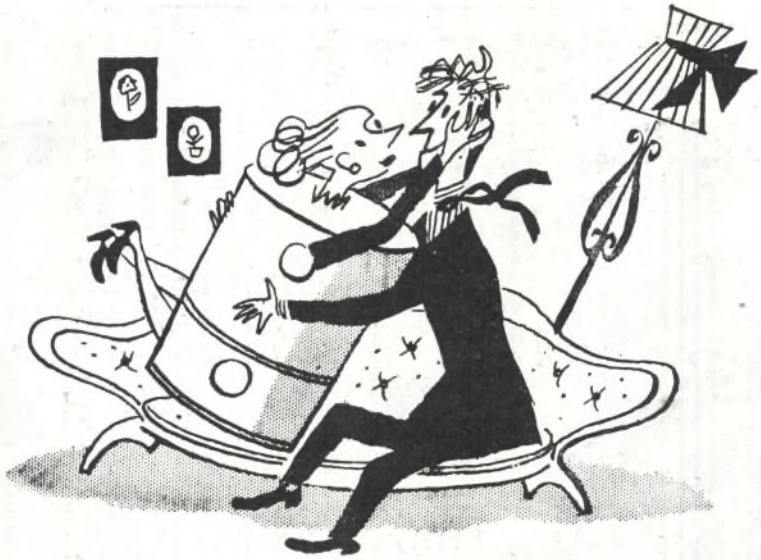

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ELECTRICIAN

ESTABLISHED 1861

Bouverie House - 154 Fleet Street - London EC 4

Telegrams: "BENBROTRIC FLEET LONDON" *Telephone:* CENTRAL 3212 (*16 lines*)

Editor: STANLEY G. RATTEE, A.M.I.E.E. *Publisher and Manager:* JOHN VESTEY

Number 3619 24 OCTOBER 1947 *Vol* CXXXIX *No.* 17

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MIDLANDS OFFICE:
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Telephone: Midlands 0784–5
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116, Hope Street, Glasgow, C.2.
Telephone: Central 3970

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A Dual Problem

THE announcement in THE ELECTRICIAN last week that coal supplies for electricity generation from current output and stock-lifting for the winter 1947/48 will amount to 16.45 million tons—compared with 15.5 million last winter—shows that the supply industry is faced with a dual problem. This, in brief, is to overcome the 2 500 MW gap between demand and generating capacity to meet it, and to restrict coal consumption for steam raising to a figure which will not exceed an average throughout the winter months of 632 692 tons per week.

In order to make up for the deficiency in generating plant, attempts are being made—with up to now indifferent success—to flatten out the national peak demand by load spreading. To keep coal consumption for electricity generation to a figure within that set by the Ministry of Fuel, however, it will be necessary to check electricity consumption, not only at peak periods but throughout the 24 hours of each day. Without any such check the daily demand for current will grow in the natural course of things, and the supply industry will of necessity have to make inroads into those coal supplies at present intended for consumption by industry. In other words, unless the daily national consumption of units is pegged irrespective of load spreading or staggered hours, the consumption of coal by the supply industry will exceed the 16.45 million allocated, and industrial production will in consequence, be starved of its coal to an amount equal to that excess. Of the dual problem of plant deficiency

and coal consumption, the latter is, perhaps, the more difficult to solve. Whereas the former may be overcome by powerless days, extending the working day over twelve or more hours and by other methods, the consumption of coal is governed by the units generated over twenty-four hours. With industry generally required to increase its export drive, it is reasonable to assume that the demand by industry for electricity will grow in step with the success of the national effort. The units generated in the period January-September of this year were already 4.6 per cent. higher than during the same nine months last year, and the coal allocation of 16.45 million tons must therefore, not only be related to this increased demand but also to the as yet unknown demand to be created by the full export drive. In these circumstances, voluntary economy in electricity consumption on the part of the domestic consumer is increasingly urgent, and places upon those making up local fuel saving committees a responsibility which is as yet not in all cases sufficiently appreciated.

Meaford Power Station

IN THE ELECTRICIAN of February 22, 1946, reference was made to the fact that the Meaford A station of the N.W. Midlands J.E.A. was unique inasmuch as the steel frame building would be erected and the four 30 MW turbo-alternators would be installed at the outset, leaving no provision for future extensions within the building. The station is referred to once more, for on Monday the first section was officially opened, and the National Coal Board are contemplating sinking a colliery near the site to raise from 1½ to 2 million tons of coal a year. Coal consumption at the A station when completed will be, it is estimated, 300 000 tons per annum and that at the B station—probably housing four 60 MW sets—is expected to be about 600 000 tons, all of which, if the National Coal Board continue with their sinkings, will be supplied direct from the pit head. Another point of interest is that there is under consideration a scheme for stowing the boiler furnace ash and dust in the waste areas underground. The foundation stone of the main building for the A station was laid in July, 1945, but progress was handicapped by the wet summer of 1946 and the severity of last winter. In spite of these difficulties, however, the complete station is expected to be in full operation by June next year.

Electricity Extension Loans

THE increase in loans sanctioned by the Electricity Commissioners to public authorities, other than the Central Board, during the six months ended September 30, is indicative of the progress being made with the power station extension programmes. The amounts sanctioned, at £54 178 099, include £29 626 722 for generating plant and £9 947 373 for buildings in which to house it. For the period 1946/47 the total value of loan sanctions was £43 978 594, of which generating plant and power station buildings accounted for £19 239 336 and £6 799 906, respectively. These figures when regarded in terms of kW instead of money represent an important and progressive step towards making good the plant-extension leeway lost during the war years, and are a contribution to the efforts being made to reduce the 2 500 MW plant shortage from which the supply industry is suffering. At present prices their purchasing power when translated into capacity value amounts to about 720 MW, if Meaford A is taken as a representative example.

"Report on Electricity"

A FILM bearing this title and produced by the Crown Film Unit for the Economic Information Committee, has this week been shown in some 400 cinemas throughout the country and is destined to be seen at a further 2 600. The purpose of the film is to show the public how the morning and evening peaks are built up, what is being done to avoid load shedding, and how the building of new generating capacity is progressing. Of its type the film is a good one, for, intended for public consumption, it shows the necessity for co-operation of the domestic and non-industrial consumer, and counters the opinion often expressed by the layman that such schemes as the Severn Barrage would, if proceeded with, solve our immediate problems. There is much in the film which could be improved but since it was produced in the commendably short

time of four weeks, it would be unfair to expect perfection. For this lateness in news of the film we apologise—qualified by the fact that the authorities responsible for seeking the co-operation of the Press, omitted to take into their confidence that section of it best able to suggest a "tie-up" with the electricity undertakings in those towns where the film is being shown. A suggestion that might have resulted in local electricity showrooms staging in their windows displays which supported the lesson of the film.

Sir Leonard Pearce

BY the death of SIR LEONARD PEARCE on Monday, not only has the London Power Company lost an outstanding engineer, but so too has the electrical industry. Quiet in manner, Sir LEONARD was last January awarded the Faraday Medal for his contributions to engineering, and among the many monuments to his pioneering spirit are the Barton power station, the design of which created a standard never before achieved in this country, and, of course, the Battersea station. His work as an Electricity Commissioner in 1925 was cut short the following year, when he joined the London Power Company, but he resumed duty as a Commissioner from 1940-45, while retaining his office with London Power. He was a most active member of the I.E.E., of which he was a vice-president in 1920, while the I.M.E.A. also had the advantage of his wide experience, which ranged from service with the B.I. Steam Navigation Co. to the Central London Railway, from the B.T-H. Co. to the Metropolitan E.S. Co.

Overseas Trade Results

THE effort which the electrical industry is putting into the export drive has been in evidence for some time; never, however, have the results been more indicative of success than during the first three quarters of this year. This is shown by the fact that shipments of electrical goods and apparatus between the beginning of the year and the end of September, at £35 050 566, were greater by £8 954 033 when compared with the same period last year, and higher than the 1938 figures by £24 842 007. During the month of September, shipments were valued at £4 823 763, compared with £2 886 753 in September, 1946, and the 1938 monthly average of £1 134 284. Bearing in mind the fact that the above figures make no allowance for the shipment of heavy electrical machinery—of which there were increases in all cases—the industry has set an export example which the rest of the country would do well to follow. Detailed and tabulated figures of both imported and exported items will be given in the next issue.

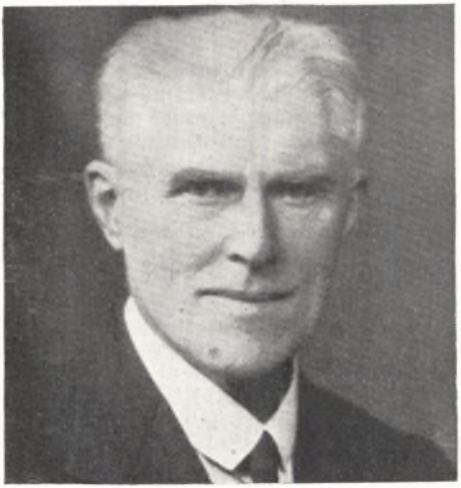
Load Spreading

THOUGH it is as yet too early to expect full results of load spreading to show themselves in any substantial reduction in the national peaks, the curve for the second Tuesday since the load-spread started, and reproduced in this issue, is of interest. Among other things it shows that there was, on October 14, a rise in national demand of about 1 000 MW between 6.30 and 7 p.m., when compared with that on September 30, while the valleys in the curve in relation to the hillocks indicate that the overall consumption of electricity was appreciably higher than on the reference date.

Electrical Anæsthesia

DANGERS attendant upon the use of anæsthetics for surgical operations may be eliminated if an electrical method of inducing anæsthesia, developed by two medical students at Melbourne University, is proved to be applicable to general practice in hospitals. It is stated that experiments carried out have demonstrated that human beings and animals can be put to sleep for long periods without any ill-effects upon the respiration or the heart. The apparatus is connected to the patient by means of electrodes, one of which is placed on the forehead and the other in contact with the lower part of the back. Gradually the patient becomes drowsy, falls asleep and does not awaken until the current is switched off. In the hospital tests the use of 120V and 100 current impulses a second did not produce any harmful effects. Developed from a pulse generator designed by the Australian Council for Scientific and Industrial Research, an unsynchronised multivibrator oscillator was employed.

Portrait—Prof. C. L. Fortescue



Prof. Fortescue must be remembered by many of our senior naval officers as their instructor in mechanical and electrical sciences in the Gunnery and Torpedo Schools at Portsmouth between 1906 *and* 1911. *Many will have met him, too, in the Physics Department of the Royal Naval College, Greenwich, where he gave instruction in all branches of electrical engineering, including wireless telegraphy, until* 1922. *Since then his main activities have been centred about university life, first as Professor of Electrical Engineering at the City and Guilds College until* 1946, *and now as Emeritus Professor of Electrical Engineering of the Imperial College, University of London. During this time, more than* 1 500 *university students must have passed through his hands and entered the electrical engineering profession.*

THE 16 years from 1906 to 1922, which Prof. C. L. Fortescue spent in the service of the Royal Navy, was a period in which marine wireless telegraphy grew from an experimental stage to high-powered round-the-world signalling, and from spark to the valve transmitter. With this evolution, he was closely associated.

Born in Barnack, Northants., in 1881, Cecil Lewis Fortescue entered Oundle School in 1896. One year later, Marconi—seven years his senior—was demonstrating his apparatus to British Government officials, and it is probable that by 1900, when Fortescue went up to Christ's College, Cambridge, he took with him an already awakened interest in the new science.

Interspersed between rowing with some distinction—two years in the University trial eights—he studied natural science, and, in 1903, gained the First Class Mechanical Sciences Tripos. Post-graduate training at the old Siemens Dynamo Works, Stafford (now the English Electric Co.) followed, and after a year spent on the technical staff of the same firm, he went, in 1906, to H.M. Gunnery and Torpedo Schools, Portsmouth, as an instructor of naval officers in mechanical and electrical science.

The next step was in 1911, when he became, at the early age of 30, Head of the Physics Department at the Royal Naval College, Greenwich, dealing, amongst other branches of electrical engineering, with wireless. For the whole of the war period, 1914-18, he was attached to the Signal School, Portsmouth, for research and development work in radio communication, and he played a significant part in demonstrating the value of and finally introducing valves into naval equipment.

After the war, he returned to Greenwich for a further four years, then took up the appointments for which he is known by countless electrical engineers throughout the Empire—namely, Professor of Electrical Engineering at the City and Guilds College until 1946, and then Emeritus Professor of Electrical Engineering of the Imperial College, University of London. His theories of technical education could be summed up as a profound conviction in the importance of the fundamentals, a principle which, as numbers of ex-students would testify, he has long upheld.

A member and past-President of the I.E.E., a member of the Institution of Civil Engineers and of the Royal Institution, Prof. Fortescue is, in addition, a Fellow of the Physical Society and of the Institute of Physics.

In his younger days, his chief outside interests were open-air sports, including, of course, rowing, and he was a pioneer motorist. Now, his favourite relaxation is agriculture, a less exact science than those he has taught with such distinction.

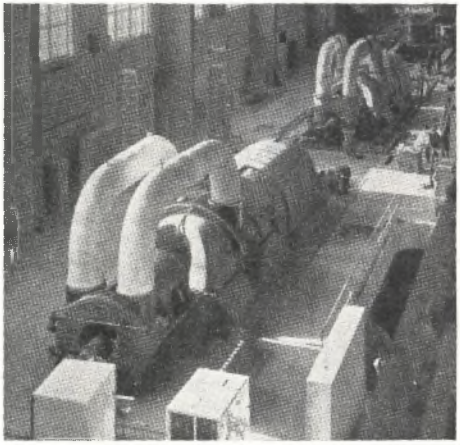
Meaford Power Station

120 MW Plant of the N.W. Midlands J.E.A.

THE new 120 MW Meaford "A" station of the North-West Midlands Joint Electricity Authority was formally opened on Monday by Mr. Emanuel Shinwell, late Minister of Fuel and Power. Generation is expected to commence from one 30 MW set next month and the whole station is scheduled for completion in June, 1948

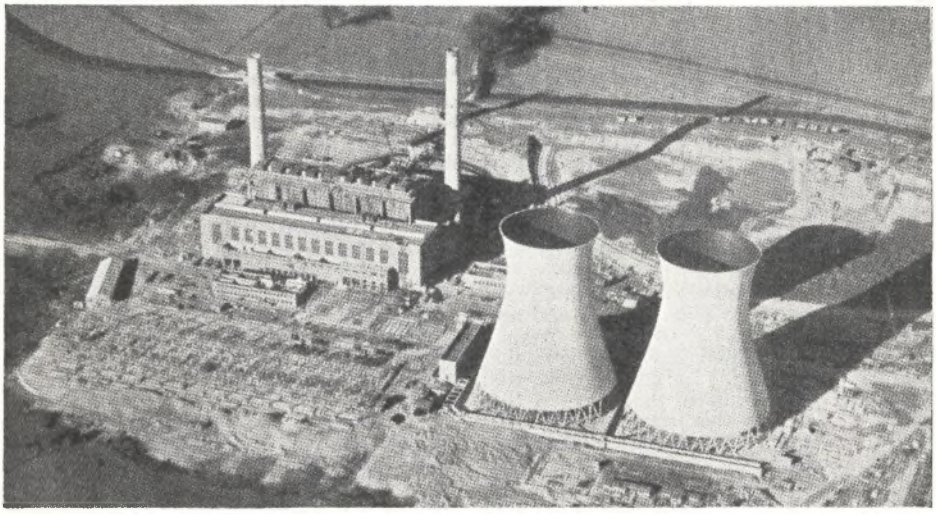
Remarkable for the fact that the building has been erected as a complete structure, leaving no provision for future extensions, the Meaford "A" station is situated about seven miles south of Stoke-on-Trent and is bounded on the east side by the L.M.S. railway and the Trent and Mersey canal and on the west by a projected main trunk road. The first proposals for a new station in the Authority's area were made in 1938, and the present station was started, after two sites had been rejected, in July, 1945. The complete installation will consist of four 30 MW turbo-alternators, steamed by six pulverised fuel-fired boilers. Based on an annual load factor of 55 per cent., the output from the completed station is expected to be 550 million units per annum, all of which will be fed to the grid via a newly-constructed 132 kV switching station on site.

The main buildings consist of a boiler house and turbine house arranged parallel with the railway sidings, and a 132 kV sub-station, occupying an area of about 850 ft. long by 475 ft. wide, is situated about 200 ft. west of the turbine house. There are also two cooling towers and a circulating water pump house, as well as an office block. Proposals have been made for the erection of a further station, of 240 MW capacity, adjacent to the present site.



Two of the four 30 MW turbo-alternators

The buildings are steel-framed struc-



An Aero Pictorial view of the Meaford station, taken in June of this year

tures, clothed in brickwork, and there is a 325 ft. chimney at either end of the boiler house. Coal is received at two points on the railway sidings and transferred to the boiler house bunkers by a belt conveyor system capable of handling 150 tons per hour. Provision has also been made for the reception of road-borne coal.

Mr. F. Favell, chief engineer and manager of the authority

Inside the boiler house, six Babcock and Wilcox high-head type pulverised fuel boilers are installed, each rated at 240 000 lbs. of steam per hr., M.C.R., and generating steam at 650 lbs. per sq. in. and a temperature of 850° F. Each boiler is equipped with two forced draught fans, two induced draught fans and two primary air fans, the forced draught fans drawing warm air from inside the boiler house. Steam is fed from the boilers into a common header fitted with valves to isolate individual units.

The turbine house installation consists of four G.E.C. 30 MW turbo-alternators, generating at 11.8 kV and running at 3 000 r.p.m. The turbines are arranged longitudinally and parallel with the length of the main buildings and are of the two-cylinder impulse-type with double flow low-pressure cylinders. Twin condensers on each machine provide a cooling surface of 32 000 sq. ft., designed to give a vacuum of 28.5 in. when supplied with 1 260 000 galls. of water per hr. at 70° F. The two 250 ft. reinforced concrete cooling towers will handle up to 2 800 000 galls. of water per hr., providing a temperature drop from 82.5° F. to 70° F. Each tower is divided down the centre to enable one-half to be operated independently of the other.

Sewage effluent is used for the make-up and purge water, and is obtained from a sewage works about two miles from the station. Four remote controlled pumps, each rated at 165 000 galls. per hr., convey the effluent through two 15 in. pipes.

The alternators are provided with direct-coupled exciters and pilot exciters and are connected through 33 000 kVA transformers situated outside the building to the 132 kV switchgear. In addition to the four large transformers, there are in the whole station 24 other transformers with outputs ranging from 30 kVA to 5 000 kVA for the auxiliary plant. Stand-by power is supplied by a 3 000 kVA transformer fed from a nearby 33 kV sub-station on the Authority's e.h.t. distribution network.

Main switching is carried out at 132 kV in the outdoor sub-station. The switchgear is of the remote electrically-operated bulk oil type, with a rupturing capacity of 1 500 MVA, and the sub-station includes, in addition to the alternator switchgear, circuits controlling the supply to various C.E.B. transmision lines. The alternator terminal switchgear is of the indoor compound and oil-filled metal-clad remote electrically operated type, the switchgear for each generator being housed separately.

Speaking at the opening ceremony, the Lord Mayor of Stoke-on-Trent paid tribute to the excellent achievement of Mr. F. Favell (chief engineer of the N.W. Midlands J.E.A.) and all others concerned with the planning and construction of the station which, he thought, considering the unfavourable weather, had been completed in very good time. Responding, Mr. Shinwell said that one of the interesting features of the station was a proposal of the National Coal Board to sink a colliery in the neighbourhood, so that coal might be delivered direct.

The main contractors included: W. H. Allen, Sons and Co., Ltd. (circulating water and sewage effluent pumps); British Insulated Callender's Cables, Ltd. (cables and accessories); Babcock and Wilcox, Ltd. (boilers, steel-framed buildings, piping, cranes and coal handling plant); Davenport Engineering Co., Ltd. (cooling towers); General Electric Co., Ltd. (turbo-alternators, feed heating plant, condensing plant, 132 kV and auxiliary switchgear and 132 kV and lower voltage transformers); and Hick, Hargreaves and Co., Ltd. (central evaporating plant).

The Erne Scheme

GOOD progress is reported on the Erne hydro-electric scheme, a £3 000 000 project which, it is estimated, will provide an annual output of 200 million units. The constructional work is at present being carried out by a labour force of 1 000, and the Eire Electricity Supply Board hope that the first units will be in operation during 1950.

The scheme involves the construction of two hydro-electric stations, one at Cliff, near the Northern Ireland border, and the other at Cathleen Falls near Ballyshannon. To provide storage for the Cathleen Falls station, an area of about 1 000 acres will be submerged, and a 100 ft. dam is to be built. The initial installation at the station will be two 20 000 kW turbo-alternators; a third set will be added later.

At Cliff, a dam 60 ft. high will raise the summer level of the Erne by about 40 ft., and the station will comprise finally two 10 000 kW sets, of which one only is to be installed at present. Part of the output from the stations will be transmitted to Northern Ireland.

STAR VOLTAGES

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

IF three impedances are connected in star to the three lines of a three-phase supply system, the vectors of the voltage drops in these impedances will be the lines joining the angular points of the triangle of line voltage vectors with some other point. If the three impedances have equal phase angles, this point will lie within the line voltage vector triangle; otherwise the star point may have any position without the triangle. There is no upper limit to the arithmetical sum of three star voltages so derived, but this sum has its least value when the vectors of the star voltages have equal phase differences of 120°. One set of star voltages has the unique characteristic that the vectors representing them have a zero resultant, and this set is determined by a start point which is the centroid of the line voltage vector triangle. All other systems of star voltages have a resultant or residue, which is three times their zero sequence symmetrical component.

Objectively, the centroid star voltages are the pressure drops on three star connected impedances of equal ohmic values and phase angles. The centroid of a line voltage vector triangle is the intersection of the three medians. If an auto-transformer with a mid-point tap is connected to two lines of a three-phase supply, the vector of the voltage between the tap and the third line is represented by the corresponding median of the line voltage vector triangle. This voltage is, therefore, in phase with the corresponding centroid star voltage and is $1\frac{1}{2}$ times this voltage in magnitude. If the line voltages of a supply are unbalanced owing to the flow of unbalanced currents in a 3-wire load through equal line impedances from a balanced voltage source, it is easy to see that the centroid star point of the unbalanced line voltage system has the same potential as the physical neutral of the source, where the voltages are balanced.

In Fig. 1, O_1A, O_1B and O_1C are the vectors of a system of star voltages derived from the supply, the line voltage vector triangle of which is ABC. O is the centroid of this triangle. The line OO_1, joining the centroid to the star point O_1 is the zero sequence component of the system O_1A, O_1B, O_1C, for, if a vector equal to and in phase with OO_1 is subtracted from each of the star voltage vectors O_1A, O_1B and O_1C, a reduced system O_1A_1, O_1B_1 and O_1C_1 is obtained, which, it is evident from the geometry of the figure, is identical with the system of centroid star voltages OA, OB and OC, free from residue and from a zero sequence component. It therefore follows that any system of star voltages derived from a system of balanced line voltages must be compounded of a zero and a positive sequence component only, and can contain no negative sequence component, for the centroid star voltages of a balanced system are themselves balanced.

The three systems of star voltages of a three-phase supply of the greatest practical

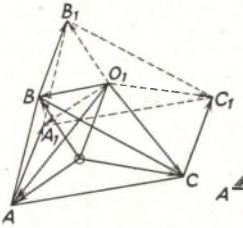


Fig. 1

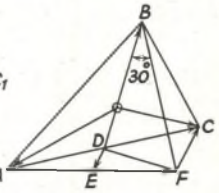


Fig. 2

importance are, first, the centroid voltages and the median voltages proportional to and in phase with them; these are used for reactive measurements. Secondly, the voltages from lines to earth, the zero sequence component of which depends upon the incidence of an earth fault; and, thirdly, the supply star voltages of a 4-wire system. Either of these two latter systems may contain a zero sequence component.

This component of the line-to-earth voltages of a high pressure system is generally measured by means of a star open-delta voltage transformer. It could also be measured as the voltage difference between earth and an artificial centroid neutral point. A stable centroid neutral can be obtained by two auto-transformers, one with a mid-point tap giving a median voltage, and the other with a one-third tap, energised by this median voltage. The potential of the tap on the second transformer will not be materially affected by the current taken by a voltmeter or relay, responsive to the zero sequence component. The centroid neutral formed by three equal star connected impedances is not stable, as the star point potential is altered if current is taken from it. The reading of a voltmeter connected between such a star point and earth is, however, always proportional to the zero sequence component of the line to earth voltages, for the instrument current is equal to this zero

sequence component divided by the vector sum of the voltmeter impedances and the parallel impedance of the three components by which the centroid neutral is obtained.

Unbalanced line voltages always give unbalanced centroid star voltages and the unbalance characteristics of the star voltages relative to those of the line voltages can easily be worked out. Fig. 2 gives the well-known geometrical construction for obtaining the positive and negative sequence components of the unbalanced line voltage system represented by the triangle ABC. AC is bisected in D, and on the median BD a 30° right-angled triangle BDF is described. AF and FC are respectively, the positive and negative sequence components of the line voltage, the vector of which is AC. OA, OB and OC are the centroid star voltages, and as

$$DF = \frac{BD}{\sqrt{3}} \text{ and } OB = \frac{2}{3} BD,$$

$$OB = \frac{2}{\sqrt{3}} DF.$$

If DE is parallel to CF, then it is seen that the vector DF is the resultant of $\frac{1}{2}$ CF and $\frac{1}{2}$ AF, that is of one-half the positive sequence component of AC and one-half the reversed negative sequence component of AC. The positive sequence component of the centroid star voltage OB is therefore $\frac{1}{\sqrt{3}}$ times the positive sequence component of the line voltage AC and leading 90° in phase; the negative sequence component of the OB star voltage is $\frac{1}{\sqrt{3}}$ times the negative sequence component of AC but lagging 90° in phase. Thus, while both positive and negative sequence components of the centroid star voltage are $\frac{1}{\sqrt{3}}$ times those of the line voltages in magnitude, the direction of the negative sequence component of the star voltages is relatively reverse to that of the line voltages.

This conclusion explains the nature of the possible errors when the reactive component in an unbalanced three-phase, 3-wire supply is measured by means of a three-phase meter energised by median voltages, or by any voltages nominally in phase with and proportional to these voltages and derived by means of auto-transformers. With unbalanced voltages and unbalanced currents, the total VAr in the load is the sum of the positive and negative sequence VAr values. A meter measuring lagging reactive consumption will correctly respond to positive sequence VAr if one of its elements is energised by the median voltage BD, for the positive sequence component of this voltage lags that of the AC voltage by 90°. The negative sequence component of the BD voltage will, however, lead the corresponding sequence voltage of AC by 90°, so that the response of the meter to the negative sequence VAr will be in the wrong sense, and the error in the rate of registration will, with unbalanced voltages, correspond to twice the negative sequence VAr. When both current and voltage unbalance are small, the negative sequence VAr will be a small quantity of the second order, and the possibility of error in the method of measurement may be ignored. If, however, current unbalance is considerable, as with welding supplies without static balancing equipment, the inherent errors may exceed the limits usually assigned for accurate methods of measurement.

Electricity Economy

DESIGNED so to stress the relationship between domestic and industrial use of power that it is made clear to the non-technical public that voluntary saving in the home can appreciably assist factories to maintain full production, a fuel economy exhibition was declared open by Lord Citrine, chairman of the B.E.A., at the Science Museum, South Kensington, on Tuesday. The exhibition is free, and will run for three or four months.

By means of models and animated diagrams, the exhibition emphasises such points as the equivalence of one bar of an electric fire to a one H.P. motor, and the importance of the maximum domestic economy at peak hours in order to avoid load shedding.

On a series of wall displays, the power used in an average household by domestic appliances is calculated in terms of the weight of coal burned in the course of a year. The displays make it clear that electric fires and immersion heaters are energy, while lighting is a minor offender. responsible for the greatest expenditure of

Performing the opening ceremony, at which Dame Caroline Haslett was also present, Lord Citrine stated that consumption of electricity in this country was now five per cent. greater than it was at the same time last year. It was reasonable to assume that some use of electricity was a direct result of the shortage of coal in the home, but there was, at the same time, something approaching a prodigal waste of electricity in some quarters. It would be five years at a minimum before generating capacity was sufficient to meet the maximum demand, and there would have to be even more load shedding and cutting this winter than last, unless demand was reduced.

Correspondence

The Editor welcomes the free expression in these columns of genuine opinions on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression

Plugs and Sockets

[To the Editor]

Sir,—" Supervisor " has invited comments on his article on B.S. 1363 in The Electrician of September 26, and while I heartily agree with his remarks would add the following:—

1. In addition to the disadvantages to which reference is made, the B.S. 1363 plug suffers from the serious handicap that it has to be taken to pieces to renew the fuse and may not be assembled correctly.

2. That the DS plug has been in large scale use for over two years and suffers from none of the disadvantages to which attention has been drawn.

Yours faithfully,
Frank R. C. Roberts,
Engineer and Manager,
Spalding Electricity Department.

E.C.A. Membership Qualifications

[To the Editor]

Sir,—In The Electrician of October 10 was published a letter from Mr. John Ferguson, under the heading " Plugs and Sockets," in which he commented on the qualifications of members of various organisations concerned with the electrical installation industry to carry out installation work. Mr. Ferguson would have been wise had he ascertained the facts before plunging into print.

I would deal first of all with his statement that " the fact that a man is a member of the I.E.E. or the E.C.A. does not mean that he is skilled." It may, perhaps, interest Mr. Ferguson to know that every member firm of the Electrical Contractors' Association is required to demonstrate, before admission, that adequate technical qualifications are possessed to carry out electrical installation work; since it is obvious that an executive official must be in a position adequately to supervise the work carried out by the operatives. Furthermore, the form of application for membership, completed by every applicant, requires details of the training of qualified officials from the apprenticeship stage onwards; and if a member firm loses its qualified executive, then membership of the E.C.A. automatically ceases. This brief statement of fact should, I think, be sufficient to indicate the extent to which Mr. Ferguson's statement conflicts with the truth.

So far as the third paragraph of the letter under reply is concerned, I can assure Mr. Ferguson that if at any time the slightest suspicion arose that any member of the association was guilty of carrying out work of the nature to which he refers, an immediate inquiry would be instituted by my Council. In this respect, I would point out that a guarantee scheme is in existence by which the association automatically guarantees the work of its members—surely a reasonable proof of the faith of the association in its members' integrity and technical ability.

Finally, the E.C.A., in common with other organisations in the electrical industry, has for many years pressed for the compulsory registration of both electrical contractors and operators.

It is the opinion of my association that only by the statutory registration of both contractor and operative can the public be protected against the type of workmanship to which Mr. Ferguson takes exception.

Yours faithfully,
L. C. Penwill,
Director and Secretary,
The Electrical Contractors' Association.

Prelude to Prosperity

Produced by the Film Producers' Guild for the Central Electricity Board, the film " Prelude to Prosperity," was given a pre-view on October 17, and is intended for showing before selected audiences. Distribution of the film is in the hands of the E.D.A. and interest is expected to be widespread. Lasting about 45 minutes, the film illustrates the progress of electrical development in this country from the days when the Crompton-Ferranti controversy held sway, deals with the conception of the grid and the part it played during the war, and explains the reason for and the effects of load shedding. The film has good entertainment value, its photography is of a high standard and its purpose is to make clear the close relation between the supply of electricity and future prosperity. With what success it will convey its message remains to be seen, for time alone will provide the answer. Meanwhile, the industry should do all in its power to promote meetings whereat to show the film, for only in that way will its objective be attained and the initiative of the Central Board reap its reward.

Electrical Personalities

We are always glad to receive from readers news of their social and business activities for publication in this page. Paragraphs should be as brief as possible.

MR. R. P. HORLOCK, formerly manager of the Leeds sub-office of the Metropolitan-Vickers Electrical Co., Ltd., was appointed manager of the company's district office at Sheffield on October 1, when Mr. R. G. MacLaverty relinquished his duties. Mr. W. H. Ball has been appointed to succeed Mr. Horlock as manager of Leeds sub-office. Mr. MacLaverty, who is remaining with the company for consultation until the end of the year, joined its predecessor, the British Westinghouse Electrical and Manufacturing Co., at Trafford Park, on June 1, 1903. He became manager of the Sheffield district office in August, 1919, and there completed his 44th year of service. Mr. Horlock went to M-V. as a college apprentice in 1928, after obtaining an honours degree at the Imperial College of Science and Technology, City and Guilds (Eng.) College, and later was associated mainly with the production of rolling mill equipment and work on manufacturers' committees. He became manager of the Leeds sub-office in 1941. Mr. Horlock is vice-chairman of the I.E.E. North Midland Centre. Mr. Ball started his engineering career in 1912 as a student at the Dick Kerr Works at Preston, and after naval service in the first world war, he rejoined the English Electric Co., and then gained further experience with the Swedish General Electric Co. In 1927 he joined the motor sales department of Metropolitan-Vickers and five years later was transferred to the company's Manchester office.

MR. R. P. HORLOCK

MR. R. G. MACLAVERTY

MR. W. H. BALL

MR. T. W. J. TEMPLE has joined the staff of the Newcastle-on-Tyne district office of the British Thomson-Houston Co., Ltd. Mr. Temple is an ex-student apprentice of the company, and before the war was at the Sheffield office. During the war he served in the technical branch of the R.A.F., attaining the rank of wing commander, and on rejoining the company in February, 1946, he was transferred to the Leeds office.

With an aggregate of 460 years' service, nine employees of B. I. Callender's Cables Ltd., were presented with wallets, containing a pound for every year of service, by Sir Alexander Roger, chairman of the company. Eight of the recipients had completed fifty years and one sixty years' continuous service. The photograph, reproduced on this page, shows Sir Alexander Roger making the presentations in the board room of Helsby works on October 9 to Messrs. Atherton, Barber, Oldfield, Vickers, Worrall, Norcross, Ainsworth and Lockett, all of the Helsby works, and Mr. R. L. Thomas of Prescot. Six other men at the Helsby works had previously qualified; the fourteen employees recording a total of 735 years—an average of 52½

SIR ALEXANDER ROGER *presenting long service awards to employees of B.I. Callender's Cables Ltd.*

years. In the next twelve months a further twelve will complete fifty years' service.

MR. HAROLD HOBSON, ex-chairman of the Central Electricity Board, is in Canada on a business trip, and a report from Toronto suggests that he may become chairman of the Ontario Hydro-Electric Commission.

SIR FRANK MEARS, who is a member of the Amenity Committee under the North of Scotland Hydro-Electric Development Act, has been appointed chairman in place of Col. the Hon. Ian Campbell, who has resigned.

MR. F. H. S. BROWN, aged 36, assistant constructional engineer to the West Midlands J.E.A., has been selected by the Electricity Committee for appointment as chief technical engineer in the Liverpool electric supply department.

MR. T. McGREEVY, of Oldham (Lancs.) Technical College, has been appointed head of the Electrical Engineering Department at Portsmouth Municipal College. He is chairman of the East Lancashire division of the Association of Teachers in Technical Institutions.

LT.-COL. H. A. P. DISNEY, director of Administration, British Export Trade Research Organisation, who gave an informal talk to Press representatives in the library of B.E.T.R.O., in London on October 16, on the subject of the organisation's new drive to sell British "know-hows" for dollars, was at one time a director of Standard Telephones and Cables, Ltd., Kolster Brandes Ltd., Standard Radio Relay and Services Ltd., and International Telephone and Telegraph Co., Ltd. (1919-1932). He joined the staff of E. K. Cole, Ltd., in 1932 and left there to become Director of Aeronautical Production, Air Ministry, (1936-38). Later he was Director of Armament and Equipment Production until 1940.

THE DUCHESS OF KENT, during her visit to Southend-on-Sea on Saturday, visited the Ekco radio, plastic and lighting works at Prittlewell. Although the firm is on a five-day week (except in the plastic department), hundreds of staff and workers came in specially to see the Royal visitor, who was introduced by the Mayor of Southend to the board and management, and to a man and woman selected by ballot.

More than 200 persons attended the social centre at the Chelmsford works of Crompton Parkinson, Ltd., on Saturday, October 4, for the annual prize-giving and parents' day in connection with the occupational training scheme. Mr. E. H. L. Cooper, general manager of the works, presided for the prize-giving. Mr. R. M. Edyvean, works' education officer, said the total number of boys in the scheme had increased to 147. He paid tribute to the co-operation and assistance received from Dr. W. Taylor, and members of his staff at the Mid-Essex Technical College. Prizes and certificates of training were presented by Dr. B. E. Lawrence, county education officer, who commended the initiative shown by the company. The Cromptonian Association Scholarship was handed to departmental apprentice A. F. Whymark by Mr. T. H. Windibank, works' director. Dr. W. Taylor, Principal of the Mid-Essex Technical College, stated that he and all members of his staff were prepared to co-operate in every way.

Obituary

MR. C. B. GABRIEL, a director of Gabriel, Wade and English, Ltd.

MR. E. E. JOLLY, chief electrical engineer and manager of the Bethnal Green electricity undertaking, in Bethnal Green Hospital, on October 17, after a short illness, aged 52 years. Before going to Bethnal Green as borough electrical engineer in 1935, Mr. Jolly was deputy electrical engineer and manager to the Ilford Corporation. He was a member of the I.E.E., an associate member of the I.Mech.E., and also an active member of the British Electrical Development Association, having served up to the time of his death on the Greater London Committee and the Domestic Installations and Appliances Committee.

MR. F. SANDLAND HAYBURN, formerly managing director of the Marconi International Marine Communications Co., Ltd., on October 14, aged 69 years. Born at Dover, Mr. Hayburn was educated at the Musselburgh Grammar School, George Heriot's School and the Heriot-Watt College, Edinburgh, of which he was a medallist. He spent ten years in the telegraph branch of the Post Office and was the first British Government telegraph engineer in the Orange Free State after the South African war. Mr. Hayburn joined the Marconi International Marine Communication Co., Ltd., in 1904, and during the 1914-18 war was in control of wireless on neutral ships. He was appointed assistant general manager of the Marconi Marine Co. in 1922, manager in 1925, general manager in 1927, director and deputy managing director in 1928, and managing director in 1933. On December 31, 1935, Mr. Hayburn relinquished his position as managing director of the Marconi International Marine Communications Co. to become foreign envoy of the Marconi group of companies. He was for a time vice-president of the Comite International Radio Maritime. Mr. Hayburn relinquished his active interests in the

Marconi companies in 1944, but continued to act as a consultant until his death.

SIR S. LEONARD PEARCE, engineer-in-chief of the London Power Co., on October 20, aged 74 years.

SIR LEONARD PEARCE

He was a pioneer in all branches of the electricity supply industry and his design of the Barton generating station, Manchester, created a standard never before achieved in this country and revolutionised long accepted principles. Later he was responsible for the engineering design and operation of the London Power Co.'s Battersea power station, and for the mechanical and engineering design of the proposed new generating station of the London Electric Lighting Co., Ltd., at Bankside. In January last he received from the I.E.E. the Faraday Medal for his outstanding contribution to the advancement of engineering practice and notable achievements in electrical engineering. Sir Leonard Pearce was educated at Bishops Stortford College and Finsbury Technical College. After serving his pupilage with J. G. Statter and Co. at West Drayton, and Thomas Richardson and Sons, of Hartlepool, he joined the British India Steam Navigation Co., and two years later became an assistant engineer to the Metropolitan Electricity Supply Co. Following an appointment with the British Thomson-Houston Co., Ltd., he became in 1900, superintendent engineer at the power station of the Central London Railway. In 1901 he was appointed deputy chief electrical engineer at Manchester and in 1903 was selected for the position of chief engineer to Manchester Corporation electricity undertaking. In 1925 he became an Electricity Commissioner, and in the following year resigned to take up the appointment of engineer-in-chief of the London Power Co. He again served as an Electricity Commissioner from 1940-45 whilst retaining his position with the London Power Co. Sir Leonard Pearce became an associate of the I.E.E. in 1898, and a member in 1904. He was chairman of the Manchester local section in 1905-06, and served as a member of the Council in 1907-08 and again in 1910-13. He was a vice-president of the institution in 1920. He was also a past president of the Manchester section of the Institution of Civil Engineers, the I.M.E.A., and the Junior Institution of Engineers. He was the author of a number of papers read before the I.E.E., the I.M.E.A. and other bodies.

Presentation to Dr. H. R. Wright

THE chairman and managing director of Siemens Brothers and Co., Ltd., Dr. H. R. Wright, was the guest of honour at a luncheon held in the library at the company's Woolwich works recently, when he was the recipient of an inscribed silver salver presented to him by members of the senior staff at Woolwich, in commemoration of his having completed twenty-one years as managing director.

Bust of DR. H. R. WRIGHT

Mr. S. W. Lumb, secretary to the company, after offering to Dr. Wright the warm congratulations and hearty good wishes of all present, mentioned that it was forty years since Dr. Wright went to the Woolwich works, having been transferred from the Siemens works at Stafford, where he had spent the three previous years. During that period he had contributed very largely to the development of the company

The presentation was made by Mr. F. Turner, who, with 49 years' service, was the eldest member of those associated with the gift.

Dr. Wright, in expressing his thanks and appreciation of the gift, spoke of the excellent relations existing between management and staff and paid tribute to the work of the many whose efforts had contributed so much toward the progress that had been made during his directorship. The company had not only carried out pioneering work in the electrical field, but had set an example in social welfare by creating as early as 1873, 74 years ago, a non-contributory pension scheme which was still in operation.

Mr. G. W. Giffin, general works manager, then disclosed that the directors of the company had signified their appreciation of Dr. Wright's services by commissioning a sculptor of international reputation to execute a bronze bust of him. This was now finished and on view, and was to have its permanent home at the Woolwich works.

SUPPLY AND INSTALLATIONS

SOME VIEWS EXPRESSED BY I.E.E. SECTION CHAIRMAN

AT the inaugural meeting of the I.E.E. Installations Section, on October 16, Mr. R. H. Rawll, borough electrical engineer, Shoreditch, chose for his Chairman's Address "A Supply Engineer's View of Some Installation Matters."

After pointing out that he is the first engineer and manager of a supply undertaking to become chairman of the section, and that the supply industry had a distinct interest in practically every electrical application falling within the scope of the section, Mr. Rawll continued as follows:—

Speaking of wiring regulations, Mr. Rawll said that it was interesting to compare the size of the present, eleventh edition of I.E.E. Regulations with that of the seventh edition of the old Wiring Rules, which were replaced in 1924. The latter were contained within the compass of a mere pamphlet as compared with the present formidable document. The Wiring Rules were, on the whole, straightforward and simple; and, although they may not have covered all the various ramifications and applications of installation work under different conditions, they were at least devoid of the constant cross-referencing which prevailed in the present volume. Without decrying in any way the painstaking work of the compilers of the present Regulations, their present form had many disadvantages. There was, for instance, not sufficient flexibility, in as much that any new development, either in type or method of wiring, however practical, which was not specifically covered by the Regulations, could not be said to comply with them, and this necessitated an amendment being issued subsequently if the matter was to be regularised. This took time, and had the disadvantage that a new method, however promising, could not be tried out in practice without incurring the odium that it did not comply with the Regulations.

Mr. Rawll had for many years advocated the drawing up by the institution of regulations setting forth the basic principles to be observed for installation work, which should not require amendment or addition for some time; and in addition, a comprehensive and detailed code of recommended good installation practice embodying the principles of the basic regulations. A proposal on similar lines was recommended in January, 1944, by the I.E.E. Post-War Planning Committee in their Report on "Electricity Supply, Distribution and Installation." The Council, however, intimated in their 1945-46 annual report that it appeared to be inadvisable to proceed with the issue of such regulations unless they were made mandatory.

In the circumstances he suggested that an example be set in the sphere of electrical installation work, of compiling and issuing a simple set of basic principles for voluntary compliance, which could then be the subject of educational effort by the institution in explanation to all concerned throughout the electrical industry, particularly the technical schools and colleges.

A new departure in the method of wiring socket-outlets in domestic premises had been the introduction of the ring-circuit, with an alternative method in the room circuit. The introduction of these methods of wiring necessitated a fuse at each socket-outlet position in order that adequate protection could be achieved in such circumstances, and as an outcome a specification for a new standard all-purpose domestic socket-outlet, embodying a fused plug, had been issued by the B.S.I. The industry had waited so long for this new standard that, had it not been for the very much smaller number of post-war houses which had been constructed, compared with that originally anticipated, a considerable number of new houses would have been equipped with the old types of plug and socket, which would have materially aggravated the position as regards interchangeability.

In the field of lighting, two factors had operated against any large-scale advantage being taken of war-time advances in technique; the necessity to economise in the use of coal, and the shortage of the materials and apparatus. Public lighting could not at present be developed, improved and extended, neither was it permissible to make full use of present installations. As to the amount of coal which could be saved by restricting public lighting, it should be borne in mind that immediately before the war the electricity sold for street lighting was of the order of only 1.82 per cent. of that sold for all purposes, and under the present restrictions consumption must not exceed half of that prevailing before the war. The additional coal required to restore pre-war standards of public lighting and hours of use must therefore be very small indeed.

One of the aftermaths of the war had been the increasing numbers of domestic electrical appliances of an unsafe and often shoddy character on sale to the

public. The problem existed before the war, and a few of the larger electricity supply undertakings, in order to protect the interests of their consumers, carefully examined and tested all appliances before offering them for sale through their showrooms. It was therefore satisfactory to record that a concerted step had been taken through the ægis of the E.D.A., to establish, in co-operation with the B.S.I., a testing house. The decision to establish such a testing house brought to a conclusion four years' work of discussion and meetings with the various interests concerned.

The necessity for the transference of load from day to night hours, thus reducing the maximum demand to a figure which could be actually supplied, would be of vital concern to industrial consumers during the coming winter and possibly for a few more winters in future. Schemes to achieve this were not merely matters of the alteration of hours of working and numbers employed, but also involved a careful examination of the electrical characteristics of the method of running the various items of plant installed, if optimum results were to be obtained in a given instance; it was in this sphere that members of the section could be of assistance in the national interest.

All conscious restrictive effort on the expansion and use of electricity, however necessary it might be, was, of course, contrary to the progressive outlook and policy which was so common throughout the electrical industry before the war. There was, therefore, a danger that those entering the supply industry at the present time would not have the opportunity of being imbued with the enthusiasm for the "all-electric idea" which prior to the war was the natural order of things in the industry. The industry would therefore need to be on guard to prevent any suspicion of defeatism insidiously creeping into its midst.

Book Review

The British Fuel and Power Industries. (London: P.E.P., (Political and Economic Planning) 16, Queen Anne's Gate). Pp. 400. Price, 30s. net.

That the fuel and power requirements of the country can only be met adequately through an increase in coal production, coupled with the elimination of waste in its utilisation, or through the development of atomic energy, is one of the conclusions arrived at in this 400-page report on "The British Fuel and Power Industries." The work of a group of experts in the main industries covered, the report contains an impartial discussion of the organisation of all types of fuel production, and of problems of marketing and utilisation. It is largely statistical and forms a valuable work of reference and guidance. The importance of harmonising the prices charged for various types of fuel, which must be closely related to the cost of production and supply, is emphasised. The continuance of competition between the various fuels as stimulating their efficient use and improving the service offered, is urged. After dealing with available hydro-electric resources, the report states that while a considerable period is likely to be necessary for the provision of the means of utilising atomic energy, this represents the only important alternative to coal as a source of fuel and power in this country, a fact which justifies the high priority afforded to atomic energy development. The efficient use of waste heat from power stations is represented as one of the most important potential contributions to conservation of the country's fuel resources, and there is scope, it is stated, for greater development of combined power and heating plants for individual factories and groups of factories in the same locality. The erection of pithead power stations run on gas obtained by the underground gasification of coal, is suggested as a possible economic method of utilising seams of coal which are not economic to work by traditional mining methods. High coal prices, which, in the view of the authors, are likely to be a feature of the fuel situation for some years to come, tend to favour railway electrification.

I.P.R.E. Annual Dinner

THE annual dinner of the Institute of Practical Radio Engineers was held in London, on October 8. In his opening remarks, the President-elect, Mr. J. F. Tomlin, stated that one of the primary aims of the institute was to raise the standard and status of service engineers. Mr. F. J. Camm, in proposing a toast to the institute, said that a body with 800 members and 900 students was already a force to be reckoned with. The question of apprenticeships was a matter to which the I.P.R.E. might give consideration. Mrs. B. A. Smye-Rumsby, the only lady member of the institute, made a plea for more women service engineers.

Mr. F. J. Camm was elected an Honorary Fellow.

Aspects of Instrumentation

ADDRESS BY CHAIRMAN OF I.E.E. MEASUREMENTS SECTION

THE importance to the national economy of electrical measurements was indicated by Mr. D. C. Gall, in his Chairman's Address to the I.E.E. Measurements Section in London, on October 17.

Taking as his subject "Some Aspects of Instrumentation," Mr. Gall, who is a manufacturer and designer of instruments, said the new regulation defining the scope of the Measurements Section as covering the whole gamut of electrical measurements had been well timed, as never in the history of the industry had electrical measurements had such importance in the national economy. Progress in manufacturing technique, whether it be due to a more uniform or better product, or to more efficient use of fuel or other basic commodities, depended more and more on instrumentation. The institution was very alive to the importance of that and the rapid developments which were so desirable.

The means available for making electrical measurements were really surprisingly slender, because the only two quantities which gave any direct indication of their presence were the electro-magnetic field and the dielectric field, and, whatever measurement they wished to undertake, the phenomenon must be made to affect one or the other of those. It was true that we could measure electrical energy when converted into heat or chemical action, but neither of those was an electrical measurement and both were of very limited use in general measuring technique.

A MILESTONE IN TECHNIQUE

The increasing importance of sensitive detection was clearly shown at the Servo Convention. To control accurately, immediate response to small stimuli and to the integral of those stimuli was required, and also the rate of change. It was also essential that that detector should have a very high degree of amplification, so that sufficient power might be available to operate robust indicators and relays. Use of amplification in measuring phenomena by electrical means could be regarded as one of the milestones in the technique. The ideal amplifier would have very high sensitivity; stand much mechanical and electrical abuse; work in any environment without maintenance or adjustment; and give linear and instant response to the smallest of inputs without zero drift or background noise. A great deal of work had been done in that field, with some success, but the final system had not yet been evolved. There were special problems in applying valve amplification to industrial purposes. As a detector of small voltages the galvanometer was still the simplest device. One could not help thinking that the electrons which flowed round the galvanometer coil under the minute accelerating voltage and produced the magnetic field, which deflected the delicate coil, thus converting electrical into mechanical energy, might be used in an electronic system with greater advantage. It might not be beyond the ingenuity of the physicist to device a method of using the movement of those electrons to influence a larger number without mechanical conversion, and so produce a detector of more robust design.

A MAJOR FIELD OF INTEREST

Electrical methods of measuring magnectic effects constituted a major field of interest. Direct access to the electronic disturbance produced by a magnetic field without need for the movement of the conductor, would be most useful in measuring devices. A magneto-electric cell might not be beyond the physicists' ingenuity to produce.

In the electrical engineering field of measurement, electronic methods had made many difficult things easy. Here it seemed to him that the stabilisation of testing circuits was one of the outstanding advances. The tedium of attempting accurate calibration under unsteady conditions was now largely unnecessary. Amplification ran all though the fabric of their work. That was the great debt they owed to electronic methods, but as engineers they might well be a little cautious. It was for the engineer to insist that electronic methods conformed to the standards of reliability and economy which were the essentials of good engineering.

They all shared the aim to make British industry technically perfect. Measurement in all its aspects was the solution. Electrical measurement was the most fruitful approach: only by measurement could a quality be judged or the efficiency of a process be assessed; only by measurement could automatic control improve uniformity and make large-scale operation economical. In research, education, development, design, manufacture, and operation at all stages, the appropriate measurement was required. By the interchange of varied knowledge and experience that was a task they could accomplish.

The Ontario Hydro System

Annual Report of the Hydro-Electric Commission

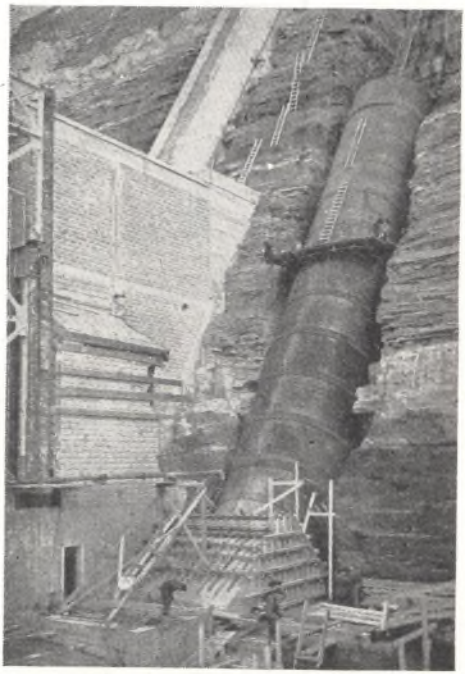
THE Hydro-Electric Power Commission of Ontario—referred to by Mr. H. Nimmo in his Presidential Address to the A.S.E.E. last week as probably the largest electricity undertaking in the world—has now published a report of its activities for the year ended October 31, 1946. It shows an increase of 1.5 per cent., or 184 million kWh, in total energy produced from all sources during the year, the output being 12 672 million kWh. Similarly, peak output reached a new record level of 2 625 000 H.P., 17 000 H.P. above the level of the previous year.

In view of the continuing increase in demand, the Commission is hastening the construction of several power developments, and is also reinforcing and extending transmission and distribution facilities. The volume of constructional work now in progress is the greatest, the report states, for many years. In the Niagara division of the undertaking, a second 70 000 H.P. water-power unit has been installed at the DeCew Falls 25 cycles plant. The new unit and its setting are similar to the initial installation, but important changes have been made, including increased storage facilities in the head-waters area and improvements to tail-water channels.

In the Eastern Ontario division, a second major project has been started at Stewartville on the Madawaska River. This installation will have a capacity of 81 000 H.P., with three units each of 27 000 H.P. operating under a head of 150 ft., and will supply 60 cycles current to the Southern Ontario system. To augment further supplies in Southern Ontario, work is in progress on the Des Joachims development on the Ottawa River. This will be larger than any other Commission plant except that at Queenstown and will have an initial capacity of 360 000 H.P. in six units, which may later, should additional storage be provided on the upper Ottawa drainage basin, be increased to 480 000 H.P. with eight units. It is expected that the plant will be in operation during 1950.

Another site being developed is at the mouth of the Aguasabon River on the Thunder Bay system. This installation will comprise two 26 500 H.P. units operating under a 290 ft. head. A fourth and last unit, with a capacity of 7 500 H.P., is being installed at the Ear Falls development on the English River in Northern Ontario.

Rural electrification projects made progress during the year reviewed, assisted by an improvement in the supply of poles. There was a net increase in rural connections of 18 230, and the average peak load supplied to all rural Hydro consumers was 139 818 H.P., an increase of 26 per cent. over 1945. Power was delivered over 23 000 miles of primary rural line to approximately 177 605 rural consumers, of which 75 219 were farms.



A 16 ft. wide penstock in course of erection at the DeCew Falls Station

New transmission lines placed in service include 130 miles of 110 kV steel-towered lines and approximately 83 miles of 12 kV to 44 kV wood-pole lines. Transmission line capacities were increased by restringing 46 miles of circuits with heavier conductor, and by reinsulating 107 miles of line for higher voltages. Lines under construction include 245 miles at 110 kV. Preliminary work is progressing for a 230 kV line from Eastern Ontario to Burlington, together with a 40 000 kVA condenser and a fourth 75 000 kVA transformer bank at Burlington.

Position-Finding Systems

CHAIRMAN'S ADDRESS TO I.E.E. RADIO SECTION

THE need for overhauling the terminology currently used for classifying radio position-finding systems was urged by Mr. C. E. Strong (Standard Telephones and Cables, Ltd.), in his Chairman's Address to the Radio Section of the I.E.E. on October 15.

Position determination by radio appeared to be on a par with communication as a main branch of the tree of which radio was the root and trunk, Mr. Strong began. Although the title had been used before in a different sense, he believed the term "radiolocation" would be ideal to cover the whole field of direction and range determination. The first problem was the selection of general terms to define main sections in the field, and so to emancipate ourselves from the perpetual use of the code names of particular systems which were coined to confuse the enemy and now tended to confuse us.

RADIOLOCATION

After describing the essentials of range and direction determination, Mr. Strong went on to say that all radiolocation systems were either hyperbolic or elliptic position-line systems; these included radial and circular position-line systems as special cases. The first division of radiolocation, therefore, might be into two parts, including on the one hand all time-sum methods giving range and, on the other, all time-difference methods giving direction. In the category of direction determination, it would be further necessary to distinguish between transmitting and receiving systems, or "direction-giving" and "direction-finding" systems.

In both main categories, it would be convenient to distinguish between broad-based and narrow-based systems, as there was a considerable contrast in application between the two. Finally, there was a very important difference between systems which had the capability of measuring the ranges or bearings of many objects simultaneously, and those that could not do so.

By some such scheme of classification, Mr. Strong continued, a first segregation of systems on broad and general lines could be obtained, but there remained systems in the same categories which would require further differentiation. For example, while Gee and Decca would, so far, be classed together as broad-based direction-giving systems, they differed widely in the technical methods used. This led to a question of further breakdown on the basis of technical methods. Three of the factors which would be relevant to this were: first, the method by which transmissions were marked, whether discontinuously as in pulse systems or continuously as in tone or radio-frequency phase-comparison methods; second, the method of modulation, whether amplitude modulation as in overlapping-pattern systems or constant amplitude time-modulation as in systems depending on pulse-interval measurement or phase comparison; and, third, the method of channel separation, whether by time multiplex or frequency multiplex.

A MULTIPLEX SYSTEM

A system was then described which, though somewhat hypothetical at present, served, the speaker thought, to emphasise the common nature of the techniques of radiolocation and radiocommunication as branches of a single art. It was a time-sharing multiplex system combining radiolocation and radiocommunication services to aircraft on a common frequency. The general idea was that a multi-channel pulse-communication transmitter could be applied as a ground station in such a manner that while some of the channels were used in the ordinary way for communication for ground to air, other channels were space-modulated for radiolocation service by the transmission of those channels from a system of spaced antennae.

The transmitter, when unmodulated, delivered a number of interlaced pulse trains on a frequency of, say, 500 Mc/s. Carrier No. 0, a train of 2 μ-sec. pulses spaced at 100 μ-sec, was used as a synchronising signal. Carrier No. 1 was a chain of $\frac{1}{2}$ μ-sec. pulses also spaced at 100 μ-sec., delayed on the synchronising train by 10 μ-sec., and carriers 2, 3, 4, 5, were similarly spaced from one another. The duties assigned to the various carriers might be: No. 1, station call sign; Nos. 2 and 3, telephone and teletype; No. 4, respondor channel for range measurement; No. 5, reference signal for an omni-range beacon service; and No. 6, bearing signal for the omni-range beacon. The feature of the arrangement was that exactly the same form of modulation was applied to the carriers, both for communication and for omni-range transmission, but the manner of impressing the modulation was, of course, quite different, being in one case in accordance with input signal voltages and in the other in accordance with the spacing of radiators.

AN ENGINEER IN COMMERCE

I.E.E. SCOTTISH CENTRE—CHAIRMAN'S ADDRESS

FOR his Chairman's Address before the I.E.E. Scottish Centre, on October 14, Mr. H. M. Speirs chose as his subject "An Electrical Engineer in Commerce," and an abstract of his remarks is given below.

The present curriculum of technical training for young engineers follows broad lines, and is selective in respect of the student who intends to become a professional engineer, as opposed to the technician. At the commencement of his career the student may have his training directed along certain specified channels, with a view to providing background knowledge forming the basis of his future make-up. Training in advanced mathematics and natural philosophy may not be required in many cases in the future, but in mastering these subjects the student has trained his mind to reason and has acquired the faculty of being able to tackle satisfactorily the problems he may meet. This period of training forms a "background" only and does not in any sense produce the finished product.

TRAINING AND INDUSTRY

In the last year of his college training, a student might be given some instruction on the ramifications and purposes of the various branches of the electrical industry, by those specially qualified to deal with those subjects.

As a final phase of instruction the student who chooses a career involving other than academic or research work, might be given an insight into administration and the conduct of business.

The student on completing his college course will probably acquire further practical experience in a works for one or two years, and will qualify for transfer to the "graduate" class of membership of the I.E.E. In the latter stages it is desirable that experience should be gained in the type of work he is most likely to be occupied with in subsequent years.

While all young engineers may not be directly associated with the business side of an organisation in later years, most engineers should acquire a good working knowledge of the administration of a firm.

Business correspondence follows a somewhat stereotyped form, but the free and expressive type of letter creates a good impression with the receiver. The method adopted by a firm in framing correspondence and tenders is indicative to the potential purchaser of the class of work or material which will be supplied against an order.

Estimating and the preparation of tenders is a class of work which should be dealt with by an engineer conversant with the work to be performed, and who is capable of forming in his mind a mental picture of the project as completed, of analysing the various steps in procedure of the work, and from experience, correlating work as executed with the time factor involved.

After a period of post-graduate training in the section of industry selected, the younger engineer will apply the knowledge he has acquired not only in furthering the work with which he may come in contact, but will also exercise a certain degree of personal responsibility. He should endeavour not to concentrate his whole effort and interest in engineering work, but should take his part in public affairs.

In recent years we have had Post-War Planning Committees making recommendations for the restoration of industry, "Codes of Practice" Committees setting standards for work and production, doubts expressed about over-production, saturation of markets, etc., but where are we going when all our efforts and planning are bound up with controls and regulations?

ENGINEERS AND GOVERNMENT

Many young engineers returning from the Forces with the desire to settle down, get a shock when they find that whichever way they turn, their efforts are nullified by controls and regulations. It has been said that an engineer does not generally make a good administrator, but surely his technical training should be an asset rather than a liability, and there are many engineers in posts of considerable responsibility to-day. Why, then, should he not "pari passu" take his part in wise government?

The Charter of the I.E.E. has enabled members to take part in the national control of electrical engineering matters—the Electricity Commissioners—but is that body going to disappear and be merged in a state controlled organisation ruled by the whims of the political party of the day? While unity of control may be very proper and desirable, when such control comes under the jurisdiction of a political party, the results may prove far from satisfactory. Is the time not ripe for the three senior institutions to confer on such matters, and if necessary amend their Charters to permit the setting up of a governmental body, with supreme power free from political influences?

Switchgear—Old and New

I.E.E. WESTERN CENTRE CHAIRMAN'S ADDRESS

FOR his Chairman's Address to the Western Centre of the I.E.E. on October 13, Mr. J. B. Gwynne Lewis chose the subject " Switchgear—Old and New." The address was supported by a number of lantern slides, by means of which the development of switchgear was traced, and by a working demonstration.

When steam-driven d.c. generating stations of small capacity came into being, Mr. Gwynne Lewis said, their output was in the main confined to lighting loads only. The stations were isolated and supplied restricted areas by means of primitive but effective mains. The commonplace bus-bar did not necessarily find a place in the switchgear used at that time. Early practice was to use an arrangement of plugs and sockets, which were connected up in such a way that any generator could supply any feeder or group of feeders; the generators themselves were run independently.

METAL FILAMENT LAMP

The coming of the metal filament lamp gave a tremendous impetus to the demand for electricity for lighting purposes, and the generation and transmission of energy increased so that the power load began to be a factor to be reckoned with and engineers began to use new terms such as " load factor " and " transmission losses." They became dissatisfied with transmitting at 110 V or 220 V d.c., and the possibility of using a.c. began to be considered. The outstanding figure in a.c. generation and distribution at this stage was Ferranti, whose effort might be said to have borne effective fruit at the Deptford power station in 1898.

The superiority of a.c. systems was recognised after a struggle between the two schools, but the engineers of those days had no standard practice on which to develop. Well-informed guesses were made on problems, and theoretical treatment followed the practical solution. Mathematical notations were developed to help the engineer to understand, mathematically, what he was doing electrically. Switchgear design shared in the advance of the young science and industry and, while it was at present far from being an exact science, its rate of progress to-day was greater, in all probability, than it had ever been.

Coming nearer to modern times, the speaker said that with large blocks of generating capacity behind any system, the difficulty arose of causing the flow of power in a circuit to cease quickly under fault conditions. That, in its simplest form, was the question which breaking capacity involved. The essential difference between primitive switchgear and that of the present day was the ability of modern gear to rupture a circuit under conditions of stress which did not in the early days exist.

In grappling with his daily problems, the power engineer spoke of MVA fault interrupting capacity figures as being necessary to meet his conditions, but it might be that the significance of the amount of energy involved was not always realised. For instance, a mixed traffic locomotive with a load of 400 tons at 50 m.p.h. over a straight and level track, and accelerating at its optimum rate, exerted a drawbar pull corresponding to 1 000 H.P., which was about 1 MVA at .8 power factor. That was the flow of power corresponding to that interrupted when a 500 kVA transformer supplied from a large system and having an inductive reactance of five per cent. was feeding into a solid fault.

Arising from the necessity for adequate rupturing capacity in modern gear, the Association of Switchgear Testing Authorities had been created, and in conjunction with the B.S.I. it laid down a recognised procedure to prove breaking capacity.

CONTINUITY AND SAFETY

The two essentials in switchgear design were continuity and safety. The second factor included the desirability of the utmost simplicity consistent with performance of the duty required. That was to say, Mr. Gwynne Lewis said, that he wished to put forward a plea for the minimum complication of any kind, electrical or mechanical. He believed it was possible so to add refinement to refinement that the ultimate product was less useful in fulfilling its purpose than one with no refinement at all. So at every stage he would say to the designer " is this additional feature really necessary?" and he would require very convincing reasons for the answer " yes."

Concluding, the speaker paid tribute to the early engineers who, he said, had successfully met the electrical conditions of their day, and who went forward into the unknown with optimistic faith and with energy, allied to a fixed determination to discover and succeed in the field of electrical application.

Future of the E.D.A. and E.A.W.

STATEMENT BY LORD CITRINE AT JOINT CONFERENCE

SOME indication of the parts that will be played by the British Electrical Development Association and the Electrical Association for Women in the electricity supply industry under nationalisation was given by Lord Citrine, chairman of the B.E.A., at the opening, on Wednesday morning, of the second post-war conference of housecraft advisers, senior demonstrators and saleswomen organised jointly by those two bodies. In the unavoidable absence of Mr. H. F. Carpenter, chairman of the E.D.A. Council, Mr. V. W. Dale, general manager and secretary, E.D.A., presided.

Lord Citrine outlined the organisation that is being set up under the Electricity Act, 1947, and referred to the autonomous nature of the Area Boards. It was, he said, that function of autonomy and freedom to make decisions in the various areas, which, side by side with the responsibilities of the Central Authority for co-ordination, would determine how successfully the new electrical service could be operated. The Central Authority was trying to sketch out the lines on which the industry would be run in the areas for the guidance of the Area Boards, and they were doing it without having the advantage of being able to consult those Boards. It would, however, be very helpful for the Boards to have some guidance as to what they ought to do. They would be free, if they so wished, to decline any advice that might be given to them, but he was sure that most, if not all of them, would take advantage of the hard work carried out by the Authority in trying to provide some common principles which might be applied to co-ordinating their work.

RECONSTRUCTION NECESSARY

There were various organisations in the industry who, in one way or another ought to be consulted, whose views ought to be known by the Central Authority before decisions on various points were taken, said Lord Citrine. He referred to only two at the moment—the E.D.A. and the E.A.W. The E.D.A., as at present constituted, was composed substantially of the same constituents who would go over to the B.E.A. and the Area Boards. Its constitution was such that even if it wished to do so, it could not continue in precisely the same way in the future so far as membership was concerned, as it had in the past. It had been composed of municipal and company-owned authorities which would no longer exist in the electrical sense. Reconstruction of the B.E.D.A. would be necessary. The Authority had said to the association, in substance: "Carry on with the minimum change so far as we are concerned, for the next twelve months. During that period we shall have every opportunity to know more about each other, and we shall know more about your problems. So, broadly speaking, that is the policy that is being adopted in that respect."

NO NEED TO CURTAIL WORK

The Electrical Association for Women was a body which, by its very nature—in his view—ought not to be absorbed into the Central Authority or its Area Boards. It must be free to express the views of its constituents. Without pledging the Central Authority too far, it could be understood that neither the E.D.A. nor the E.A.W. would find any necessity to curtail its work on the account of the lack of financial facilities.

Dame Caroline Haslett, director of the E.A.W., spoke on "The Responsibilities of the Trained Woman in the Electrical Industry," and said that as more opportunities opened for women in the industry so would their responsibilities increase. The housecraft advisers and demonstrators were an important link in the chain of efficient service to the domestic consumer.

Mr. Dale, in the course of his address on "Electricity and Coal Conservation," referred to the growing tendency in some quarters to make electricity the villain of the piece in the coal crisis, and urged the need to refute that impression. He mentioned that while 20 years ago it would have needed 53 per cent. of the output of coal to produce the amount of electricity that was being generated to-day, it now needed only 13 per cent. He also stated that if the energy needed for colliery electrification were taken from the national supply system instead of from single or group generating plants, 4.2 million tons of coal per annum could be saved. By electrification, 750 000 tons of coal per annum could be saved in the cotton industry, a million tons a year in the woollen industry, and the railways could be run on one-third of the present consumption of coal.

Answers to Technical Questions

We produce below the answers to a selection of questions which have been sent to us by readers. The co-operation of students and others in making this feature one of general interest is invited

A correspondent has a ⅛ H.P., 100 V, 5 800 r.p.m. universal motor and wishes to run it from a 220 V supply without rewinding the armature.

The simplest procedure would be to put a resistance in series with it and the appropriate value can be calculated as follows.

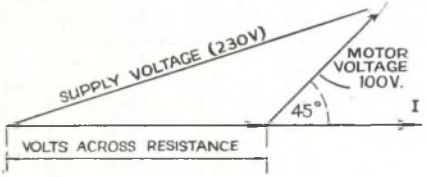


Fig. 1.—Vector diagram of motor in series with resistance

The efficiency of a motor of this size will probably be about 70 per cent. and the power factor about 0.7 lagging so that at ⅛ H.P. the motor would take a current of

$$\frac{\frac{1}{8}\times 746}{100\times 0.7\times 0.7} = 2.5 \text{ A.}$$

If a resistance is used in series with the motor, the voltage drop across the resistance will be in phase with the current, while the voltage across the motor will lead the current by 45° (power factor = 0.7). The vector diagram of the voltages will thus be as shown in Fig. 1. If this diagram is drawn to scale it can be seen that the voltage drop across the series resistance will be 150 V. Since the current through it would be 2.5 A the resistance would have to be 150/2.5 = 60 ohms. Such a resistance could be made up from a length of nichrome or other resistance wire or alternatively a 1 kW, 220 V heater element, which has a resistance of 50 ohms, would be reasonably satisfactory. There would, of course, be a continuous loss in the resistance (I^2R) of $2.5^2 \times 60 = 375$ W.

If it were desired to avoid this loss a choke could be used instead of the resistance. The voltage across the choke would lead the current by 90° and by drawing a vector diagram similar to that in Fig. 1 it can be seen that in this case the voltage across the choke would again be 150 V, so that it would have to have a reactance of 50 ohms. This corresponds to an inductance of $50/2\pi\ 50 = 0.16$ H.

An alternative possibility would be to rewind the field with a greater number of turns, although this would probably be less satisfactory. With the motor running on 100 V the voltage across the armature would probably be about 60 or 70 V, and this value would have to be approximately the same if it were run on 220 V, if the armature were not to be rewound and the speed were to be the same. The extra voltage would, therefore, have to be absorbed in the field winding—if the field circuit were rewound with about twice the number of turns in order to do this, the flux produced would be very much increased for the same current, and sparking, overheating and a lower speed would result. Rewinding with about half as many turns again of the same size of wire might be a possible compromise, but without fuller details of the motor it is impossible to say whether or not it would be satisfactory. In any case trial and error would probably be the best way of finding out.—E. O. T.

Does the use of cooling towers for an electric power station result in a lower overall efficiency than if river water could be used for cooling?

The efficiency of a station depends on the degree of vacuum obtainable in the condenser and this, in turn, depends on the temperature of the cooling water passed into the condenser. Fig. 1 shows typical values. If river water is used the

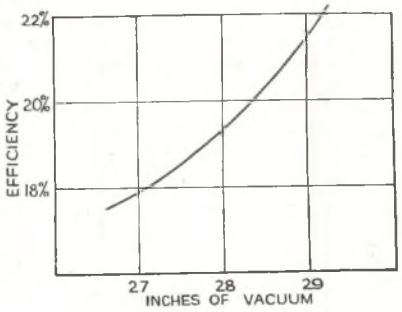


Fig. 1.—Effect of vacuum on efficiency

temperature during the summer months is generally about 64° F. and this is low enough to obtain a condenser vacuum of about 29 in. The quantity of water required is between 3 and 4 gal. per hour per kW of station output.

If a cooling tower is used the warm water from the condenser (at about 70 to 75° F.) is passed to a stack of wooden slats placed in the lower part of the tower; the water trickles down over the slats and at the same time air passes upwards and removes the heat, the upper

part of the tower acting as a chimney to create a good draught of air.

Early types of tower were built of wood and are of the shape shown in Fig. 2a,

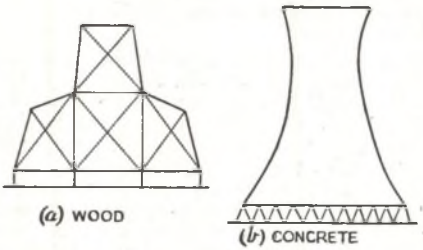


Fig. 2.—Types of cooling tower

many being still in use. Structural difficulties limit the size, and the maximum amount of cooling water with which such a tower can deal is about 300 000 gal. per hour. A large modern station would thus require an impracticable number of such towers. This fact, the tendency to deteriorate and the rather inefficient air flow arrangements of these towers led to the development of the ferro-concrete tower shown in Fig. 2b. The outline is hyperbolic in shape and this gives high mechanical strength and stability as well as being ideal for streamlined air flow. These facts have enabled single towers between 200 and 250 ft. high to be built which are capable of dealing with 3 to 5 million gal. per hour of cooling water. The water is led to a point 25 to 30 ft. above the base, the remainder of the tower being to produce the necessary draught. Water vapour leaving the top of the tower may cause trouble due to its being deposited on surrounding buildings but this is minimised by widening the top of the tower as shown—this reduces the air velocity and allows the condensed moisture to drop back; holes are sometimes placed in the side near the top to assist in this.

By the use of such highly-efficient towers it is generally possible to reduce the temperature of the condensate sufficiently to maintain a vacuum of 28 or 28.5 in. under summer conditions without difficulty. Although a riverside site for a station may in general terms be expected to give a slightly higher efficiency, modern cooling tower designs have made the difference so small that it is no longer a decisive factor in the choice of site for a station.—E. O. T.

Training the Illuminating Engineer

FOR his Presidential Address to the Illuminating Engineering Society on October 14, Dr. J. W. T. Walsh spoke on the "Training of the Illuminating Engineer," to the effect that although since the foundation of the society in 1909 membership had been open to anyone interested in the subject of illumination, progress in illuminating engineering had been so great that there had arisen a new profession, that of illuminating or lighting engineer. The first effect of this on the structure of the society was the institution in 1940 of Fellowship of the society. This, however, did not meet the need for a hall-mark of the competent lighting engineer. The society was therefore faced with either admitting to membership only the professional lighting engineer, or alternatively retaining its cultural status and making no attempt to apply any professional hall-mark to those of its members engaged in lighting engineering. Fortunately a compromise had been found by which the required distinction could be applied without affecting the conditions of membership.

It was important that the profession should quickly come to be recognised as one demanding a severe discipline on the part of those entering it, who should be prepared for at least five years part-time study on the theoretical side after obtaining the school certificate, and for a practical training covering that period, and at least three further years of more advanced and responsible practice under a qualified lighting engineer. Following insistence upon a standard equal to a pass in the Intermediate Examination of the City and Guilds the society should demand a theoretical knowledge up to the Advanced Grade Examination, Section A, which involved a more detailed study of what was included in the earlier examination. The Advanced Grade, Section B, was a valuable guide to the kind of practical experience students should be expected to acquire.

In cases where it was necessary for the trainee to get part of his experience with one organisation and the rest with another, an appeal was made for breadth of vision and a willingness to accept the need for a change from one firm to another on the part of the trainee and, in fact, active encouragement to him to make such a change at a suitable stage in his training. Such an arrangement would be greatly to the ultimate benefit both of the individual and of the profession as a whole.

There was also the problem of the lack of instruction classes within a reasonable distance. In such cases private study seemed the only solution.

Electrical Notes from India

From Our Own Correspondent

ONE of the major disasters of the floods which overtook Ceylon, is the severe damage to the hydro-electric power station, which is under construction at Norton Bridge, in central Ceylon. Details now available indicate that the road bridge was washed away, and the work in progress was wrecked to a very large extent. It was expected that the first stage of the scheme would be completed in 1948, but it is now known that this programme cannot be adhered to.

Before this disaster overtook the scheme, Mr. F. S. Maconachie, chief resident engineer, said that it would not be in full operation before early 1950, but it is now doubted whether there can be completion by that date.

A large proportion of the work was to have been finished by the end of next year, but delay was occasioned by the time taken for the manufacturers to make, deliver and erect the mechanical and electrical equipment on order in England. The consulting engineers, said Mr. Maconachie, were making every endeavour to speed up the deliveries of all equipment and materials. The most difficult portion of the work, he said, had been the construction of the tunnel, which is 8 388 ft. long. Work at the moment was somewhat handicapped by the heavy flows of water coming into both faces. The completion of the tunnel was now in sight, and he hoped that both faces would be joined up by the end of the year. But this is now problematical as the floods have done great damage to the tunnel.

The temporary works necessary for the concreting of the dam were also well advanced before the floods came, and the bridge over the dam was expected to be in operation next year. The power house building, which was ready to receive the steel superstructure, has also been damaged. Work on the pipe-line formation, together with the pipe anchors, was well advanced, and the haulage way formation had been completed and ready to receive the sleepers and rails, but what damage has been done to this by the floods is still not known.

In regard to the 52-mile long transmission line from the power house to Colombo, Mr. Maconachie said that the survey had been completed, and construction materials were arriving in the island. This line should be completed well ahead of the whole works.

Germinated paddy, energised by electrification, yielded over 50-fold, whereas normally the crop had been 20- to 22-fold or at best 25-fold, said Mr. J. E. de Mel, electrical engineer, when demonstrating certain experiments carried out by him on paddy fields. He placed about a bushel of germinated paddy on an insulated iron sheet and energised the grain by electrification. A cultivator wearing rubber gloves then sowed the electrified seed on the prepared paddy field.

Proposals for the electrification of the suburban railway systems of Calcutta are engaging the attention of the Calcutta Terminal Facilities Committee set up by the Railway Department of the Government of India.

The scheme provides for the electrification of the system of the East Indian Railway from Howrah to Burdwan, both on the chord and main line routes. Similarly the Bengal Assam Railway suburban line will be electrified from Sealdah to Kanchrapara and Ranaghat; Dum Dum to Bongaon; and Sealdah to Budge Budge, Diamond Harbour, Lakshmikanthapur and Port Canning. On the Bengal Nagpur Railway, the electrification will cover the Howrah to Kharagpur line.

I.E.E. Students

THE North-Western Students' Section of the I.E.E. opened the new session on October 11 with the annual luncheon, followed by the Chairman's Address, at Manchester.

At the luncheon, Mr. J. E. P. Mills, the new chairman, said the facilities offered by the institution for the exchange of information would be a great help to its members, who were faced with the tasks in the critical years ahead. Mr. R. A. S. Thwaites (Centre Chairman), replying, spoke of the recent inaugural gatherings in London and their reflection of the important national and international position the institution held.

Following the luncheon, Mr. Mills gave an address entitled "Modern Electric Winding Engines," in which he discussed the factors involved in the design of such engines for the mining industry. After the subsequent discussion, Mr. H. Watson-Jones, chief electrical and mechanical engineer to the North-Western Division of the National Coal Board, reviewed the paper.

Industrial Information

Research Stations for Scotland

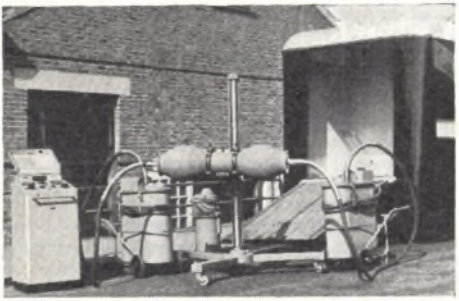
The new mechanical engineering research station, which is being set up by the Department of Scientific and Industrial Research, will be sited in Scotland. In addition, sub-stations for fuel research, building research and road research are also to be established in Scotland by the D.S.I.R.

World Power Conference in London

The International Executive Council of the World Power Conference, meeting at The Hague, unanimously accepted the invitation of the British National Committee to hold the Fourth Plenary World Power Conference in London in 1950. This invitation was conveyed by Mr. Harold Hobson, vice-chairman of the British National Committee, who informed the Council that the British Government had promised full support.

Mobile X-Ray Unit

For examination in situ, of welded high-pressure pipe lines Philips Electrical, Ltd., have produced a mobile X-ray unit housed in a 4/5 ton van, the body of which is divided into compartments accommodating all the necessary X-ray equipment and providing a complete darkroom service. Stewarts and Lloyds, Ltd., have taken delivery of the first of these X-ray vans, for the routine examination of their welded, high pressure pipe lines to ensure that the welds are free from defects. The type of equipment supplied for the van is a

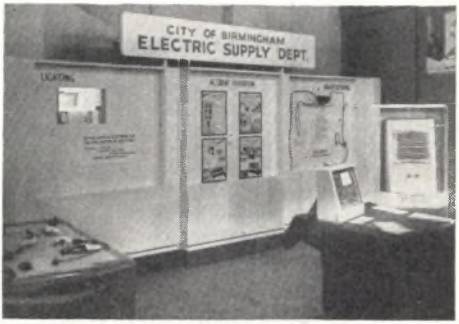


Philips' Macro 300 mobile X-ray inspection unit assembly at the foot of the van ramp

Philips' Macro 300 inspection unit, capable of examining steel up to a thickness of 4¼ in. The h.t. generators for the X-ray equipment are moved by small two-wheeled trollies. The lighting in the darkroom is concealed in the angles of the roof and consists of six 10 in. tubular strip lights fitted into reflectors having a flat opal glass front. Special cable and hose drums, fitted in compartments below the chassis of the van, will, when coupled to external supply sources, feed the various water and electrical circuits. A 34-gal. storage tank is housed above the driver's cabin to boost the water pressure.

'Safety in the Home" Exhibition

A "Safety in the Home" exhibition,



Display by the Birmingham electricity department at the "Safety in the Home Exhibition"

the first of its kind in the country, sponsored by the Birmingham Accident Prevention Council and opened by the Lord Mayor, was held in the Town Hall, Birmingham, for six days. The electric supply department co-operated by staging an exhibition of the causes and means of preventing electrical accidents. Three panels constituted the background of the stand, and drew attention to causes of domestic electrical accidents; the importance of adequate and correctly placed lighting; and the danger of amateur wiring extensions and the misuse of plug adaptors. Actual specimens of faulty wiring, home made adaptors, etc. were displayed. Methods of ensuring maximum safety against fire risks with electric fires were shown, and a prototype reflector fire incorporating a guard in the general design, demonstrated the trend in safety methods advocated. By contrast, a cheap Continental fire, constructed of wood with a silver-papered cardboard reflector and a complete disregard of electrical safeguards in its internal wiring, amazed the visitors.

The Northmet Players

A cleverly blended colourful mixture of comedy, melody, glamour and gaiety was enjoyed by the audiences who filled the Church House, Southgate, each evening

on October 16, 17 and 18, when the Northmet Players presented their first show, "Current Events," an original revue throwing into humorous relief with commendable skill everyday activities of the staff of the Northmet Power Co. The "Northmet Sparklets," a well-trained troupe of glamour girls, sang and danced vivaciously and there were ingeniously contrived burlesque sketches and comical caricatures, topical and otherwise; songs, musical items, tap dances, a charming fantasia with graceful dances, a delightful period song and dance act in costume, and a short thriller, the programme concluding with a gay and lively scene, in which the whole company participated, at "The Café Ohm-from Ohm." The revue, with original music, lyrics and sketches, were devised by Norman Axford and produced by Clifford Baron, who was the author of the thriller and a song. The music was arranged by Ernest Farquahar, the settings, lighting and dance ensembles were designed by Roger Maddock, the dancers were trained by June Snelling and Charles Hardie was the business manager.

Reyrolle Workers Return

The eight days' strike of 1 000 employees at the works of A. Reyrolle and Co., Ltd., Hebburn-on-Tyne, over bonus pay ended on October 16, on an undertaking being given that negotiations would be resumed.

Lamp and Lighting Campaigns

The Philips Electrical Co.'s display materials for the forthcoming season have been designed to produce the maximum effect for counter and shop window display, and offer ample variety. Among the new sales aids is a compelling coloured centre-piece standing 3 ft. 6 in. high and depicting a young woman holding a hand mirror, accompanied by an electric lamp, with the caption "See for yourself how good they are." The poster campaign continues the design "When the Sun Sets." To meet the need for literature on fluorescent lighting, there are available the A.162 80 W fluorescent fittings leaflet, and A.163, a 12-page leaflet giving details of the new range of fluorescent industrial fittings. A separate list contains prices for all lamps, control gear and fittings. A prestige Press advertising campaign will be based on the quality of Philips' light group products.

Philips' coloured centre-piece for window displays

Reproduced on this page is a small cut-out designed by Cryselco, Ltd., Kempston Works, Bedford, in connection with their lamp sales publicity campaign. Supplies of these sales aids are now available to the trade.

The new Cryselco cut-out display piece

The E.I.B.A.

The Electrical Industries' Benevolent Association's Year Book for 1947, just issued, contains the report of the Council and balance sheet for 1946, and a graph showing that the amount of grants paid to beneficiaries had increased from £2 000 in 1932 to £16 134 in 1946. There is also a list of regional and branch committees, with the names and addresses of honorary secretaries.

Glasgow Modern Homes Exhibition

The Modern Homes Exhibition, which opened at Kelvin Hall, Glasgow, last week, and was organised by the Corporation, includes a comprehensive display of domestic electrical appliances by the electricity department, and by the following firms:—

Hoover, Ltd.; the British Vacuum Cleaner and Engineering Co., Ltd.; J. and H. Walter, Ltd.; Vactric, Ltd.; J. Sterne and Co., Ltd.; Electrolux, Ltd.; British Luma Co-operative Electric Lamp Society, Ltd.; A. and C. Edelman (1939), Ltd.; Bryterlite Electrical Co. (Glasgow), Ltd.; Glasgow's Lighthouse, Ltd.; National Utilities, Ltd.; William Levene, Ltd.

Rotary Shaft Oil Seal Units

The British Standard for Rotary Shaft Oil Seal Units and Related Dimensions (B.S. No. 1399), just issued, deals with the dimensions associated with the fitting of rotary shaft oil seal units which are classified, and gives a list of units for shaft diameters from 0.25 to 7.0 in. in conjunction with housing diameters from .75 to 8.0 in. Limits and maximum corner

radii in housings, shaft sizes, lead-on chamfers and relative positions of sealing lips are given. Copies may be obtained from the British Standards Institution, 24, Victoria Street, S.W.1, price 2s. post free.

Electric Overhead Cranes

The new British Standard for Electric Overhead Travelling Cranes for use in Factories, Workshops and Warehouses (B.S. No. 466) is a revision of the standard first published in 1932. The specification deals with electric overhead travelling cranes, power driven in all motions, whether working indoors, under cover, or exposed to the weather; but it does not apply to special duty cranes, such as heavy-duty steelworks cranes, for which it is intended to prepare a separate standard. Copies may be obtained from the British Standards Institution, 24, Victoria Street, London, S.W.1, price 4s. post free.

Collier Sinks in Collision

The 1 554 ton collier, "Charles Parsons," owned by the London Power Company, was in collision on Tuesday with the Stagg Line "Cydonia," 2½ miles off Southend, and was sunk. Built by Austins of Sunderland, and launched in 1936, she was bound from Swansea to Battersea, loaded with 2 400 tons of coal. Her crew of 12 was saved following a radio appeal for help.

Cast Iron Research

A note on the Report of the Joint Advisory Committee on Conditions in Ironfoundries is contained in the current issue of the Bulletin of the British Cast Iron Research Association. Abstracts from foundry literature are arranged in ten main divisions.

Preserving Fruit

Hints on preserving fruit are given on this month's "Cheerful Rationing" card issued by the Electrical Association for Women, 35, Grosvenor Place, London, S.W.1. There are also recipes for apple jelly, apple and bramble jelly, apple scones, carrot savory, cheese butterflies, banana puffs and date cakes.

Contracts Open

WE give below the latest information regarding contracts for which tenders are invited. In the case of overseas contracts, particulars are to be had from the Board of Trade, Millbank, London, S.W.1 (corner Horseferry Road), unless otherwise stated:—

Coventry, October 27.—Electrical installation in 448 houses on various Corporation estates. Specification from City Architect, 1a, Warwick Row, Coventry.

Plymouth, November 1.—Supply of (a) meters; (b) time switches; (c) underground joint boxes; (d) underground disconnecting boxes. Specifications from City Electrical Engineer, Armada Street, Plymouth.

Rochdale, November 3. — Supply, delivery, laying, jointing and commissioning of 0.2 sq. in., 33 kV underground cable, together with associated pilot cable. Specification from Engineer and Manager, Electric House, Smith Street, Rochdale.

Edinburgh, November 10.—Supply and delivery of 33 kV ring main switchgear and 5 000 kVA transformers. Specifications from Engineer and Manager, Electricity Department, Dewar Place, Edinburgh, 3.

Pretoria, November 11.—Supply, delivery and erection of: (a) piping equipment and (b) circulating water pumps and equipment, for first stage of "B" power station. Specifications from City Electrical Engineer in Pretoria or from the consulting electrical engineers, Messrs. Merz and McLellan, Carliol House, Newcastle-on-Tyne, 1; deposit, £2 2s.

Stoke-on-Trent, November 12.—Manufacture, supply, delivery and erection of two 1 000 MVA outdoor oil circuit-breakers, switchgear structures, and two indoor control panels, as an extension to existing 33 kV equipment. Specification from General Manager, Electricity Department, 31, Kingsway, Stoke-on-Trent; deposit, £2.

Eston, November 15.—Supply and delivery of: (a) e.h.t. ring main switchgear; (b) l.t. switchgear; (c) 1 500 kVA transformer; (d) supplying, laying and jointing of approx. 1 250 yds. of e.h.t. and l.t. underground cables. Specifications from Electrical Engineer, Electricity Showrooms, Middlesbrough Road, South Bank, Middlesbrough.

Formby, November 17.—Supply and delivery of one 400 kVA transformer and one pedestal type l.t. oil circuit-breaker, for above. Specifications from Electrical Engineer, Council Offices, Formby.

Worksop.—Supply of e.h.t. and l.t. p.i. cables. Particulars from Borough Electrical Engineer, Electricity Works, Canal Road, Worksop.

Electricity Supply

Accrington.—An architect has been appointed to prepare plans for the new generating station at Huncoat. He is Mr. Robert N. Mackellar, of Cackett, Burns, Dick and Mackellar, of Newcastle-on-Tyne.

Penmaenmawr.—The Council has approved proposals for reducing tariffs. They include reductions of the two-part tariffs to ¾d. per unit and meter rents by 50 per cent., except in the case of sub-meters installed for consumers' benefit.

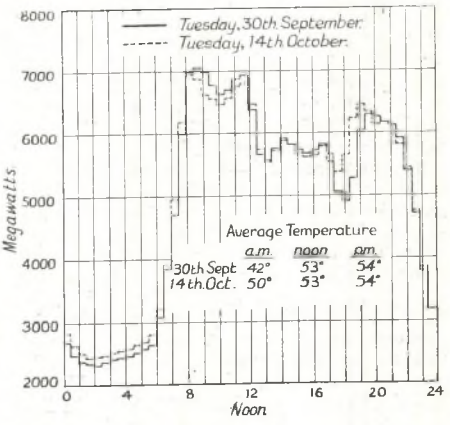
Belfast.—The Electricity Committee has agreed to provide facilities for training for a six months' period an Indian engineer in the commercial and administrative aspects of the supply industry. His salary and maintenance will be provided by the Indian Government.

Chester.—Following the receipt of preliminary notification from the C.E.B. that plant has been allocated, the Electrical Engineer is to obtain quotations for the construction of a new power station in the area, comprising two 30 000 kW sets with boiler plant. Provision will be made for two further sets.

Gateshead.—The first stage of the Council's street-lighting scheme, involving 238 lamps, at a cost of £17 015, is to be started. The Ministry of Transport has consented to part of the work being approved now in order that orders can be placed for some of the equipment needed.

Kyle of Lochalsh.—The first of the smaller schemes of the North of Scotland Hydro-Electric Board to be in operation will be that at Nostie Bridge, a project which will supply the districts of Kyle, Loch Carron and Skye. After visiting the scheme in the course of a general tour of inspection of the Board's projects, Mr. A. E. MacColl, deputy chairman, stated that the project would be producing power by the autumn of next year. Expressing his satisfaction with the progress made despite shortages of labour and materials, Mr. MacColl added that the major scheme now under construction at Fannich was expected to be in operation by spring, 1949.

Nelson.—Speaking on load spreading measures, Ald. R. Winterbottom, chairman of the Electricity Committee, recently suggested that odd-numbered houses in local roads and streets should take the bulk of the electricity supply on Mondays, Wednesdays and Fridays and the even numbers on Tuesdays, Thursdays and Saturdays. If housewives would do their washing, ironing, baking and special cleaning necessitating the use of electrical appliances on those specified days, he



Compared with the curve for September 30, before load-spreading was started, the C.E.B. national load curve for Tuesday, October 14, above, shows evidence of a further increase in the night-time and early morning load. There was also a considerable rise, amounting to nearly 1 000 MW, in the national demand between 6.30 and 7 p.m. The average mid-day and evening temperatures were the same on both days, although the morning temperature on October 14 was 8° warmer

stated, it would cut down the load by more than 30 per cent. Mr. A. H. Todd, chief engineer of the near-by Clitheroe undertaking, has also suggested a staggering of wash days as an easy way in which housewives can reduce the peak load.

Banbury.—There has been a further development in the street lighting problem at Banbury, referred to in a recent issue. The divisional road engineer has made an inspection, and if his recommendation to the Ministry of Transport is favourably received it is possible that the Council's scheme will be sanctioned very much as it was first proposed. If sanction is granted in the near future, the S.W. and S.E.P. Co. have indicated that there will probably be some electric street lighting in the town before Christmas.

Scotland.—In their Constructional Scheme No. 15, published last week, the North of Scotland Hydro-Electric Board plan to take advantage of the fall in the River Gaur, Perthshire, which flows from

Loch Eigheach into Loch Rannoch. A dam 45 ft. high and 335 ft. long is to be built at the east end of the Loch, which will be almost doubled in size. Additional streams will be diverted into the loch to utilise a catchment area of 93 sq. miles with an average rainfall of 69 in. A fish pass for salmon will be provided from the tail race and the road between Rannoch station and Kinloch Rannoch will be diverted along the North side of the loch. In the generating station, a single turbine operating at a gross head of 92 ft. will drive a 5 000 kW alternator. The power generated will be transmitted at 33 kV to the Grampian E.S. Co.'s existing system, connecting with the Rannoch power station.

Southend-on-Sea.—Extensive reinforcements of the undertaking's transmission and distribution system, estimated to cost at least £525 000, are planned to meet rising demand. Sending us details of the project, which has now been submitted to the Commissioners for loan sanction, Mr. R. C. Golding (borough electrical engineer and manager) states that after full discussion between the undertaking and the C.E.B., it has been decided to replace the three existing 33 kV grid lines by two 132 kV lines and to provide a firm 60 MVA at a new switching station to be situated centrally on the northern boundary of the borough at Prittlewell. Bulk supply will then be given at 33 kV in place of 11 kV as at present. A new 33 kV network will be superimposed on the existing 11 kV system, and the scheme decided upon will allow for six 33/11 kV major feeding points to be sited at convenient points throughout the borough. Specifications and drawings are in course of preparation, and tenders for cables, switchgear and transformers will be invited at an early date. The first portion of the scheme is estimated to cost £220 000, this sum comprising purchase of C.E.B. land, cables, switchgear and transformers, at £44 500; 33 kV cables and pilots at £68 500; 33 kV switchgear and transformers at £87 000; 33 kV switch-house and control room at £20 000. The first part of the scheme should be completed and ready to augment the supply at Leigh for the winter load of 1948. This will be followed by an additional feeding point at Eastwood to provide an adequate supply the following year for a new industrial estate being developed in that area. The 33 kV feeders, each with a capacity of 15 MVA, will be operated initially as transformer feeders, but sufficient land is being obtained now to provide for the installation of switchgear and the operation of the feeders as either ring mains or radial feeders at a future date.

ELECTRICITY COMMISSION LOAN SANCTIONS

AMOUNTS SANCTIONED FOR PERIOD FROM APRIL 1, 1944, TO SEPTEMBER 30, 1947

(A) PUBLIC AUTHORITIES (EXCLUDING CENTRAL ELECTRICITY BOARD)

ITEM	PERIOD 1944-45	1945-46	1946-47	6 mnths. to Sept. 30, 1947
	£	£	£	£
Purchase of property	13 907	124 165	322 556	83 906
Buildings (generation purposes)	6 711 285	10 710 085	6 799 906	9 947 373
Buildings (distribution purposes)	42 734	789 258	1 618 303	513 179
Plant (generation purposes) ...	20 323 383	19 077 935	19 239 336	29 626 722
Plant (distribution purposes) ...	593 327	2 381 948	4 854 982	6 147 676
Mains and services	491 422	3 667 759	8 299 475	6 386 516
Meters and instruments ...	31 249	246 418	679 128	661 733
Wiring installations	1 107	16 009	80 017	47 000
Apparatus	24 034	245 500	594 788	420 940
Other purposes	105 370	393 298	1 490 103	343 054
Total	£28 337 818	£37 652 375	£43 978 594	£54 178 099

(B) CENTRAL ELECTRICITY BOARD

	£	£	£	£
Purchase of property	—	—	—	—
Buildings (distribution purposes)	200 000	—	—	—
Plant (distribution)	230 000	—	—	—
Mains	400 000	—	—	—
Civil defence	100 000	100 000	—	—
Generating stations	1 075 000	—	—	—
Other purposes	20 000	—	—	—
Total	£2 025 000	£100 000	—	—

(C) TOTAL AMOUNTS SANCTIONED DURING EACH QUARTER

	£	£	£	£
April 1—June 30	1 067 578	16 792 980	8 816 821	20 164 978
July 1—Sept. 30	5 801 894	4 035 003	18 414 206	34 013 121
Oct. 1—Dec. 31... ...	8 070 946	10 337 392	8 231 878	—
Jan 1—Mar. 31	15 422 400	6 587 000	8 515 689	—
Grand total	£30 362 818	£37 752 375	£43 978 594	£54 178 099

Company News

NIGERIAN ELECTRICITY SUPPLY CORP., LTD.—Power sales for yr. ended Feb. 28, realised £153 332 (£200 173), plus int. and transf. fees £1 542 (£3 949), mkg. total rev. £154 874 (£204 122); deduct operating exes., etc., incldg. £35 000 (£30 806), deprecn. £89 575 (£81 409), lvg. prft. £65 299 (£122 713). To tax provn. £32 500 (£58 000), deb. int. £2 407 (£7 555), deb. redemption nil (£14 438), res. nil (£5 000), div. 8% (10%) and bonus 2% (2½%) £29 975 (£37 469); fwd. £16 868 (£16 451).

BAGDAD LIGHT AND POWER CO., LTD.—Sale of current, etc., 1946, £294 243 (£277 693), plus int., etc., £2 497 (£1 757). To cost of generation £43 727 (£46 565), distribtn. £26 125 (£26 141), gen. exes. £25 098 (£22 224), fees £3 902 (£3 053), Govt. tech. control, etc., £228 (£236). Deprecn. £26 734 (£25 003), for Brit. taxn. and Iraq Govt.'s participatn. £134 100 (£134 500), blce. £36 825 (£21 734). To pref. div. £9 621 (£8 747), div. 6½%, tax free, on ord. £13 006 (£12 006), fwd. £21 483 (£7 285). Fixed assets total £841 074, curr. assets £146 325, curr. liabs. £265 648.

DUBILIER CONDENSER CO. (1925), LTD.—Prft. to Mar. 31 £45 840 (£58 260), other income £3 254 (£4 818), mkg. £49 094 (£63 078). To patent costs £922 (£954), dirs.' fees £600 (same), dirs.' addtnl. remun. £1 046 (£1 743), deprecn., amort., etc., £8 947 (£8 958), tax £15 000 (£21 000), leavg. prft. £22 578 (£29 822). To gen. res. nil (£14 675), ord. div. 20% (same), fwd. £32 687 (£24 076). Stock and work £132 286 (£102 713); debtors £111 224 (£112 757); cash £411 (£80 900); cash E.P.T. refund £37 319 (nil), creditors and current tax £89 677 (£137 486), bank overdraft £44 747 (nil).

STRAND ELECTRIC HOLDINGS, LTD.—Accts. of operating co. for yr. to April 30 show gross trdg. prft. (includg. approx. £11 000 on settlement of war contracts applicable to previous yrs.) £160 405 (£123 183), plus rents receivable £3 740 (£2 182), prft. on sale of equip. £1 075 (£800), mkg. £165 220 (£126 165); deduct exes., deprecn., fees, etc., £114 005 (£90 101), tax £34 980 (£26 951), lvg. £16 235 (£9 113), to which is added £3 000 (nil) excess tax prov. charged in prev. yrs. To res. £7 000 (nil), div. gross to parent co. £22 245 (£16 569). Div. of parent co. 17½% (12½%, incldg. 2½% bonus), fwd. £4 428 (£3 549). To facilitate preparation of consd. accts., accts. of holding co. have been made up to April 30 instead of July 11, 1947, and in future financial yr. of holding co. will be the same as that of the operating co., namely, May 1 to April 30. Although accts. of holding co. cover period of less than 10 months, those of operating co., from which holding co. derives whole of its rev., cover a full year's trdg.

TELEPHONE RENTALS, LTD.—Speaking at the annual meeting, Mr. F. T. Jackson (chairman) referred to the employees' profit-sharing scheme which had been inaugurated, and said this had been remarkably well received by their staff and was achieving its purpose in giving the employees a direct interest in results, thereby providing an additional incentive to effort. This year, the sum set aside for the purpose was £21 332. As an approximate comparison with the dividend paid to shareholders, the total amount paid out under employees' participation amounted to a net figure of £12 000, or about 1½ per cent. of the issued capital of the company. Dealing with the present position of the company, the chairman said that although they were not the manufacturers of the equipment they installed and maintained, the shortage of materials affected their suppliers. The period between placing an order and the commencement of deliveries was between nine and twelve months.

Metal Prices

		Monday, Price	October 20 Inc.	Dec.
Copper—				
Best Selected	...per ton	£130 10 0	—	—
Electro Wire bars	... „	£132 0 0	—	—
H.C. Wires, basis	... „	£149 10 0	—	—
Sheet	... „	£173 10 0	—	—
Bronze Electrical quality 1% *Tin*—				
Wire (Telephone), per ton		£172 5 0	—	—
Brass (60/40)—				
Rod basis ...	... per lb.	1s. 1¾d.	—	—
Wire	... „	1s. 6⅛d.	—	—
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)	...per ton	£9 10 0	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in.	...	£35 15 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in.	„	£22 15 0	—	—
Lead Pig—				
English	„	£91 10 0	—	—
Foreign or Colonial ...	„	£90 0 0	—	—
Tin—				
Ingot (minimum of 99.9% purity)	... „	£442 10 0	—	—
Wire, basis ...	... per lb.	5s. 6¾d.	—	—
Aluminium Ingots	...per ton	£80 0 0	—	—
Spelter	...	£70 0 0	—	—
Mercury (spot) ... (*ex. warehouse*)	per bott.	£16 0 0	—	—

Prices of galvanised steel wire and steel tape supplied by C.M.A. Other metal prices supplied by B.I. Callender's Cables, Ltd.

Commercial Information

Mortgages and Charges

NOTE.—*The Companies Act of* 1908 *provides that every mortgage or charge shall be registered within 21 days after its creation, and that every company shall, in its annual summary, specify the total amount of debt due from it in respect of mortgages or charges. The following mortgages and charges have been registered. The total debt prior to the present creation, as shown in the annual summary, is given—marked with an *—followed by the date of the summary, but such total may have been reduced.*

EDWARDS AND CO. (ELECTRICAL), LTD., Bournemouth.—August 5, £1 700 debenture, to Mrs. E. H. Klitz, Bournemouth; general charge, and £2 900 debenture, to A. R. Klitz, Bournemouth; second general charge.

CRANBROOK RADIO, LTD., Bristol.—August 5, £10 000 debentures; general charge. * £2 000. October 5, 1946.

HARBOUR ARC MANUFACTURING CO., LTD. (formerly SURREY ARC WELDING CO., LTD.), London, E.C.—August 1, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank from the company and/or Fay Harbour; charged on 35, Vallance Gardens, Hove. *—. December 31, 1944.

LONGFORD ELECTRIC CO., LTD., Stretford.—Sept. 6, charge, to Williams Deacon's Bank, Ltd., securing all moneys due or to become due to the Bank; charged on land and bldg. formerly used as Wesleyan Methodist School, Grosvenor Street, Chorlton-upon-Medlock. *Nil. Feb. 5, 1947.

Satisfactions

LONDON ELECTRICAL CO. (BLACKFRIARS), LTD.—Sat'ns. Aug. 14, £1 000 and £400 reg. Apr. 26, 1934.

EXPRESS MAGNETO AND ELECTRICAL CO. (JERSEY), LTD., Bristol.—Sat'n. Aug. 22, £800, reg. June 27, 1936.

ACE ELECTRONICS, LTD., London, S.W.—Sat'n. Aug. 27, of charge reg. Jan. 27, 1947.

Coming Events

Friday, October 24 (To-day)

INSTITUTION OF MECHANICAL ENGINEERS.—London. Presidential Address. *5.30 p.m.*

BIRMINGHAM ELECTRIC CLUB. — Ladies' Evening.

Saturday, October 25

ASSOCIATION OF ELECTRICAL HOUSECRAFT ADVISERS.—London. At 35, Grosvenor Place, S.W.1. Annual General Meeting. *3 p.m.*

Monday, October 27

JUNIOR INSTITUTION OF ENGINEERS, SHEFFIELD AND DISTRICT SECTION.—Sheffield. At the Metallurgical Club, West Street. "Plastics" by W. E. Amies. *7.30 p.m.*

I.E.E., MEASUREMENTS SECTION.—London. "Standardisation in the Electrical Industry," by P. Good. *5.30 p.m.*

ELECTRICAL POWER ENGINEERS' ASSOCIATION, MIDLAND TECHNICAL GROUP.—Wolverhampton. At the Victoria Hotel. "Modern Illumination Technique," by J. C. Lowson. *7 p.m.*

I.E.E., N. EASTERN CENTRE.—Newcastle-on-Tyne. "Standardisation of Switchgear," by D. E. Lambert and J. Christie. *6.15 p.m.*

Tuesday, October 28

I.E.E., SCOTTISH CENTRE.—Glasgow. At the Royal Technical College. "The Application of Electrical Technique to the Service of Some Other Industries," by H. Cobden Turner and G. M. Tomlin. *6.30 p.m.*

E.L.M.A. LIGHTING SERVICE BUREAU.—London. At 2, Savoy Hill, Strand, W.C.2. Illumination Design Continuation Course. *Until October 30.*

I.E.E., N. WESTERN CENTRE, TRANSMISSION GROUP.—Manchester. "Standardisation of Power Cables," by W. H. Lythgoe. *6 p.m.*

COVENTRY ELECTRIC CLUB.—At the Civic Restaurant. "New Lamps for Old," by L. J. Davies.

I.E.E., N. MIDLAND CENTRE, INSTALLATIONS GROUP.—Leeds. "Protective Finishing of Electrical Equipment," by F. Widnall and R. Newbound. *6.30 p.m.*

I.E.E., S. MIDLAND CENTRE, RUGBY SUB-CENTRE.—At the Corporation Electricity Showrooms. "Tooth Ripple Losses in Unwound Pole-Shoes," by W. J. Gibbs. *6.45 p.m.*

Wednesday, October 29

I.E.E., N. WESTERN CENTRE.—Preston. At the Harris Institute. "Record of Experience on the Irish Electricity Supply System," by A. Burke, R. C. Cuffe and W. O'Neill. *6.45 p.m.*

I.E.E., N. WESTERN STUDENTS' SECTION.—Manchester. "Some Aspects of Railway Electrification," by J. Beasley. *6.45 p.m.*

INSTITUTE OF WELDING.—London. At the Institution of Civil Engineers. Presidential Address, by J. L. Adam. *6 p.m.*

I.E.E., N. MIDLAND CENTRE, SHEFFIELD SUB-CENTRE.—At the Royal Victoria Station Hotel. "Comparisons Between Gas and Electricity on the Basis of Coal Economy," by P. Schiller. *6.15 p.m.*

I.E.E., WESTERN CENTRE, INSTALLATIONS GROUP.—Bristol. At the Merchant Venturers' Technical College. Address by R. H. Rawll. *6 p.m.*

Thursday, October 30

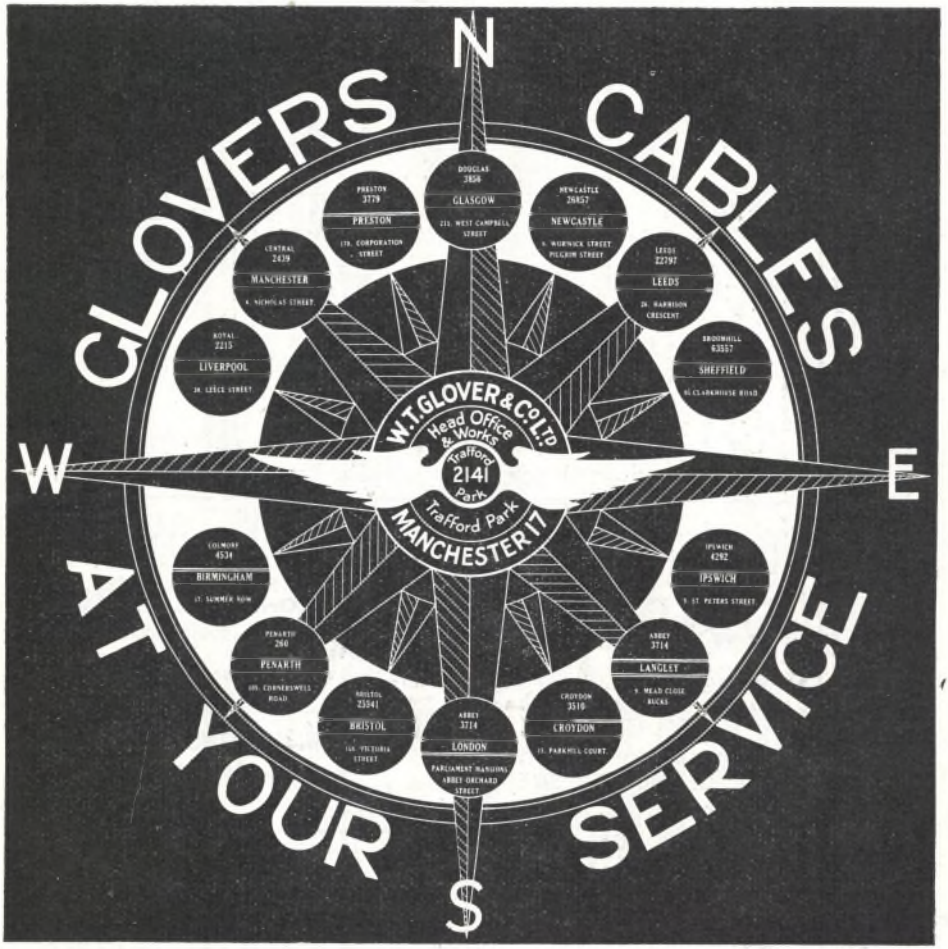
LEICESTER ELECTRICAL SOCIETY.—At the Electricity Offices. "The Care and Maintenance of Electric Motors," by R. A. Joseph.

INSTITUTION OF ENGINEERS-IN-CHARGE.—London. At the St. Bride Institute. Address by the President-Elect, Lt.-Col. J. D. K. Restler. *6.30 p.m.*

BATTI-WALLAHS' SOCIETY.—London. At the Connaught Rooms. Luncheon to Dr. T. E. Allibone. *12.30 p.m.*

Friday, October 31

INSTITUTION OF MECHANICAL ENGINEERS.—London. "Turbine Blades for the Whittle Engine," by T. A. Kestell. *5.30 p.m.*


GLOVERS CABLES
AT YOUR SERVICE
N
E
S
W
W.T.GLOVER & CO. LTD.
Head Office & Works
Trafford Park
2141
Trafford Park
MANCHESTER 17
DOUGLAS 3858
GLASGOW
221, WEST CAMPBELL STREET
NEWCASTLE 26457
NEWCASTLE
9, WARWICK STREET, PILGRIM STREET
LEEDS 22797
LEEDS
29, HARRISON CRESCENT
BROOMHILL 63557
SHEFFIELD
81, CLARENDUSE ROAD
IPSWICH 4282
IPSWICH
9, ST. PETERS STREET
ABBEY 3714
LANGLEY
9, MEAD CLOSE, BUCKS
CROYDON 3510
CROYDON
13, PARK HILL COURT
ABBEY 3714
LONDON
PARLIAMENT MANSIONS, ABBEY ORCHARD STREET
BRISTOL 23041
BRISTOL
126, VICTORIA STREET
PENARTH 260
PENARTH
189, CORNERSWELL ROAD
COLMORE 4534
BIRMINGHAM
17, SUMMER ROW
CENTRAL 2439
MANCHESTER
4, NICHOLAS STREET
PRESTON 3179
PRESTON
179, CORPORATION STREET
ROYAL 2215
LIVERPOOL
24, LEECE STREET

INDEX TO ADVERTISERS IN THIS ISSUE

CLASSIFIED ADVERTISEMENTS

None of the vacancies in these columns relates to a man between the age of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that Order.

SITUATIONS VACANT

BRITISH ELECTRICITY AUTHORITY.

EDUCATION AND TRAINING OFFICER.

APPLICATIONS are invited for the post of CHIEF EDUCATION AND TRAINING OFFICER in the Labour Relations Department of the Authority with headquarters in London.

A starting salary, commensurate with qualifications, will be paid within the salary scale of £1,500, rising by annual increments of £50, to £2,000 per annum. Salary will be subject to deductions for superannuation.

Candidates should have experience in adult education and in the preparation and administration of practical and technical training schemes for both craftsmen and professional engineers. They should state age, qualifications, experience, present salary and personal references.

Applications, which will be acknowledged and treated as confidential, should be sent within 14 days to the Acting Establishment Officer, British Electricity Authority, Portland Court, 170a, Great Portland Street, W.1. (272)

BRITISH ELECTRICITY AUTHORITY.

ASSISTANT SECRETARY.

ADMINISTRATIVE OFFICER

THE British Electricity Authority invite applications for a limited number of appointments which will be made at headquarters (London) in the following administrative grades :—

1. ASSISTANT SECRETARY on a salary scale of £1,500 rising by annual increments of £50, to £2,000 pe annum.
2. ADMINISTRATIVE OFFICER on a salary scale of £900, rising by annual increments of £35, to £1,250 per annum.

The above salaries will be subject to deduction for superannuation.

Candidates must have had administrative or executive experience, preferably in the electricity industry, and also have a wide knowledge of secretarial duties. They should state age, qualifications, experience, present salary and personal references.

Applications, which will be acknowledged and treated as confidential, should be sent within 14 days to the Acting Establishment Officer, British Electricity Authority, Portland Court, 170a, Great Portland Street, W.1. (271)

DRAUGHTSMEN required by switchgear engineers. Experienced in contract work, protective gear diagrams or design.—Applications in writing, with full particulars, to : Ferguson, Pailin Ltd., Manchester, 11. (84)

QUALIFIED Electrical Engineer, age 22-27. Good education, personality and initiative essential. Must have sales experience. Excellent prospects if willing to start modestly with firm of Electrical Appliances Manufacturers.—Box W.E.M., Harwood Press (Advertising) Ltd., 47, West Street, Harrow, Middlesex. (281)

TECHNICIAN wanted fully experienced in all aspects of manufacture of Fluorescent Tubes. Immediate engagement. Good prospects.—Write : Box L.H.H., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4. (273)

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COUNTY BOROUGH OF OLDHAM.

ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the appointment of Chemist in the Corporation's Power Stations, an extension of one of which recently has been directed by the Central Electricity Board.

Applicants should possess a suitable qualification in chemistry and have had practical experience in the chemical laboratory of a modern power station, with high pressure boiler plant. Salary in accordance with N.J.B. Schedule, Grade 8 ; on present classification £481-£507 per annum.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937. The successful applicant will be required to pass a medical examination and to comply with the condition as to residence to which appointments under the Corporation are subject. Canvassing will be a disqualification.

The age limit for new entrants to the Local Government Service is 45 years unless a transfer value in respect of superannuation is payable. For the purpose of this appointment, the age of applicants who are serving or have served in H.M. Forces will be regarded as being reduced by the number of years of their war service.

Applications, endorsed "Chemist," stating age, full details of education, training and experience, with copies of not more than three testimonials, to be forwarded to the Chief Engineer and Manager, Corporation Electricity Department, Greenhill Offices, Oldham, not later than Wednesday, November 5th, 1947.

EDWARD HAINES, LL.M.,
Town Clerk.

Town Hall,
OLDHAM.
October 23rd, 1947. (270)

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A QUANTITY of Electric Bulbs, 12 v. and 24 v. S.B.C., for serial burning.—Suplex Lamps Ltd., Suplex House, 239, High Holborn, W.C.1. Phone. Holborn 0225. (279)

AMMETERS, Voltmeters and Wattmeters, switchboard/portable pattern, first grade accuracy. Sizes varying from 2 in. dial to 6 in. dial inclusive. Short delivery. —Write for price and literature to : Measuring Instruments (Pullin) Ltd., Electrin Works, Winchester Street, Acton, London, W.3. (247)

BRITAIN'S best bargains in Electric Cable. 8½ million yards available at big reductions, covering Auto, Ignition, Flexs, Radio and Starter Cable.—List free on application to : Box 5004, Magna Ltd., 82-94, Seymour Place, London, W.1. (277)

BRITISH Electric Co. (Beco) Ltd. can supply most types of A.C. and D.C. Motors from stock.—British Electric Co. (Beco) Ltd., Electra House, 25-29, Lower Road, Rotherhithe, S.E.16. Bermondsey 3449. (20)

ELECTRIC HOIST BLOCKS, capacity 5 cwt. to 7 tons. Reasonable delivery.—A. Morgan and Co., 50, Wilkin Street, London, N.W.5. Telephone : GUL. 1147. (24)

ELECTRIC MOTORS, ¼ h.p., 3,000 r.p.m., D.C., 200-250 v. Also 110 N. Stock delivery, £6 each.—JOHN E. STEEL, Bingley, Yorks. Phone 1066. (TC113)

ELECTRIC MOTORS, A.C. and D.C. We supply all types and sizes of Electrical Machinery : Slow Speed Reduction Gears can be supplied to customers' requirements with short deliveries.—Send your enquiries to The Electropower Co., Ltd., 3, Retreat Close, Kenton, Middlesex. Tel. : WORdsworth 4928. (14)

FOR SALE

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FOR SALE. 89 000 New Porcelain Cleats, ⅝ in. × ⅝ in. × 3⅛ in.—Offers and enquiries to: A. T. Vaughan, 69, Hainault Road, Leytonstone, London, E.11. (276)

FOR sale from stock. New Lundberg SWITCHES, 2 in. × 1½ in. × 1 in. Adhesive Tapes, white, 1 in. and 1¼ in.—For particulars and price apply: E. S. Mashal, 86, Alie Street, E.1. Phone: Royal 4405/6. (264)

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LAMPSHADE Wires, Fanguards, etc., to customers' requirements. Spotwelding and small capstan capacity available.—Industrial Design and Manufacture, 1a, Devonport Road, Shepherds Bush. (262)

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ONE Variable Speed Commutator Motor by Holmes of Newcastle, 100/25 h.p., 960/230 r.p.m., 500/400 volts, 3-phase supply. For operating this variable speed commutator motor, Brookhirst Switchgear and Control Panel, 100 h.p., rating complete with all equipment, is available. Full technical details on application. THE BRITISH ELECTRIC CO. (BECO LTD.), 25-29, Lower Road, Rotherhithe, S.E.16. (258)

PENCIL Elements for electric fires of very good quality, 9 in. to 12 in., 750 W to 1 000 W, wound to your requirements. Wholesalers and manufacturers. Deliver same week.—Charles, 48, Dorchester Way, Kenton, Harrow, Middlesex. (248)

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VACUUM Cleaner, Spares and Accessories. Belts, Brushes' Bearings, Fans, Dustbags, etc. Largest stock of spares in the country. Repairs, rewinding, etc.—Reliance Vac Spares, Ltd., 152-154, Broadway, Bexley Heath, Kent. (TC116)

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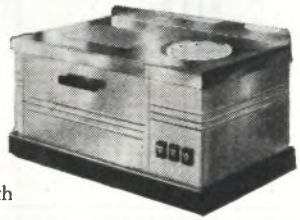

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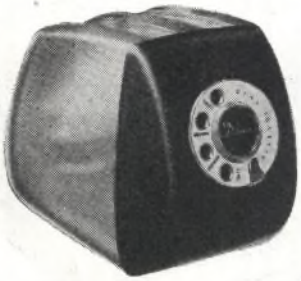

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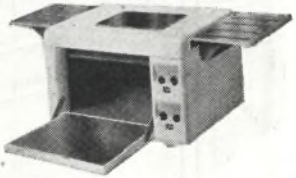

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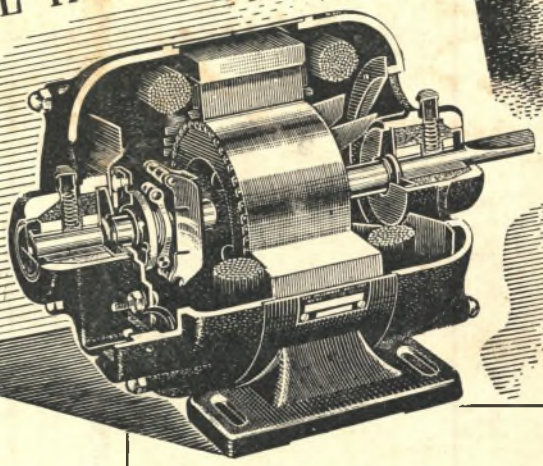

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