

THE

# ELECTRICIAN

Vol. CXXXIV. No. 3485.

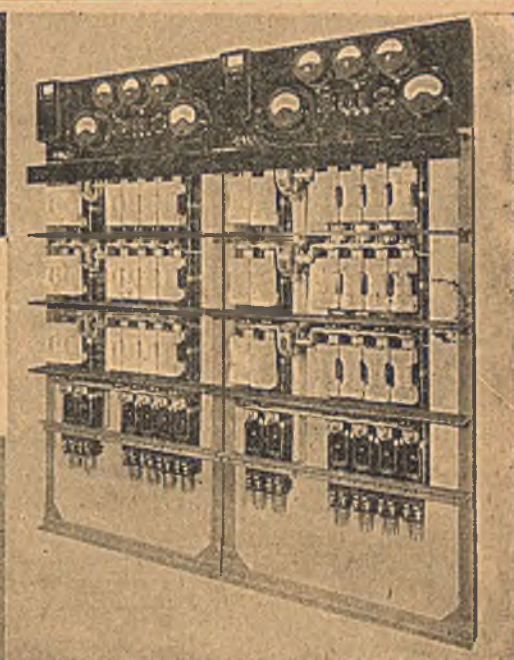
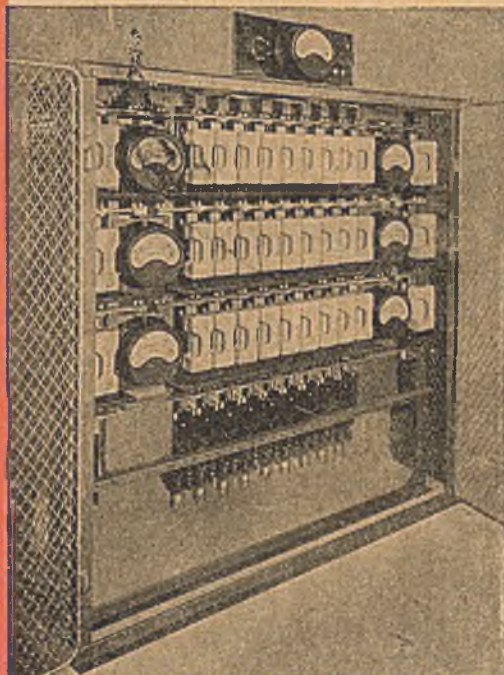
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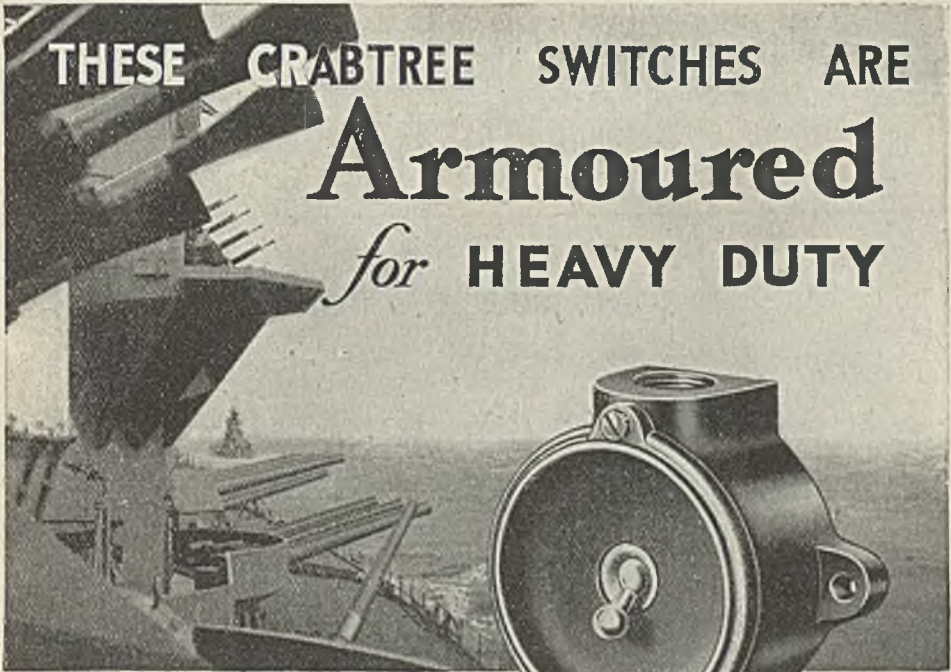
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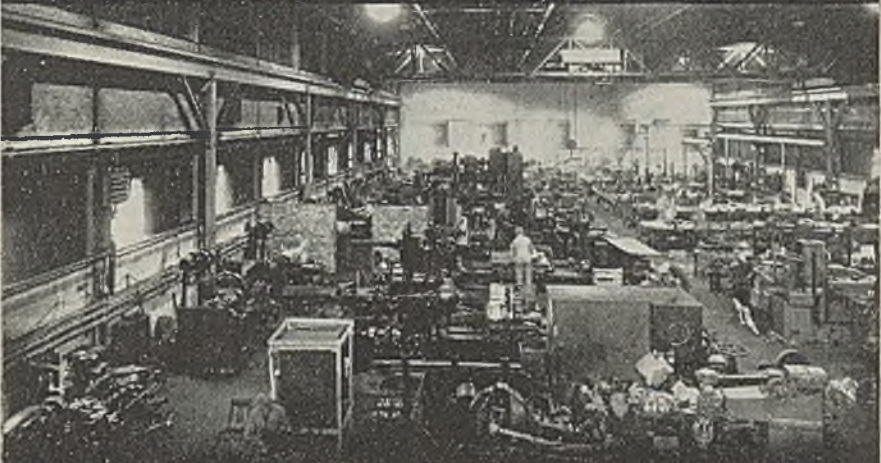


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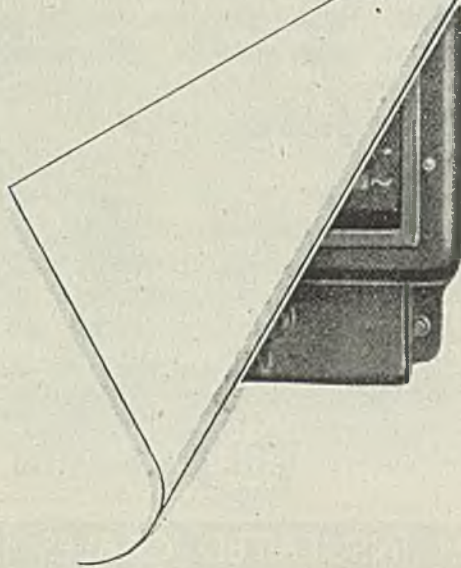
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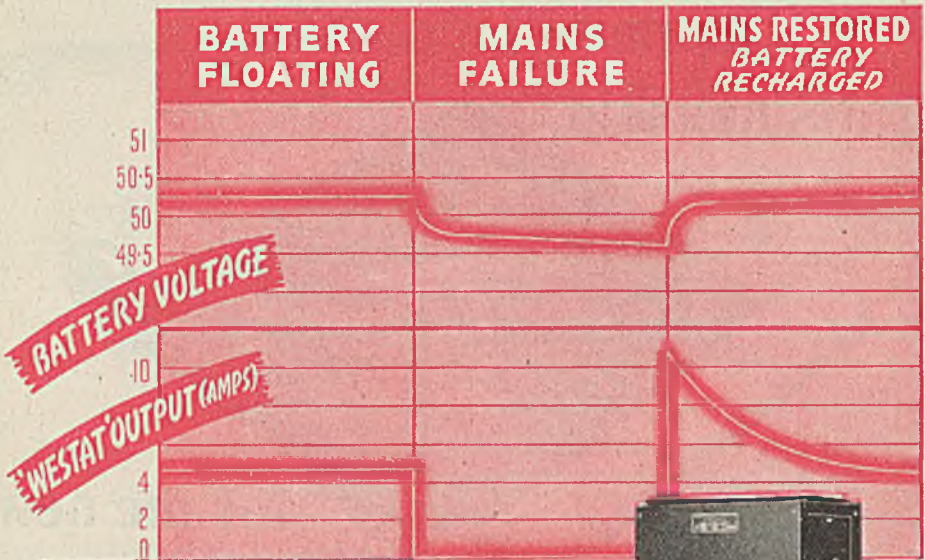
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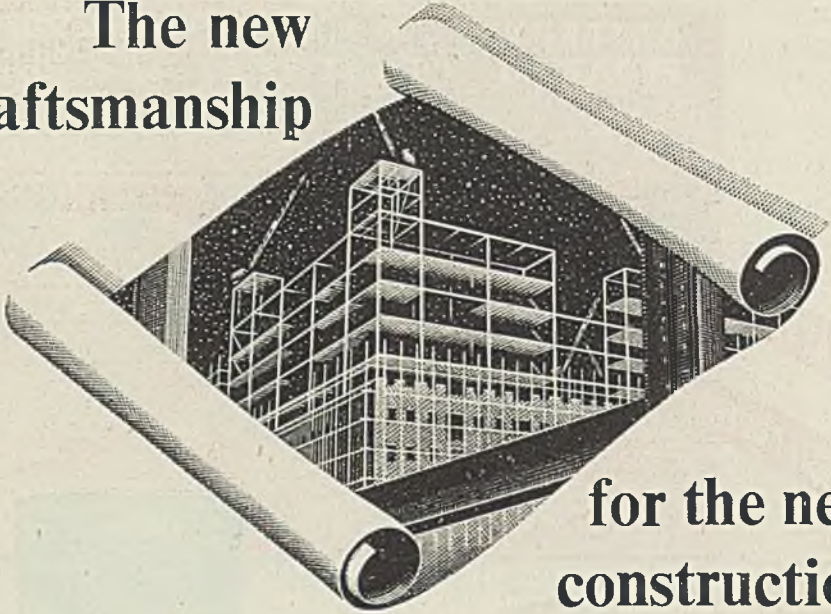
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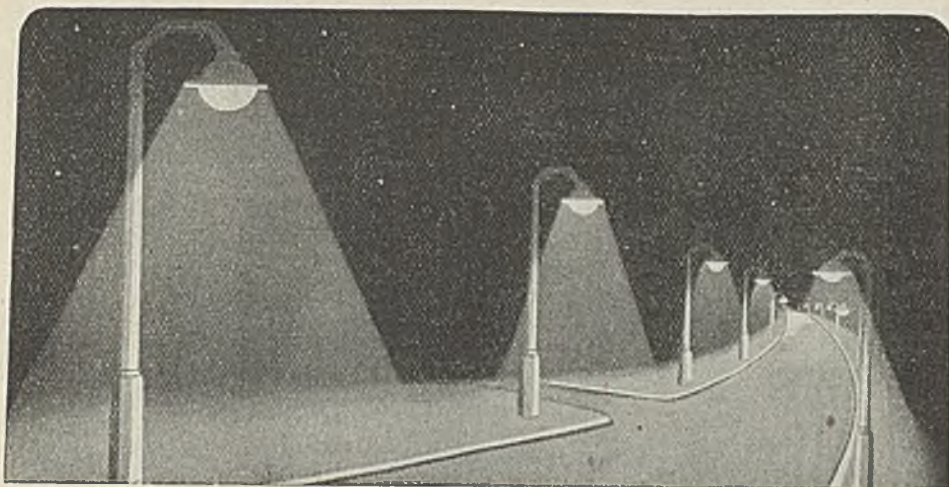
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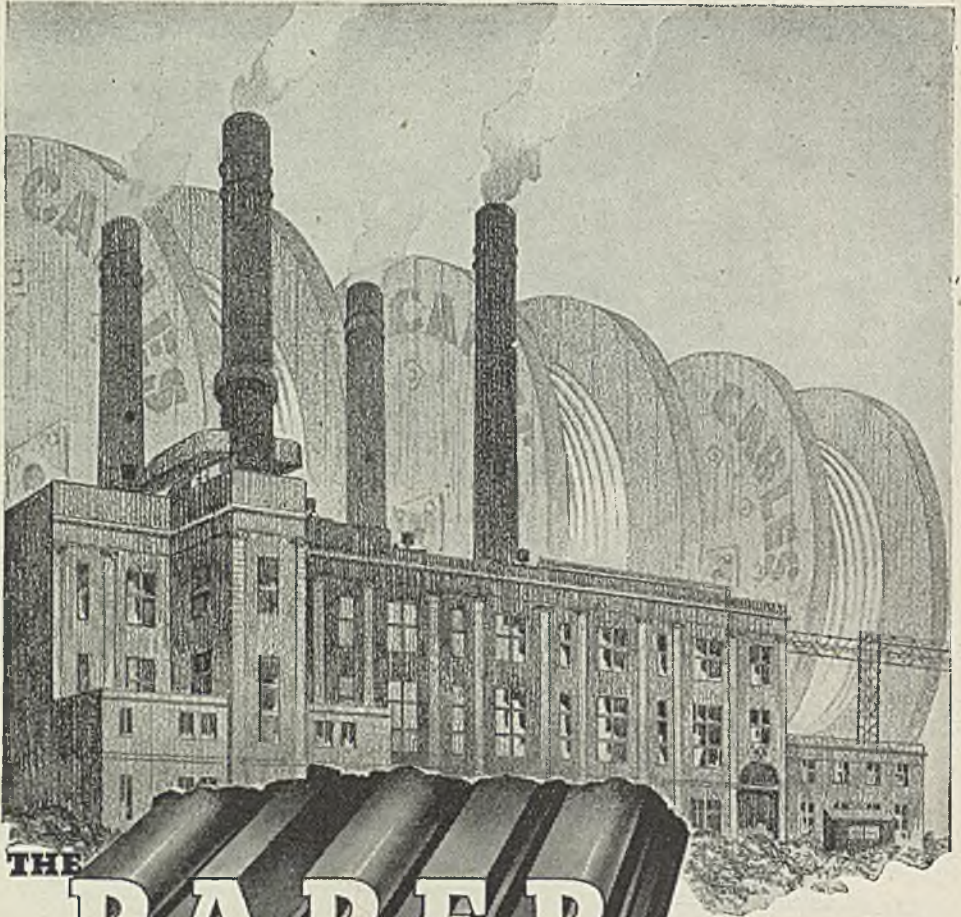
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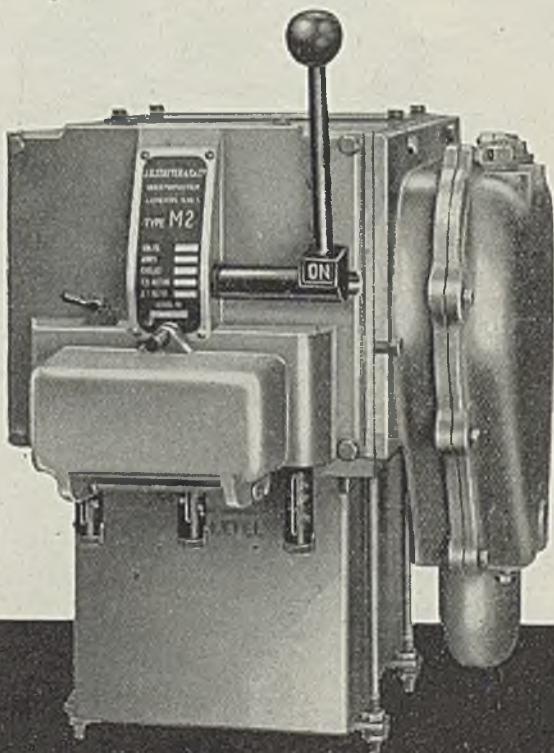
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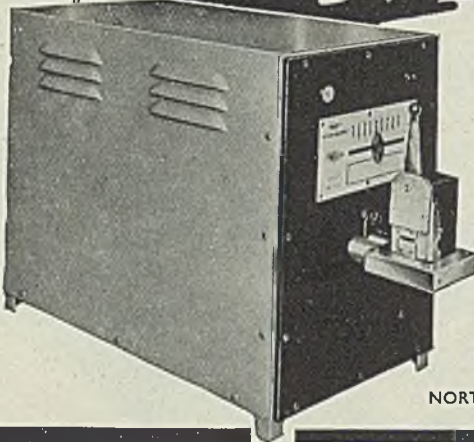
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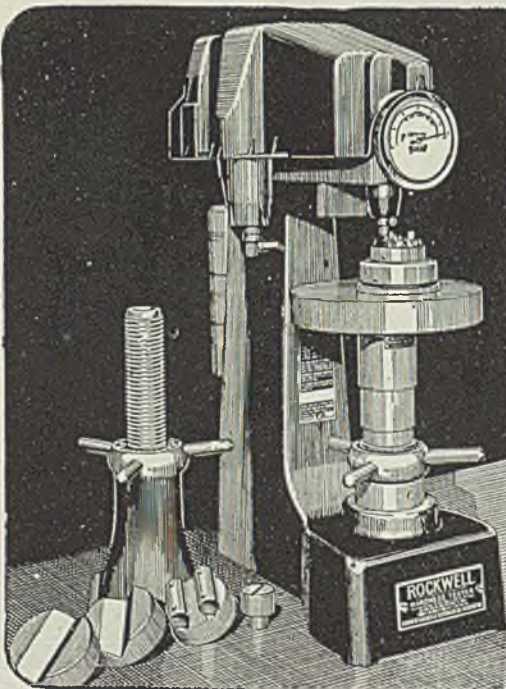


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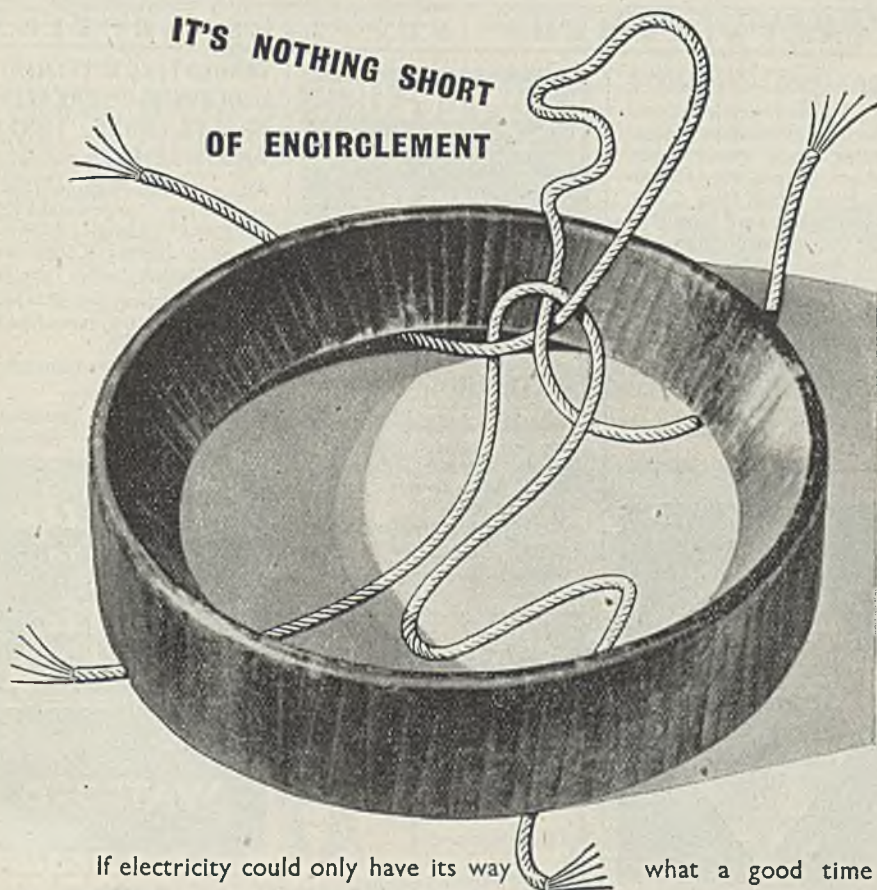
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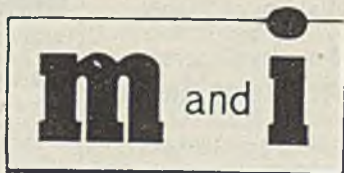




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**IMPORTANT:** The final date of entry for the Examination is 3rd May, 1945.

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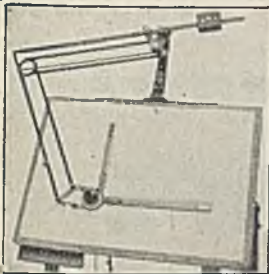
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March 16, 1945

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must be operated and, as the Committee suggests, extended to the provinces. Such a service, coupled with better maintenance arrangements for receivers than was in vogue before the war, should do much to increase the public taste far beyond the 20 000 or so enthusiasts who possessed television sets before the Alexandra Palace service was closed down.

There were in 1939, certain firms interested in the potentiality of the cinema for displaying television programmes, and though the cinema industry recognises the part that television is destined to play in the future field of public entertainment, its reception of the idea as an added attraction in the cinema is lukewarm. This may be based on a doubt whether the development of television in the cinema would be detrimental to its interests, but experience with sound broadcasting suggests that such fears are unfounded. The Hankey Committee has borne this point in mind, for among its recommendations is one that the possibilities of the use of television in cinemas should receive close attention, and the difficulties of the past be seriously considered lest they prejudice the development of the service.

With respect to television and export trade, before its potentialities can be developed it is obvious that some form of standardisation must be introduced, and this subject, it is understood, will receive consideration at an International Telecommunications Conference, which will doubtless be held fairly early in the post-war period. American pre-war practice was based on 525 lines per picture compared with the British pre-war standard of 405 lines and though the number of lines per picture in the two systems may be unimportant in relation

## Television Development

THE Committee appointed in September, 1943, under the chairmanship of Lord HANKEY, to prepare plans for the reinstatement of television after the war, has published its findings and among them will be found much of interest to the electrical industry. Because of the technical qualifications of its personnel, the recommendations of the Committee are based on sound engineering, coupled with a consideration of the potential uses of television as an aid to export trade, and they should therefore, be reviewed against a background far wider in its aspect than that concerned with the mere re-establishment of the pre-war conditions. In the first place, television will be resumed after the war in a more favourable atmosphere, for though the war years have not, apparently, produced any particularly spectacular advance in television technique, a number of technical refinements have, at any rate, been developed. Before these can be put to good use, however, a broadcast service

to other technical differences more likely to affect the quality of the received picture, it is sufficient to complicate interchangeability between British and American apparatus—one of the first essentials if overseas markets are to be developed.

#### Opportunity for Co-operative Research

IT will be generally agreed that before television can hope to rival sound broadcasting in its popularity, there must of necessity be a good deal of research devoted to it, both with respect to technical advancement and reduction in the price of receivers. In spheres of other electrical interest the lesson was learnt long ago that where research is concerned the most profitable results are those obtained by the establishment of such bodies as the E.R.A., and with no more sinking of individuality than has taken place in the electrical industry, television interests might serve their purpose best by eliciting the good offices of this already valuable and internationally recognised organisation.

#### B.B.C. Charter

CLOSELY related to the future of television is the question of the B.B.C. charter, for granted in 1926 and renewed in 1936 for ten years, it will next year cease to exist unless Parliament prolongs its life. Responsibility for the maintenance of the television service up to the outbreak of the war was, as is the case with sound broadcasting, vested in the B.B.C., since when a number of reasonable criticisms have been made respecting the power to broadcast being the exclusive right of any single body, while suggestions have been made that broadcasting should be carried out on the sponsored programme principle of the United States. A number of other critics have claimed that the B.B.C. should be allocated one wavelength and the remainder handed over to properly constituted private companies, so that broadcasting service might be exposed to the refreshing blast of competition.

#### An Engineering Problem

WHICHEVER way the problem is looked at, there is always the technical difficulty of overcoming our proximity to Continental stations and their insatiable appetite for power. In the United States, medium wave broadcasting is, due to geographical considerations,

free from interference except of its own making, thus by limiting power output, some sort of orderly reception is possible. In Europe the problem is more complex for with French, Italian, German and Russian stations operating on high-power, the pre-war tendency was for each country to out-distance the other. With an increase in the number of broadcasting stations in this country, we would in all probability have a higher standard of entertainment, but to make its enjoyment possible would necessitate a review of the wavelength and power allocation in the whole of Europe. As an engineering problem this should not be insoluble, and its correct solution would permit of a variety of broadcast entertainment in this country, at least as good as that provided before the war in the United States, Germany and elsewhere.

#### Bomber Command and the Ruhr

IF Squadron-Leader ALAN MORRIS of the Photographic Interpretation Section, R.A.F. Bomber Command, has been correctly reported, the Ruhr as a producing centre has virtually ceased to exist, in that 40 per cent. of Duisburg has gone, 64 per cent. of Mulheim, over 50 per cent. of Dortmund, and 83 per cent. of Bokum, which produced Germany's highest grade steel, have been rendered useless. These figures are of special electrical interest, for in the area referred to was built up before the war an installation of power storage stations, which must by now be largely inoperative. The Herdecke installation for instance is only 10 km. from Dortmund and 30 km. from Essen, its position being shown in the sketch map reproduced on p. 228. The vulnerability of the area and its value to the enemy will be appreciated when it is realised that the map also indicates the complete 220 kV network extending from Vorarlberg in Austria to Wesel and Ibbenburen in the north. The interconnection of Herdecke with the control point at Brauweiler is incidentally, located on this side of the Rhine, between Cologne and Dusseldorf.

#### Victoria's Electrical Silver Jubilee

THE State Electricity Commission of Victoria, this year celebrates its Silver Jubilee and the ultimate objective of the original Electricity Commissioners, appointed under the 1918 Act, of the

linking together of all available sources of power supply, whether coal or water, has been largely achieved. To-day, the Commission generates over 98 per cent. of the electricity produced in Victoria for general purposes, and the power resources are in an advanced state of development which comprehends the needs of the next decade. But for the war the hydro-electric scheme for Kiewa, comprising two 12 000 kW turbo generators, would have been completed.

#### Brown Coal as Fuel

WITH the growth of the undertaking has sprung up the briquetting enterprise at Yallourn. This was initiated as a means of providing regular fuel supplies for the thermal stations as well as demonstrating the economic value of the extensive brown coal deposits as industrial and domestic fuel. The post-war programme of work to be carried out represents a total of £5 415 000 in the first instalment, including £1 000 000 as the initial expenditure on a new open cut in the coal field and a second briquette factory. The intention is apparently, to make the State of Victoria progressively more self-contained in the matter of fuel supplies, envisaging a total yearly production of briquettes up to 2 000 000 tons.

#### Growth of Co-operative Societies

THOSE many small electrical traders who have lost their businesses as a result of the war will be interested to hear that they are the subject of a memorandum which the Holborn Chamber of Commerce has circulated to other Metropolitan chambers. The memorandum urges that it is the obvious intention of the co-operative societies and other multiple firms to force a still larger number of small traders out of business, and to prevent others from re-establishing their positions after the war. It quotes the statement made by Col. LLEWELLIN, Minister of Food, on August 1 last year, that between August 1, 1939, and May 15, 1944, co-operative societies showed a net gain of 312 businesses, and multiple concerns displaced 512 independent firms.

#### Help for Small Traders

IN addition to the electrical businesses shut down on account of their owners being called-up, there are too, a number whose doors are closed as a result of de-

fence measures in coastal towns, evacuation, and so on. The interests of these must also be watched and anything that is done in their cause,—already being championed by such bodies as the E.C.A.—will receive the support of the whole industry, for if the needs of future development and servicing are to be met in relation to the anticipated expansion in domestic electrification, it is to the small trader and electrical contractor that the majority of the public will turn.

#### Electrical Industry and Air Supremacy

OFFICIAL recognition of the part which the electrical industry has played in our achievement of air supremacy was given 'by Mr. A. T. LENNOX BOYD, Parliamentary Secretary of the M.A.P. at the A.S.E.E. luncheon last Saturday, and as great as has been the contribution, still more is expected of the industry. Happily, however, the future service which electrical engineering may render aviation is concerned more with preventing wars than fighting them, while at the same time promoting the advance of civil flying. There is, apparently, a plan afoot for the building of an aeronautical research station near Bedford, wherein will be erected eventually wind-tunnels, involving, in all, electrical plant estimated to be equal to several hundred thousand kW. Mr. LENNOX BOYD gave no indication of the nature of the plant, but we gather that motors will form the greater part.

#### Achievement of Private Enterprise

THE great task accomplished by the Southern Railway in connection with D-day was referred to by Col. ERIC GORE BROWNE, chairman at the annual meeting last week. He described 1944 as the greatest year in the history of the undertaking, for it was from the coast of Southern England that the armies of Great Britain and the United States set forth. These major operations of war, on the success of which our national existence depended, would not have been possible unless, in the years between the two great wars, and before, the Southern had ploughed back annually into the undertaking large sums of money which might have been distributed in dividends. This is a cold, hard fact, said Col. GORE BROWNE, often forgotten by some of the political leaders of to-day.

# Power Storage Plant in the Ruhr

## How Its Loss Will Affect German Steel Output

WITH the advance of the Allied armies into the Ruhr and the intensification of our bombing attacks upon it, it is interesting to consider their crippling effect upon the electric power supply in the area

vated reservoir by means of pumps, and the erection of the Herdecke and other power storage stations in the district. Thus the R.W.E. had at its disposal sufficient energy for the generation of peak-load power on the largest scale. Some 500 000 units were at its disposal at the Herdecke station every morning, and could be used at any time during the day; this not only served as a guarantee for the supply to the network, but also represented an extraordinary instantaneous reserve. The plant enabled the R.W.E. to satisfy all special demands for peak-load current without any increase in tariff.



Power resources in the Ruhr

and the consequent reduction of the German war potential.

According to information already published in THE ELECTRICIAN in 1940, heavy peak demands for the steel industry were met by the installation of power storage stations, and one of the largest of these was at Herdecke on the banks of the River Ruhr, some 10 km. south of Dortmund and 30 km. east of Essen. Its position roughly is shown on the sketch map reproduced on this page, which also indicates the complete 220 kV network extending from Vorarlberg in Austria to Wesel and Ibbenbüren in the north. The inter-connection of Herdecke with the control point at Brauweiler is located on this side of the Rhine, between Cologne and Dusseldorf.

The peak-load problem was solved in a satisfactory manner by the adoption of the principle of accumulating water in an ele-

The upper reservoir, covering an area of 18 acres, was designed and constructed to permit the full development of the available power. It had a capacity of about 350 000 000 gals., and the maximum variation in water level from empty to full was 65 ft. The maximum pressure head between the lower reservoir, Lake Hengstly, and a full upper reservoir was 540 ft., and the minimum head available, so far as our information goes, was thus 475 ft. Before the war a maximum capacity of 2 100 cusacs was available for pumping, by means of four pumps each of 525 cusacs; the upper reservoir could be completely filled by three of these units in ten hours, the power required being approximately 105 000 h.p. The turbines had a total capacity of 3 600 cusacs, over four units of 900 cusacs each, and when the turbines were fully loaded the power developed was about 195 000 h.p. The upper reservoir could be completely discharged in about four and a quarter hours.

The power house was, in 1940, 500 ft. in length, and each machine had an axial length of 85 ft. Each set consisted of a spiral Francis turbine with a free shaft end, a synchronous three-phase generator and a twin two-stage pump, running at 300 r.p.m.

The construction of the upper reservoir, oval in shape and located about 800 ft. above sea level, necessitated the excavation of 1 300 000 cu. yd. of rock.

A characteristic of this type of station is that in times of low power consumption the waste current of the water stations, or the increased night output of the steam stations, is employed to pump water back into the storage reservoir.

**Mansfield.**—The Electricity Committee is seeking sanction to borrow £2 000 for meters.



# Future of Television

## Findings of Hankey Committee—Early Transmissions Recommended

**T**ELEVISION for London immediately after the war, and plans for extending the service to six big provincial centres are among the recommendations by Lord Hankey's Committee on Television, set up in September, 1943.

The report, which was published last week, says that the opening of a television service after the war should not be deferred for the uncertain period required to give an opportunity of incorporating some fundamental improvement in the system and, accordingly, the television service should be re-started in London on the basis of the system in operation before the war, which had achieved a high degree of reliability and afforded consistently good entertainment value in the home.

### Services in Provinces

Plans should be made for the extension of television to possibly six of the most populous provincial centres as soon as possible after the London service is re-started.

These plans should be on the basis of the 405-line system, but the scope of the extension on that system should be kept under review by an advisory committee which, it is proposed, should be reappointed in the light of the general conditions prevailing at each stage, including progress made in the development of a new system of transmission or reception.

Studio programmes should be relayed by the provincial stations from the main programme centre in London.

The aim should be to produce an improved television system having a standard of definition approaching that of the cinema, and possibly, incorporating colour and stereoscopic effects.

Vigorous research on such a system should begin immediately staff can be made available, and all firms capable of producing a complete system should be eligible to compete.

The adopted system should not embody any patented devices which might be prejudicial to the general interests of British manufacturers.

The necessary staffs and materials should be released immediately they are required.

Television is destined to play an important part in the field of public entertainment, but large-screen reproduction of television programmes is not likely to be generally acceptable until the standard of definition approaches that of the cinema.

Collaboration between the cinema industry and the B.B.C. in the exploitation of television should lead to mutually beneficial

results, although the public showing of television programmes will give rise to problems in connection with performers' rights which will need close attention by the suggested advisory committee.

The Postmaster-General should have powers to enforce the suppression of electrical interference.

The considerable amount of research which will be necessary before a radically improved television service can be produced, calls for the closest co-operation between all the interests concerned.

Research should be co-ordinated under Government auspices, great care being taken to avoid the stifling or the hampering of initiative and competition. This task should go to the advisory committee.

The main manufacturing firms should be encouraged to pool their television patents with a view to ensuring that these patents are made available for use as the national interest may demand.

The successful development of television at home is of prime importance to the development of an export trade. While the industry must be responsible for the development of the export trade, and should keep a close watch on the possibilities and prospects, it should keep in close touch with the advisory committee as the normal channel for communication with the appropriate Minister.

The advisory committee should keep the Government advised of developments in television, so that these might be brought to the notice of Dominion and Foreign Governments.

The standards of the immediate post-war British television system should not be changed to bring them into conformity with the present American system (525 line definition), but the earliest opportunity should be taken of reaching international agreement on bands of frequencies.

### Financing the Service

Arrangements for financing the television service must depend on the arrangements for financing the B.B.C.'s sound broadcasting services after the war. The aim should be to make the television service self-supporting as soon as possible.

Special television licences should be introduced as follows: (1) A licence for domestic viewers at an additional fee of £1 a year; (2) a cinema television licence, the amount of the fee and the date of its introduction to be considered later.

The report says that the extension of the service to large centres of population

outside London will greatly increase the demand for receivers, the price of which should fall when mass production methods become possible.

The ability of television to give the viewer a front row seat at almost every kind of exciting or memorable spectacle should ensure a success for the services in this country, which should eventually be reflected in the export market.

The Committee consisted of Lord Hankey; Sir Stanley Angwin, Engineer-in-Chief, General Post Office; Sir Edward Appleton, secretary, Department of Scientific and Industrial Research; Sir Noel Ashbridge, Deputy Director-General, B.B.C.; Sir Raymond Birchall, Deputy Director-General, General Post Office; Prof.

J. D. Cockcroft, Air Defence Research and Development Establishment, Ministry of Supply; Mr. W. J. Haley, Director-General B.B.C.; and Mr. R. J. P. Harvey, assistant secretary, Treasury. Prof. Cockcroft was absent from the United Kingdom on other Government business during the latter part of the Committee's deliberations and was able to attend only the earlier meetings. He, however, kept in touch with the Committee throughout. Mr. R. W. Foot, formerly Director-General of the B.B.C., attended the first twelve meetings of the Committee; on his resignation from the B.B.C. his place on the Committee was taken by Mr. J. Haley. Mr. O. F. Brown, of the D.S.I.R., attended a number of meetings of the Committee as deputy for Sir Edward Appleton, and Mr. T. C. Macnamara, of the B.B.C., attended many of the meetings in the capacity of technical witness.

## Electrical Targets in Japan

### Many Hydro-Electric Undertakings—Coastal Power Stations

THE increasing vulnerability of Japanese industrial areas to attack by carrier-borne and land-based aircraft, must inevitably bring into the sphere of operations as high priority targets, the many hydro-electric stations that supply power for munition factories and other purposes, and, consequently, the facts given below should be of interest.

The number of hydro-electric power plants in Japan at the end of 1936, was 1 340, with a total output of 3 650 000 kW. Among these were 86 stations rated at 10 000 kW or above, whose total output amounted to 2 030 000 kW, approximately 56 per cent. of the grand total. The majority of these stations are located in the central part of the main island, and their output is transmitted to Tokyo, Nagoya and Osaka. Those with an output of 50 000 kW and over, in 1936, were: Komaki, on the River Sho-kawa, 72 000 kW; Kurobegawa No. 2, River Kurobegawa, 65 200 kW; Ohigawa, River Ohigawa, 62 200 kW; Saku, River Tonegawa, 55 000 kW; Toyomi, River Aganogawa, 54 000 kW; Yasuoka, River Tenryugawa, 52 500 kW; Yanagawara, River Kurobegawa, 50 700 kW. Komaki, the largest station, has a huge reservoir with a dam 75 meters high, the highest in Japan.

At the end of 1936, there were several water-power stations under construction, to meet the accelerating increase of power demand all over the country. Two stations begun on the Shinano-gawa, namely Shinanogawa station of the Tokyo Dento K.K. and Sendu station of the Imperial Government Railways, were among the most important. The former was rated at 170 000 kW, the latter at 120 000 kW. These were expected to be put in operation in 1939.

The increase of hydro-electric power

brought a consequent increase of steam power. At the end of 1936 there were 217 thermal stations with a total output of 2 140 000 kW, an average of 9 860 kW per station. There were 49 stations with outputs of 10 000 kW or above, amounting to a total output of 1 907 000 kW, or 89 per cent. of the entire steam power capacity.

Steam power stations of large capacity for electrical enterprises are situated near the coast, in districts where power is chiefly in demand, such as the Tokyo-Yokohama district, the Kyoto-Osaka-Kobe district, Nagoya district, and Northern Kyushu district. On the coast of the Inland Sea, Shikama No. 3 station, Saka station, and the Ube No. 2 station are among the most important.

Amagasaki station in the Kyoto-Osaka-Kobe district, is modern and was the largest steam-power station in Japan. Its total installed capacity in 1936 was 318 000 kW, consisting of six 53 000 kW turbo-generator units. The undertaking operating it was planning a second station adjacent to the first station to be equipped with six 75 000 kW machines. The first of these, manufactured in Japan, was under installation, and it held the record for that country. Tsurumi station, in the Tokyo-Yokohama district, the second biggest station, had the largest steam generating units. The 62 500 kVA main generator was directly connected to a three-phase 63 000 kVA, 10.5/69 kV transformer.

The 26 200 kW Mitsubishi turbo-generator installed in 1935 at Saka station, was, at that time among the largest machines to run at 3 600 r.p.m. A number of similar speed machines rated at 25 000 kW, and 50 000 kW, were on order and some had already been installed.

# Reactive Metering

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

THERE are, in theory, three kinds of 2-element, three-phase meters that could be used to measure the reactive kVAh consumption in a 3-wire, three-phase supply. The first is a meter, each element of which is completely compensated internally so that the torque it produces is proportional to kVAh. Meters of this kind, which would be connected similarly to

derived pressures are each in quadrature with a line pressure used for an energy meter. The advantage of using a quadrature transformer is, therefore, that voltages of the correct magnitude and phase are applied for reactive metering to a standard energy meter, so that the instrument registers direct in kVAh, and requires no multiplying constant. The association of currents and voltages in a meter so connected is shown in Fig. 2. It is evident that all types of meters used for reactive measurements, excepting the first referred to above, depend for accuracy of registration upon balance of the line pressures of the supply. The connection of an energy meter adapted for reactive measurement is more complicated than that of an ordinary 3-wire energy meter, and the connections ought to be checked by a skilled technician before the reactive meter is placed in commission.

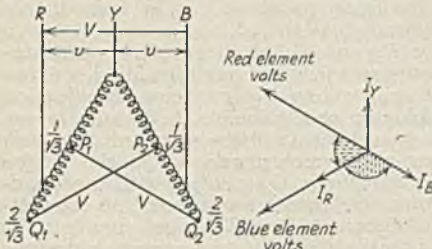


Fig. 1.

Fig. 2.

energy meters, have never been commercially developed. The second kind of meter is one in which each element is partially compensated to the extent of  $30^\circ$ , and which is connected in circuit so that the line pressures applied to the voltage circuits are  $60^\circ$  out of phase with the corresponding line pressures applied to an energy meter. The third kind of reactive meter is a standard type of energy meter connected in circuit so that the pressures applied to the voltage circuits are  $90^\circ$  out of phase with those used for energy metering. These artificial or quadrature voltages for making an energy meter register reactive consumption, can be obtained by using the star or line-to-neutral pressures of a three-phase 4-wire supply. If a standard three-phase meter, designed for the line voltages is used, the registration will be only  $1/\sqrt{3}$  of the required value, and a multiplying constant will be required. A better way of obtaining the quadrature voltages is by means of a quadrature transformer, which is illustrated diagrammatically in Fig. 1. The two transformer elements are connected to the supply in open-delta, and each element has a  $1/\sqrt{3}$  tap P; and a  $2/\sqrt{3}$  tap Q. It is easy to see that if the line voltages are balanced so that there is a phase difference of  $60^\circ$  between these voltages from R to Y and B to Y, then the pressures between a P terminal of one transformer element and a Q on the other are each equal to the line pressure, and that the phases of these

The reactive kVAh consumption in a three-phase 4-wire supply can be measured by methods analogous to those applicable to 3-wire systems. Thus a 3-element meter, having its voltage circuit designed for the line pressure of the supply, can be so connected that each element voltage is lagging  $90^\circ$  on the corresponding star pressure used for energy measurements. Such a meter would be of non-standard design and if constructed for energy

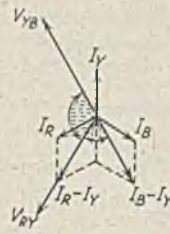


Fig. 3.

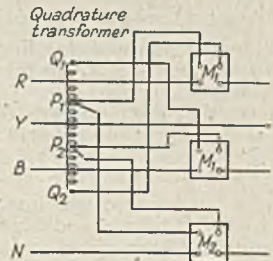


Fig. 4.

measurements, its registration would give  $\sqrt{3}$  times the required reactive consumption, so that a constant would be required. The 2-element meter method of measuring energy in 4-wire circuits can be adapted for reactive registration in the manner indicated in the vector diagram Fig. 3. Each current circuit carries a resultant current obtained from a delta-connected system of three current transformers, and the voltage circuits are energised by line pressures respectively in phase quadrature

with the star pressures used for energy measurement. As the full-load meter current is 8.67 A, a 10 A instrument is required. The registration will be  $\sqrt{3}$  times the required kVArh consumption because the meter voltages are  $\sqrt{3}$  times those used for energy measurement. It should be noted that the accuracy of this latter method of reactive measurement depends upon accuracy of the balance of the line voltages. The accuracy of the analogous method of energy measurement depends only on the star voltages being free from a residue, in which condition the line voltages need not be equal.

If, as is not unusual, the whole of the loading of a 4-wire supply between lines and neutral is lighting of unity power factor, it might, at first thought be supposed that a 2-element meter connected to a quadrature transformer as indicated in Fig. 2 would correctly measure the reactive consumption, since the whole of this reactive consumption would take place in the 3-wire component of the supply. That this is not the case is easily seen by considering that the meter, so connected, carries the currents of an unbalanced lighting load only. The torque produced by the red element will correspond to  $\sqrt{3}V_S I_R \cos 60^\circ$  or to  $\frac{\sqrt{3}}{2} P_R$  where  $P_R$  is the power carried by the red line. The torque produced by the blue element will correspond to  $\sqrt{3}V_S I_B \cos 120^\circ$ , or to  $-\frac{\sqrt{3}}{2} P_B$  where  $P_B$  is the power in the blue line. There will, therefore, be a resultant torque represented by  $\frac{\sqrt{3}}{2} (P_R - P_B)$ , so that the meter will register notwithstanding there is no reactive consumption. If the line-to-neutral loading is of lagging power factor it can be shown that the resultant torque due to this loading in the meter will correspond to  $\frac{3}{2} (Q_R + Q_B)$  where  $Q_R$  and  $Q_B$  are respectively the kVAh of the line-to-neutral loading carried by red and blue lines, and this torque will correspond to the total reactive consumption in this loading only when the line-to-neutral currents are balanced.

The theoretical errors of a 2-element meter, connected as indicated by Fig. 2, can be corrected by using in conjunction therewith a standard single-phase meter designed for the star pressure of the supply. According to Blondel's theorem, the energy in a 4-wire supply can be measured by a combination of meter elements in which the Y line is treated as the common return instead of the neutral, as is customary. Thus this energy can be measured by a standard 2-element meter normally con-

nected, together with a single-phase meter carrying the neutral current and energised by the neutral-to-yellow voltage, the required consumption being the algebraic sum of the two meter registrations. If the voltages applied to such a combination are caused to lag in phase by  $90^\circ$ , the algebraic sum of the registrations will evidently be equal to the reactive consumption. Thus, the additional meter to be used in conjunction with the standard 2-element instrument and the quadrature transformer, is a single-phase instrument carrying the neutral current and energised by a voltage equal to and lagging  $90^\circ$  on the neutral-to-yellow star pressure. It is immediately apparent that the voltage between the two taps  $P_1$  and  $P_2$  of the quadrature transformer satisfies this condition. Fig. 4 shows the connections of a metering combination employing this principle.  $M_1$  and  $M_2$  are the two elements of the standard 2-element three-phase meter, and  $M_3$  is the single-phase meter in the neutral with the quadrature star pressure impressed on its voltage circuit. The algebraic sum of the registrations of the two meters gives the required reactive consumption in kVArh, directly and without any multiplying constant, and the accuracy of the consumption so obtained depends only on the balance of the line voltages.

#### LOCATION OF INDUSTRY

An informal I.E.E. discussion on "Location of Industry" was held on February 26, when Mr. D. B. Williamson gave a brief outline of the Barlow, Scott and Uthwatt Reports. In his view, the electrical industry had a vital part to play and it was suggested that an electrical advisory service should be set up to give guidance on questions of availability of supply, tariffs, and the like. The Scottish hydro-electric and the Severn barrage schemes, if adopted, would support the trend of dispersal from the industrial concentrations at the coal fields. The general discussion touched on the broader implications of central planning. It was emphasised that whereas national considerations might suggest that a certain industry should not be established in a particular area, alternative sites might lack the necessary facilities and amenities. It was generally recognised that at the present time there was very little evidence on which to base planning of the long-term kind. As to the need for ensuring that supplies of electricity would be available in any new part of the country that was chosen, it was agreed that this could now be taken for granted, such was the ability of the supply industry to meet all demands that might be made upon it.

# 100 000 H.P. Wind Tunnel

## Plant for New Aircraft Research Station

THE debt the Government and the aircraft industry in particular owes to the electrical industry was acknowledged by Mr. A. T. Lennox-Boyd, M.P., Parliamentary Secretary, Ministry of Aircraft Production, at the annual luncheon of the Association of Supervising Electrical Engineers on March 10, when about 470 members and guests attended.

The president, Mr. E. R. Wilkinson, who occupied the chair, said that though he had, during the war, made arrangements for supplies of electricity to war factories, involving individual loads up to 50 000 kW, such loads' magnitude sank into insignificance compared with the requirements of the peace-time project upon which Mr. Lennox-Boyd and his department were now actively engaged. After commenting upon the Severn Barrage Scheme, the President said he would like to enter a plea for the Government to appoint a panel of experts to review the Weir Committee's Report on Railway Electrification, published in 1931. It appeared to him that such electrification would be a much more economical proposition than the Severn Barrage Scheme, in that if carried out to the full there would be a saving of 10 000 000 tons of coal a year.

Industries generally in this country must be brought to the highest pitch of efficiency in order to maintain our position in the export markets, and one of the most promising means of achieving that end was by a greater degree of electrification; the Platt Report on the cotton industry was an example of the need for modernisation and electrification.

### Supply to War Factories

Mr. Lennox-Boyd said the Government and the aircraft industry knew of the work the association had done in the last five years, particularly under the presidency of Mr. H. W. Swann. Steps had been taken to see that the training and experience of supervising electrical engineers were used to the full in the war, and he knew from experience, first in the Navy and then in the M.A.P., how efficiently they had been used. The grid had been a source of national advantage and he paid tribute to the C.E.B. as a whole for the work that had been done in the last five years. No one would ever be able to measure the debt the M.A.P. owed to them. The electricity supply industry had never failed the aircraft industry and if the same qualities of initiative, drive, courage and hard work were shown in the years ahead, there was nothing to fear for the future.

Referring to the research centre to be established in Bedfordshire to take the

place of that at Farnborough, he gathered that it would require something like the power needed to light Manchester City, and called for plant two-thirds the size of that at the Battersea station. At the moment the largest wind tunnel was of 4 000 h.p. The new centre would have several of 40 000 h.p. and eventually one of 100 000 h.p. They were now on the verge of designing aircraft which would travel at a speed of 700 m.p.h., and for the testing of such machines it would be necessary to have wind tunnels of velocities greater than hitherto envisaged. That was going to call for an immense load from the electrical industry, and they looked to them with confidence to supply their needs.

### Reward of Research

Dr. C. H. Clarke (director of Lever Bros. and Unilever, Ltd.) suggested that the outstanding achievements of the electrical industry were due to the fact that it had recognised the need for research. Quoting figures showing that in 1938 consumption in the United States for industrial and domestic purposes was 771 units per head, whereas in this country it was 414 units, Dr. Clarke said the electrical industry, like others, must realise that there was still something to be done after the war; the electrification of industry was proceeding too slowly. The electrical industry, by showing how electrical devices and electricity generally, could be used, would hasten the pace. In the domestic sphere the position was different. No one could doubt that in the post-war era there would be a tremendous increase in the utilisation of domestic appliances, but there were many problems. There was the economic one to start with, and there was the problem of marketing the goods. Marketing was a science that had advanced very rapidly.

Sir Cyril Hurcomb, Director General, Ministry of War Transport, speaking in place of Sir Noel Ashbridge, Deputy Director General, B.B.C., who was unable to be present, said there had been a great strain upon the industry, more particularly on the personnel, and the results that had been achieved must be first in their thoughts. The strain had fallen upon the engineers, both upon the generation and the distribution sides, who had kept us going with increasing momentum during the war years. He agreed with Dr. Clarke that there was an immense future in the developments of peace, and he was not so sure that if we were going to have serious projects such as that to which Mr. Lennox-Boyd referred, we would not

want the Severn Barrage Scheme. Our resources in coal might be illimitable, but with ever-increasing prices he was not so sure that the country could afford to neglect its major resources, including the tidal power in the Severn.

Referring to the progress of the industry during the war, Sir Cyril said that since 1938-39 the traction load had fallen off only very little, in spite of necessary restriction of the train services. In public lighting the powers of darkness had temporarily prevailed, but lighting would soon resume. In domestic lighting, heating and cooking, there had been an increase in the number of units sold, from 1938-39 up to 1943-44, of something over 16 per cent.; and the units sold for power had increased by 50 per cent. In 1938-39, under 11 000 million units were sold, and in 1943-44, nearly 21 000 million units. The total units sold for all purposes had increased by 50 per cent. During that period the manpower engaged in the industry decreased by 25 per cent., and the average revenue per unit actually declined since 1938-39 and remained where it was in the first year of the war. An industry which had been able to give to the public 50 per cent. more of its product, with 25 per cent. less manpower, and had kept its average price per unit steady, had, he thought, rendered a remarkable contribution, both to the war effort and to the national economy.

One matter which they had been considering lately was the standardisation of voltages. The question was taken up before the war, and had it not been for the war, the voltages below the standard 230 V would by now have been raised to the standard. The question had been taken up again, and all sections of the industry were closely engaged upon it. He was sure that it would be agreed that if there was anything in our present development which needed to be reviewed, now was the time to do it. He had little doubt that out of their conversations with the industry, a programme which would be the prelude to real steps forward in progress would be agreed upon.

#### Technical Efficiency

Sir Arthur P. M. Fleming, president of the E.R.A., said that one of the individual obligations that concerned all of them was to keep themselves up-to-date. That was no mean job when one contemplated the rapidly changing conditions of the electrical industry, and he sometimes wondered how the electrical engineer could develop the capacity to acquire the knowledge that he needed. When he thought of those rapid changes, realising that the text book was rapidly outstripped by the speed of new works, one could see how much they owed to the technical institutions and asso-

ciations which provided platforms for discussion and issued papers which enabled the professional engineer to keep *au fait* with modern developments, and added to that was the immensely valuable services the technical Press did for all of them in their industry. One wondered how one could contemplate the great gap that would exist but for those resources, between the time of the creating of new knowledge and the time when it could be disseminated and assimilated.

Sir Arthur went on to speak of the need, in the face of intense international competition, for education and training. In that respect, he said, the A.S.E.E. had done a magnificent job. It had wisely established means for educating and training its younger members. He urged that the work should go on and that the standard of admission should go increasingly higher, and that their training should be as thorough as possible, keeping in mind always the fact that their industry was expanding, and new conditions and new developments were arising all the time.

Mr. J. Flood, chairman of the association, also spoke.

#### EXTENSIONS AT SUNDERLAND

A tribute to the work of the electricity industry during the war was paid by Major Lloyd George, Minister of Fuel and Power, speaking at the inauguration at Sunderland of extensions to the Corporation's electricity generating plant, which have cost £750 000. The event coincided with the 50th anniversary of the undertaking.

Replying to a toast, proposed by Major S. Furness, M.P., and Mr. S. Storey, M.P., Major Lloyd George said that the electrical industry had considered it its duty to carry on, "blitz" or otherwise. After six winters of war, it was remarkable that the electricity supply had failed on only five occasions and for only very short periods. Maintenance of supply had only been possible through the ingenuity and energy of those connected with the industry.

Mr. Harold Hobson, chairman of the Central Electricity Board, replying to the toast of "Our Guests," said he was concerned with the tendency in this country to allow questions of industrial expansion to be mixed up with the rather imponderable question of aesthetics. He was all in favour of beauty, but this was an industrial country and industries needed power, and power in these days needed electricity. They could not afford to overrate other factors in the job which was ahead.

Others present included Sir J. Kennedy, deputy chairman of the Electricity Commissioners. Mr. E. Ditchburn, chairman of Sunderland Electricity Committee, presided.

# Modern Lift Practice

## Discussion on Development of Variable Voltage Control

A PAPER on "Modern Electric Lift Practice," by L. S. Atkinson, was read and discussed at the meeting of the I.E.E. Installations Section, on March 8.

This paper reviewed present-day electric lift practice by making brief reference to those aspects of the subjects which are the concern of the architect, and to the application of lift equipment to suit various classes of building. It explained the changes that have been made in general design from time to time to meet the problems created by the increasing height of buildings and their growing populations, and further described the equipment as generally installed to-day.

**Mr. E. B. Hunter** (Phoenix Assurance Co., Ltd.) said he wondered whether the increase of speed of lifts was justified in buildings, where the normal distance of travel was about 150 ft., and whether the extra cost of the gearless machine was justified for such short distances. He asked what was the difference in prime cost for these higher speeds, apart from the question of maintenance. Again, to what extent did higher speeds affect the amount of over-run necessary at the base and top of the shaft? This was an architect's problem mainly, and some basic idea of how much space to allow would be helpful. There was considerable reduction in maintenance cost when the machine room was at the top of the shaft. With automatic lifts more frequent inspection was necessary, and some lead as to how often inspections should be, would be welcomed.

**Mr. L. N. Duguid** (H. M. Senior Engineering Inspector of Factories), mentioned that since 1937, when the users of lifts were compelled to adopt reasonable standards of construction and maintenance, there had been a steady and substantial decline in the number of accidents. In 1937, the annual rate of accidents which had been fairly steady for a number of years, was 430, but by 1943, the number had been reduced to 193. These were accidents which caused a man to be away from work for three days or more. The fatal accidents were 25 in 1937, and 12 in 1943. These figures, he added, were remarkable, in view of the fact that they included the whole of the war period, when the number of man-hours worked in factories had increased enormously. Much of the credit for this improvement was due to the lift maker, who not only put in excellent new installations, but had done good work in bringing old installations up to date as far as possible. As to the breakage of suspension ropes, there was very little

occasion for that nowadays, provided there was efficient inspection and maintenance. Accidents had been caused through the use of lifts of types not really intended for the purposes to which they had been put, and he hoped that makers of lifts and hoisting apparatus would do all they could to ensure that apparatus of the right type for the purpose in view would be used.

**Mr. Stanley Heaps**, an architect, suggested that there was the risk of making lift installations too complicated.

**Mr. R. S. Phillips** (Power Branch, G.P.O.), expressed disappointment in that the paper made no reference to recent improvements. There was nothing in the paper, he said, that could not have been written ten years ago, and as the author had not mentioned any improvements during that period it could be assumed there had not been any. He did not think the extra cost of high car speeds was justified unless the conditions were such that a system of zoning could be adopted which would restrict the use of the high-speed lift to relatively long travels; and even in high buildings where there was a great deal of floor to floor traffic, it could be catered for by medium-speed lifts. High-speed lifts should only be used for the top floors. Although nobody very much liked mercury arc rectifiers for supplying d.c. from a.c. mains, he did not think the author was quite right when he referred to the inherent inability to return regenerated current to the line. Commenting on the author's final reference to the extension of variable voltage control, Mr. Phillips said he thought this was a retrograde step and that development should be towards a.c. motors and a.c. controllers.

**Mr. A. G. Ramsey** said that in his address as chairman of the Installations Section last year he advocated dimensional standardisation of lift wells, car sizes and landing openings and, as a matter of fact, something was moving in this direction. Nevertheless, he would like the author's opinion as to the extent to which he thought this was possible. As to gearless machines, the author did not mention whether the rating of the motor-generator set was intermittent or continuous. Although he appreciated that it was difficult to quote actual costs, he would welcome some idea of the approximate relative costs of geared and gearless installations for the same size, speed and duty. Also, was it possible with gearless lifts to standardise in a few sizes the motor-generator set, the motor and the control? This would, to a certain extent, tend to bring down the price. The paper

contained curves for the power consumption of geared machines; could the author give similar curves for gearless machines and also indicate the effect of the idling loss on the inefficiency of the motor-generator set? He appreciated the difficulty of giving figures on these lines at the present time.

**Mr. J. W. Standing** said that the reduction of maintenance was important because it required the services of a skilled man who would be better employed on constructive work at the present time. It was essential to carry out an exacting test of safety gear when the lift was installed and ensure that it worked. After that, it was only necessary to make sure that it operated freely. Would the author say a little more about tandem motor drive? The majority of buildings now were supplied with a.c., and where a lift speed of 300 ft. per minute was adequate, it seemed to him that tandem drive provided a sound and simple engineering proposition that required little maintenance. He would also like more information as to the latest practice regarding ropes—perhaps "fashion" was the better word to use.

**Mr. G. Davidson** asked for further information as to the relative merits of having the machine room at the top or the bottom of the lift shaft. According to the paper the difference in weight was less than one ton in having the machine above and for such a small difference he doubted whether there would be any appreciable saving in the structural ironwork in the lift well. This had a bearing on the economic merits. There was extra cost in sheaves and weights and rope if the machine was at the bottom, but with the machine room at the top there was additional cost in cabling. It was necessary to go carefully into those points when deciding where to place the machine room.

**Mr. V. R. Turner** also expressed disappointment that something was not said in the paper about ropes, which was a most complex subject. The 8/19 construction was in general use and gave good results, but this was not in the British standard specification and it would be helpful to have opinions on the merits of this type so that some authoritative expression of opinion would be available when the standard specification came up for reconsideration. He thought the author had not been quite fair to the tandem motor. The paper gave the impression that the standard two-speed a.c. motor was to be preferred, but his experience was that the tandem motor was the better machine and gave better results. It was slightly more expensive, but the a.c. commutator motor was very much more expensive.

The author, in reply, said it was not

so much a question of higher speed as the higher rate of acceleration and retardation which was secured with variable voltage control. In buildings which required 10 to 14 lifts or more, by using higher car speeds it was possible to reduce the number of lifts and so allow more floor space for letting or selling. Frequency of inspection varied with the extent to which the lift was used. For a busy lift, once a week was not too frequent. The Factory Act, which became effective in 1938, had the effect of making jobbing engineers a little cautious about calling themselves lift engineers, and there was no doubt that the Act had done much to improve safety and remove many of the abortions that once existed. Concerning the lack of progress during the last ten years he pointed out that for five years his company had had to concentrate on the war and not on experimental work in connection with lifts. However, there had been great development in the years just preceding the war in many directions and particularly with variable voltage control, and he prophesied that variable voltage control would supersede all a.c. motor drives for the more important lifts, for those duties which required two-speed motors. He still maintained that mercury arc rectifiers would not return regenerated current to the line. The question of standardisation was being considered seriously and, in so far as new buildings were concerned, standardisation of car sizes had much to be said for it.

#### I.E.E. LONDON STUDENTS

A paper entitled "Mercury-arc and Mercury-vapour rectifiers in Transmitters" was read before the I.E.E. London Students' Section on March 5 by Mr. T. M. Ellison. The author drew attention to the very high efficiency of the mercury-arc rectifier compared with that of a motor generator set or bank of hard valves, and he described the principles of operation of the two types, namely the continuously evacuated and the pumpless steel tank rectifiers. Details of their construction were given, together with the connections of the associated six-phase transformers. The pumpless rectifier was superior because of its greater simplicity and absence of losses in auxiliaries. Also, inverted operation was possible with this type.

Mr. Ellison described the use of hot cathode valve rectifiers. These had a lower first cost than the mercury-arc types, but a much shorter life and higher standing losses for the same loading. The maximum economical rating of the valve rectifier was put at about 100 kW. For h.t. powers above this a steel tank rectifier was preferable.



# 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.*

The degree of Ph.D. (External) has been awarded by the University of London to

**Mr. J. N. Aldington**, B.Sc., F.R.I.C., F.Inst.P., for a thesis on "The High Current Density Mercury Vapour Arc." Dr. Aldington is assistant works manager and head of the laboratories of Siemens Electric Lamps and Supplies Ltd., Preston, and has played a leading part in the research work and development in the field of both incandescent



**Dr. J. N. Aldington**

filament and electric discharge lamps—during the past decade.

The funeral took place at Hampstead Cemetery, on March 9, of **Mr. George Keith**, chairman and managing director of Keith Blackman, Ltd., who, as announced in our last issue, died on March 5, at the age of 69 years.

After 34 years' service with Marconi's Wireless Telegraph Co., Ltd., of which 25 were spent in the patent department and the last 17 as joint chief of that department in charge of patents, **Mr. W. H. Nottage** has retired on reaching pension age, and has been succeeded by **Dr. G. F. Brett**.

The following have been nominated for election by the Installations Group of the I.E.E. North-Western Centre for the next session. Chairman, **Mr. L. H. A. Carr**; Committee, Messrs. C. J. Fox, C. C. Kirby, A. Menzies, A. R. Milne, C. V. Sadler and H. Watson-Jones; hon. secretary, Mr. S. R. Mellonie.

**Mr. J. A. Braidwood** (Dorman Long and Co., Ltd.), as chairman, and Messrs. **T. E. Daniel** (Darlington Corporation) and **J. B. Lancaster** (I.C.I., Ltd.), as vice-chairmen, have been nominated by the Committee of the Tees-side sub-centre of the I.E.E. North-Eastern Centre for election on September 30.

A "Brains Trust" was the feature of the monthly meeting of the Coventry Electric Club on March 6. In addition to technical matters, questions dealt with concerned changes in post-war house wiring, development of fluorescent lighting for domestic premises, and the advisability of making compulsory the adequate lighting of all class "A" roads in the post-war

years. The "Brains Trust" consisted of Messrs. F. Godden, the city electrical engineer and manager (question master), F. L. Cator, K. W. D. Roberts, A. Manigetti, A. J. Heelis, G. Marson, and S. A. Hunter.

A group of Members of Parliament interested in the re-development of their bomb-damaged constituencies visited the E.D.A.'s exhibition of all-electric kitchens at the Building Centre, Maddox Street, recently. Among them was Mr. John Wilmot, Parliamentary Secretary to the



**Sir Oliver Simmonds and Mr. W. F. Higgs examining the buffet type of cooker at the E.D.A. kitchen exhibition**

Ministry of Supply. The visitors were conducted round the exhibition by Mr. Clarence Parker, chairman, and Mr. V. W. Dale, general manager and secretary of the association.

## Obituary

**Mr. James Cuthbertson**, of James Cuthbertson and Co., on February 27.

**Mr. H. S. Cumisky**, branch manager of the Newcastle sales office of Callender's Cable and Construction Co., Ltd., on March 5.

**Mr. Geoffrey Strange Masters**, works accountant of the English Electric Company's Stafford works, on February 25, aged 53 years. Mr. Masters joined the accounts department of Dick Kerr and Co., Ltd., in 1911, and when that firm was taken over by the English Electric Company he continued in their service.

# Water Power in Canada

## Hydro-Electric Progress During 1944—War-time Expansion

THE annual review of hydro-electric progress in Canada prepared by the Dominion Water and Power Bureau, indicates that the programme of war-time expansion in hydro-electric facilities has been virtually completed and that power production for war purposes appears to have passed its peak. During 1944 the net increase in water-power installation was 68 700 h.p., comprised almost wholly of the completion of the Brilliant plant (68 000 h.p.) on the Kootenay River in British Columbia. This was the smallest annual increase recorded since 1939, and no large power projects are now under construction. In the production of electricity the monthly figures show an increase of less than one per cent. for the first ten months of 1944, over the corresponding period of 1943, and a month-by-month comparison shows that production during the months of June to September, 1944, was less than in 1943.

### Total Installed Capacity

Canada's water-power installation, at the end of the year, reached a total of 10 283 213 h.p. One-fifth of this total, or 2 000 000 h.p., has been installed in the past five years, almost wholly for war purposes and, with the conflict in Europe nearing its final stage, this achievement in hydro-electric development may be assessed as a basic factor in Canada's vast war-production programme. About one-third of Canada's water-power development has been used for war production; one industry alone, the aluminum industry, having utilised at peak production one-quarter of all hydro-electric energy consumed in the Dominion. In the period of readjustment from war to peace, the initial effects of which already are in evidence, it can be anticipated that power surpluses will develop in certain areas. For the most part these surpluses should be moderate and should be absorbed within a reasonable time as industries change over from war-time to peace-time production and undertake the problem of supplying the huge backlog of civilian needs. In the province of Quebec, however, there is a special situation, brought about by the great war-time development of water power for the aluminum industry, which may lead to a large power surplus centred in the Saguenay River district unless new uses for aluminum and adequate post-war export markets enable this Canadian indus-

try to maintain operations at a high level or other large-power-consuming industries are attracted to the area.

The new generating station at Brilliant of the West Kootenay P. and L. Co. (Consolidated Mining and Smelting Co. of Canada) is the company's fifth station on the Kootenay River, and in conjunction with those of the other four plants, provides a total of 346 000 h.p.

### Experiment in Rural Service

In Alberta, Calgary Power Co., Ltd., and Canadian Utilities, Ltd., undertook the supply of power to three selected rural areas as an experiment to determine the feasibility of more general rural service. The Calgary Power Co.'s experimental area comprises 104 farms east and west of Olds, whilst Canadian Utilities, Ltd., is bringing electrical power to thirty farms in the Swalwell area and to some fifty farms south of Vegreville. A power commission was established by the Government of Alberta during the year with wide authority to deal with power matters within the province.

In Manitoba, Neepawa, Ste. Elizabeth, Aubigny, and Underhill were connected to the transmission lines of the Manitoba Power Commission and Dauphin was incorporated into the system on December 1. In addition, some 325 farms were connected.

Actual construction of power projects during 1944 by the Hydro-Electric Power Commission of Ontario was limited to an extension of the Alexander development on the Nipigon River, consisting of the installation of a fourth unit—a fixed blade propeller-type turbine, rated at 19 000 h.p. under a head of 58 feet, and a generator rated at 15 000 kVA. The unit is expected to be in operation by July. The plant will then have a rated capacity of 73 000 h.p. About 460 miles of rural distribution lines were built by the Commission. The total number of miles in service is now 21 137.

Two fuel-power plant additions were made in Nova Scotia. The Nova Scotia L. and P. Co., Ltd., added a 10 000 kW steam turbo-electric unit in its Halifax plant. The other fuel-power plant is an entirely new one, under construction by the Nova Scotia Power Commission at Inverness on the Island of Cape Breton. The installation will consist of two steam turbines, one rated at 625 kW, and the other at 500 kW.

# News in Brief

**Rate Relief Allocation.**—The Darwen Corporation is devoting £1 000 from the electricity department towards the relief of rates during 1945.

**Temporary Housing Equipment.**—The Billingham-on-Tees U.C., proposes installing electricity for cooking, washing and lighting in 100 temporary houses.

**Leighton Buzzard Lighting.**—After 100 years of street lighting by gas, the Council has accepted a tender for electricity.

**Trolley-bus Profits.**—The Reading Corporation trolley buses are estimated to have made a profit of £15 000 for the current financial year.

**Proposed Southport Exhibition.**—The Southport Electricity Committee has agreed to make a contribution of £100 if the British Electrical Development Association organises an electrical exhibition in the district.

**Blackpool Street Lighting.**—The Corporation has decided that when they return to pre-war street lighting, for two-thirds of the year they will want £22 500 for gas, against £13 500 this year, and £15 700 for electricity, against £4 850.

**Scottish Industrial Power Cut.**—A compulsory cut of 25 per cent. in the consumption of gas and electricity was imposed on all Scottish concerns recently by the Ministry of Fuel and Power following colliery strikes by colliery firemen in the Lanarkshire areas.

**Post-war Programmes.**—The Electricity Commissioners have sent a letter to the Accrington Corporation asking for details of a five-year programme of work it is proposed to carry out after the war in Europe. Following a request from the Electricity Commissioners that consideration should be given to equipment needs for development in 12 or 18 months after the war, Burnley Electricity Committee is submitting an estimate of £10 595.

**New Radio-telephone Service.**—Cable and Wireless, Ltd. announce the opening of a radio-telephone service between Port-of-Spain, Trinidad, and Paramaribo, Surinam (Dutch Guiana). The rate is £2 5s. for a 3-minute call. Radio-telephone service is also available between Port-of-

Spain and the U.S.A., Canada, Cuba and Mexico through the American Telephone and Telegraph Company's station at Miami, Florida.

**Sanatorium Installations.**—The Hastings T.C. proposes modernising and improving lighting and electrical equipment at Borough Sanatorium at a total estimated cost of £736.

**E. D. A. Kitchen Filmed.**—A domestic scene in the No. 1 kitchen by two radio stars, Miss Dorothy Carless and Mr. Eugene Pini, will form part of the Pathé New Pictorial No. 28 which is being released on March 26.

**Bombay Tramways Purchase.**—Bombay Municipality has decided to purchase the Bombay Electric Supply and Tramways Co., according to a resolution passed by Bombay Municipal Corporation, on March 8.

**Women Citizens' Protest.**—The Bolton Women Citizens' Association has expressed disapproval of recent payments made to the Electrical Engineer and staff, in respect of the new electricity generating station, on the grounds that it involves a wrong principle and one that may become a precedent.

## BRITISH STANDARDS INSTITUTION

At the luncheon of the British Standards Institution, on March 6, Sir John Greenly, in proposing the toast of the B.S.I., said that the work of the institution was originally confined to engineering, but as an example of the widening of its scope, standardisation of women's dresses, blouses and lingerie had been undertaken. The institution now had over 1 500 technical committees preparing standards for nearly all branches of industry.

Lord Woolton, president, in reply, referred to the establishment of the institution in 1901 by the engineering industry and said that standardisation was one of the basic principles of efficient production; it ensured the maximum value per unit of price; it gave the consumer protection by guaranteeing a standard of quality or performance. He felt it was necessary to see that the public were aware that goods made to a British standard meant value for money.

### TWENTY-FIVE YEARS AGO

*FROM THE ELECTRICIAN of March 12, 1920: The Handley Page passenger aeroplane, which left London for Paris on the 4th inst., with six passengers, a crew of three and with a load of freight, was fitted with a Marconi wireless telephone, and a spoken message was received from it when over the Channel at 1.45 p.m., that the machine had just passed another Handley Page aeroplane flying from Paris to London. This is the first time that a practical application of Marconi telephones has been made on the London-Paris Handley Page air service.*

# Electrical Industry's Future

Annual Meeting of N.W. Area E.D.A.—Combined Service Unit

THE annual luncheon of the North-West England and North Wales Area of the E.D.A., held at the Midland Hotel, Manchester, on Tuesday, was attended by representatives from more than 50 towns in the area. Mr. R. H. Harral (Blackburn) presided.

## Work in Hand and Anticipated

Mr. Tom Smith, M.P., Parliamentary Secretary, Ministry of Fuel and Power, in congratulating the association on the progress it had made during the last 25 years, remarked that during that period the number of electricity consumers had increased from 1 000 000 to 11 000 000. Within the next 25 years, the progress of electricity supply and usage would be no less noteworthy, especially in the domestic field. In whatever developments took place, the factor of price would have some relation to the rate of expansion. Since 1940, the production of electricity had been almost miraculous and it still had unbounded possibilities. That undertakings should have survived bombing raids so well was not altogether a matter of luck—it was the result of much hard work, intensive planning and the exercise of much forethought. In this country we had the capacity to produce the plant required for all home and overseas needs, but it was important that there should be an even spread of orders and that contracts should be fulfilled to time. Orders had been placed for plant for 2 000 000 kW and some of these were now in hand. He believed that with the even spread of orders there was ten years' work ahead.

Mr. Clarence Parker, chairman of the association, emphasised the importance of maintaining a partnership of interests between the supply industry and the Ministry of Fuel and Power in order to develop planning to take electricity to rural areas, to help forward research and standardisation of voltages, and to secure the utmost use and benefit from our full resources. The industry had as big a part to play in peace as in war conditions. It was a fact beyond controversy that the standard of living increased in exact ratio to the production of electricity. Finally, Mr. Parker ventured the opinion that in the post-war years, it might be necessary for the association to embark upon a policy of decentralisation, instead of concentrating the whole of its work in London.

Acknowledging the toast of the guests, which was proposed by Mr. R. H. Harral, Mr. H. N. Grundy, Regional Controller, Board of Trade, spoke of the urgent need there would be for research and develop-

ment in all post-war industries, and that was a sphere in which the Board of Trade could help. Government factories had been leased to new tenants; this would mean the production and consumption of more electric power. New factories were to be built in various places and the siting of power stations was closely related to the siting of such factories.

\* \* \*

In the annual report which was submitted to the general meeting of the Area Council, which met after the luncheon, it is stated that progress had been made in connection with the combined service unit. A committee had co-operated with the Mid-East England Area Committee working on similar lines and they reached agreement upon the essential features of a design to meet the needs of consumers in small and medium-sized houses. The joint committee hopes that all other areas of the E.D.A. will co-operate in an endeavour to evolve a national unit.

Mr. H. Metcalfe (Bacup) was elected chairman in succession to Mr. R. H. Harral; Mr. G. A. Robertson, deputy chairman; and Messrs. J. B. Hudson and A. D. Hegan were elected to the Area Council.

## In Parliament

The following are replies to recent questions in the House of Commons:—

*Post-War Production.*—Replying to Mr. Ellis Smith, who asked, what action was being taken to bring about a large increase in the supply of electric power as soon as possible on the termination of hostilities; and had steps been taken to increase to its utmost the productive capacity of power plant manufacturers for home consumption and for export, the Minister of Fuel and Power, gave an assurance that all was being done that could be done to see that existing capacity was efficiently worked and that extra capacity was extended as quickly as possible.

*Equipment (Advance Orders).*—Mr. Higgs asked the Minister of Fuel and Power on what authority the Electricity Commissioners had authorised undertakings to purchase electrical equipment for post-war requirements from specified areas such as Scotland, the North-East coast and South Wales. In reply, Mr. Tom Smith said the letter sent out by the Commissioners to authorised undertakings, to which, he presumed, Mr. Higgs referred, had the approval of the Treasury, the Board of Trade and the Ministry of Fuel and Power.

# Victoria Electricity Commission

## Annual Report and Silver Jubilee Review

THE twenty-fifth annual report of the State Electricity Commission of Victoria covering the financial year ended June 30, 1944, discloses that during the year—the fifth year of war—the several power stations were again subjected to the risk of breakdown in consequence of being operated under conditions of overload and without, what is considered to be, normal provision for spares.

Electricity supply revenue totalled £5 104 631, an increase for the year of £166 029. Expenditure on account of electricity supply, exclusive of special expenditure and appropriations, amounted to £4 085 636—an increase of £391 376.

The net surplus for the year was £124 872, after appropriation for the following purposes:—(i) Strengthening reserves to meet future expenditure and unforeseen happenings: £310 000 has been reserved for rural extensions and contingencies. (ii) Writing off non-productive expenditure of £82 721, mainly incurred in the developmental stages of Kiewa and in respect of the non-paying tramway systems in Ballarat, Bendigo and Geelong.

Electricity sales to industry were 17 million kWh lower than in 1942-43—an early indication of the uncertainty forecast last year of maintaining the war-time revenues from industrial supplies.

### Units Sold

Over 1 200 million kWh were sold in Victoria during the year, of which 98 per cent. was generated by the Commission's system. There are now 448 000 consumers of whom 300 000 (67 per cent.) are supplied directly by the Commission. Country consumers were further reclassified for tariff purposes, 35 000 benefiting by £27 000 for 1944.

The lack of spare plant is evident from the following particulars of the electricity generating system, at the close of the year under review:—Installed capacity, without provision for breakdown, 359 815 kW; assured capacity, with full provision for breakdown, 281 000 kW; maximum demand recorded to June 30, 1944, 328 000 kW.

The installation of an 18 000 kW turbo-generator at Newport was completed, but manufacturing and construction difficulties and losses at sea through enemy action delayed other plant installations, which were progressing as follows:—Kiewa: No. 3 Development (originally planned for completion in the autumn of 1942) two 12 000 kW turbo-generators—first set, completion

date, September, 1944; second set, completion expected, December, 1944. Newport: (Originally planned for completion—first set, 1941 second set, 1944) two 30 000 kW turbo-generators and boiler plant—first set, completion expected, February, 1945; second set, shipment date of major sections from overseas, June, 1945.

### Development of Power Resources

As the year marks the silver jubilee of the Commission a brief survey of its activities during the 25 years of its existence is given in a supplement. The power resources it is claimed, are in an advanced state of development which comprehends the needs of the next decade. Emphasis has been laid on Victoria's fuel requirements for purposes additional to electricity supply, and including the manufacture of town's gas. Here again the work of the Commission has been most important, for its briquetting enterprise—initiated as a means of providing regular fuel supplies for its thermal power stations, existing and prospective, in the metropolis and elsewhere beyond Yallourn, as well as of demonstrating the economic value of brown coal as industrial and domestic fuel—has pointed the way to complete independence of imported black coal.

To-day, the Commission generates over 98 per cent. of the electricity produced in Victoria for general purposes, and there are nine districts (or branches) for local distribution, viz.:—Metropolitan, Ballarat, Bendigo, Eastern Metropolitan, Geelong, Gippsland, Midland, North-Eastern, and South-Western. Between them they serve 300 465 consumers—metropolitan and country—in 552 centres, 120 of which were included in the 66 local undertakings acquired as the first steps in the formation of homogeneous and economic electric supply areas. The development since acquisition of the country undertakings is to be measured by the fact that while sales therein have expanded more than twelve-fold, the revenue received has increased by only 188½ per cent., while the average price per kWh has been reduced from 8.03d. to 1.71d. At present, 7 500 farms are receiving supply.

As the result of direct reductions in scheduled charges, and the incidence of the Commission's standard tariffs in reducing the kWh cost as consumption increases, the average charge per kWh retailed in all the areas served by it has been lowered since 1924-25 from 2.62d. to 1.23d. or by 53 per cent.

# Electricity Supply

**Croydon.**—The Electricity Committee is to replace a l.t. distribution board at Waddon Factory Estate sub-station at a cost of £951.

**Keighley (Yorks).**—The Electricity Committee has agreed to increase all basic electricity charges by 5 per cent. as from April 1.

**Leeds.**—The C.C. has agreed that the 5 per cent. increase in electricity charges should now be extended to tariffs subject to a coal price clause.

**Clitheroe.**—As from January 1, 1945, the unit charges for electricity supplied by the Corporation to poultry farmers, will be: First 1 000 units per qtr., 1d. per unit; over 1 000 units per qtr., ½d. per unit.

**Wallsend.**—The T.C. has approved plans by the North-Eastern Electric Supply Co., Ltd., for electric cable installations in the main road at Benton.

**Barrow-in-Furness.**—The Electricity Committee has obtained sanction to borrow £16 278 for extensions at Buccleuch Street works and a feeder cable between Barrow and Ulverston.

**Cardiff.**—The Electricity Committee reports that the total expenditure on the first section of the extension of Roath power station was estimated at £994 757 and sanction is being sought to borrow £220 000 beyond the original loan sanction

for £775 396, and also to borrow £78 000 in excess of the local sanction for the second section.

**South Shields.**—The Electricity Committee has approved the following revised scale of electricity charges for houses:—A fixed annual charge of 10 per cent. of the rateable value (minimum charge of £1 per annum) plus running costs of ½d. per unit for the first 250 units per quarter, plus 10 per cent. war increase. The fixed annual charge will include the meter rent.

**Bermondsey.**—The tariffs for the supply of electricity and gas for the temporary huts being erected on various sites have been considered by the Housing Committee which is satisfied that the provision of heating and lighting by electricity would be more reasonable. With regard to the huts within the supply area of the Council's electricity undertaking, the Committee has adopted the suggestion of the Borough Electrical Engineer that the tariff should be the two-part domestic tariff of 1s. per week standing charge and a running charge for electricity at ½d. per unit. It has also agreed to the following scale of maintenance charges for apparatus to be installed: cooker 3d. per week, washboiler 1d., kettle 1d., two radiators 1d., free replacement of lamps and maintenance of wiring 2d.

## 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 Department of Overseas Trade, Millbank, London, S.W.1 (corner Horseferry Road), unless otherwise stated.

**Lincoln (Parts of Kesteven).**—Supply of electric lamps to institutions at Grantham, Sleaford and Stamford, and the Children's Homes at Grantham and Stamford, for the six months ending September 30, 1945. Particulars from the Public Assistance Officer, County Offices, Sleaford, Lincs.

**Lincolnshire,** March 16.—Supply of electrically-driven land drainage pumps for Witham Fifth District Internal Drainage Board, and Skegness Internal Drainage Board, Particulars from Mr. F. H. Tomas, 50, Wide Bargate, Boston; deposit £3 3s. each specification.

**Abertillery U.D.C.,** March 17.—Supply of electrical materials for the period ending March 31, 1946. Particulars from Mr. Dawson Thomas, 40, Somerset Street, Abertillery.

**Burnley T.C.,** March 19.—Supply of electric lamps to the Institution, from April 1 to September 30. Forms of tender from the Public Assistance Officer, 20, Nicholas Street, Burnley.

**Southend-on-Sea, T.C.,** March 31.—Supply and delivery over a period of 18 months of 5 000 house service meters. Specifications from Mr. A. C. Johnson, Electricity Works, Southend-on-Sea.

**Manchester Electricity Department,** April 3.—Supply, delivery and erection of (a) automatic voltage variation equipment and reactors (Spec. 821), (b) mercury and rectifier equipment (Spec. 822), and (c) 660 V d.c. traction switchgear (Spec. No. 823). Particulars from Mr. R. A. S. Thwaites, Town Hall, Manchester, deposit £1 1s.

**Manchester Electricity Committee,** April 7.—Supply and delivery during a period of 12 months of service cutouts (Spec. 819), and cables (Spec. 820). Particulars from Mr. R. A. S. Thwaites, Town Hall, Manchester, deposit £1 1s.

# Industrial Information

**Birlec, Ltd.**—Birmingham Electric Furnaces, Ltd., have changed their name to Birlec, Ltd.

**A 7-Range Clip-on Ammeter**—A new clip-on ammeter having seven ranges, all self-contained, has been introduced by Ferranti, Ltd. Called the "7-range," it is being supplied as an addition to dual



**Ferranti clip-on Ammeter**

range models. The selector switch, by means of which any one of the seven ranges—10, 25, 50, 100, 250 500, or 1 000 A—can be used, is operated by the thumb of the hand holding the instrument, and it is not necessary to remove the clip-on ammeter from the conductor being tested. The core is fully insulated and has a 2½ in. square aperture. The handle is slotted to take a strap. The indicating portion consists of a 2½ in. dial moving coil rectifier type instrument fitted with a toughened glass. The clearly marked scale ensures easy readings.

**Course for U.S. and Dominion Forces.**—A course on electrical engineering for American and Dominion Forces, organised by the British Council and the I.E.E. South Midland Centre, is being held this week at the University Overseas Club, 5, Great Charles Street, Birmingham.

**Change of Address.**—Troughton and Young, Ltd., are closing their evacuation premises at Birtley House, Bramley, Surrey, today, March 16, and transferring to their London offices, Imperial Court, Basil Street, Knightsbridge, S.W.3. Telephone: Kensington 8881.

**E.D.A. Bulletin.**—The February number contains some interesting facts and figures from the Norwich area on the electrical equipment of rural houses; details of cookery courses for the Services at Dover and Halifax; a suggestion for inter-station electric transport; and news from the areas.

**Electrical Courses for Teachers.**—In addition to courses for members of the A.T.S., training is being provided at the Liverpool electricity showrooms, on Saturday mornings, for domestic science and science teachers, who wish to qualify for the E.A.W. certificate examination. The

course commenced on March 3, and already some 51 teachers from Liverpool, Wallasey, Birkenhead, Bootle, Southport and Ormskirk have enrolled.

**Approval of Permitted Prices.**—The Central Price Regulation Committee has approved the following selling prices.—Two types of electric fires manufactured by the A.D. Davidson Electric Co: 1 kW sheet metal fire: Manufacturer's 9s. 11d.; wholesale 12s. 4½d.; retail 16s. 6d. 2 kW sheet metal fire: Manufacturer's 16s. 3d.; wholesale 20s. 7½d.; and retail, 27s. 6d. These prices are exclusive of purchase tax. The Hawgan electric iron complete with flex manufactured by Arthur Dodgson (Airframe) Ltd.: Manufacturer's selling price 18s.; wholesale 22s. 6d.; retail 30s. These prices do not allow for cash or settlement discounts and are exclusive of purchase tax. Infra red ray appliances made by the Ergon Electrical Manufacturing Co., Ltd.: Retail selling price, Ergon lamps, hand model No. 126, with 9 in. angular stand 58s.; as above, with 14 in. angular stand 60s.; table model, No. 127. 110s.; super floor model, No. 125, 160s.; spare infra-red unit 9s.; spare radiant heat unit 8s. These prices are exclusive of purchase tax.

## Metal Prices

	Monday, Price.	March 12. Inc. Dec.
<b>Copper—</b>		
Best Selected (nom.) per ton	£60 10 0	—
Electro Wirebars ...	£62 0 0	—
H.C. Wires, basis ... per lb.	9¾d.	—
Sheet ... ..	10¾d.	—
<b>Phosphor Bronze—</b>		
Wire(Telephone)basis per lb.	1s. 0½d.	—
<b>Brass (60/40)—</b>		
Rod, basis ... .. per lb.	—	—
Sheet " " " " " "	—	—
Wire " " " " " "	10¾d.	—
<b>Iron and Steel—</b>		
Pig Iron (E. Coast Hematite No. 1)... per ton	£6 18 6	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ... ..	£27 10 0	—
Mild Steel Tape (Cable Armouring) basis 0.04 in. ... ..	£20 0 0	—
Galvanised Steel Wire No. 8 S.W.G. ... ..	£26 0 0	—
<b>Lead Pig—</b>		
English ... .. per ton	£26 10 0	—
Foreign or Colonial ..	£25 0 0	—
<b>Tin—</b>		
Ingot (minimum of 99.9% purity) ... per ton	£303 10 0	—
Wire, basis... .. per lb.	3s. 10d.	—
Aluminium Ingots ... per ton	£85 0 0	—
Speller... ..	£25 15 0	—
Mercury (spot) Warehouse ... .. per bottle	£69 15 0	—

NOTE.—Above prices are nominal only, no allowance being made for tariff charges, charges for insurance, etc. Prices of galvanised steel wire and steel tape supplied by Cable Makers Association. Other metal prices by British Insulated Cables Ltd.

# Company News

HEENAN AND FROUDE LTD.—Intm. div. 5% (same).

BRAITHWAITE AND CO. (ENGINEERS), LTD.—Intm. div. 3% (same).

BRITISH COLUMBIA POWER.—Qtrly. div., 40 cts. per "A" sh. (same).

PETER BROTHERHOOD, LTD.—Intm. div. 8% on ord. (same).

VOKES LTD.—Bonus 7½% (same), mkg. 20% (same). Net. pft. to June 30, 1943, £12 587 (£3 607).

BRITISH XYLONITE CO. LTD.—Sec. Intm. div. 7½% on ord., in lieu of fin., mkg. 10% (same).

HAWTHORN LESLIE AND CO. LTD.—Intm. div. 3% less tax (same) on ord. for yr. endg. June '30 next.

TAYLOR TUNNICLIFF (ELECTRICAL INDUSTRIES) LTD.—Fst. and fin. div. on ord. 10% (same). Net pft., 1944, £28 247 (£27 244).

BOURNEMOUTH AND POOLE ELECTRICITY SUPPLY CO.—Fin. div. on ord 7½%, mkg. 12½%. Net pft. is stated as £58 478 (£57 116).

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Fin. div. 5% (same), mkg. 8%, less tax (same). Net pft. for yr. £534 923 (£520 968).

MANX ELECTRIC RAILWAY CO., LTD.—Receipts to Sept. 30, £22 193, less exes. £18 133, leavg. pft. £4 060 (£3 473), re-dueg. debit blee. to £8 515.

FRANCO SIGNS, LTD.—At an extra-ord. gen. mtg. resolutns. increasg. the cap. from £200 000 to £300 000 by the creatn. of 200 000 new shs. of 10s. each, were carrd.

BRUCE PEBBLES AND CO. LTD.—Div. on ord. 5% (same) and bonus 3%, both less tax (same). Pft. 1944 after taxatn., etc., £42 554 (£39 737). To deprecn. £20 000.

METROPOLITAN ELECTRIC SUPPLY CO. LTD.—Fin. div. for 1944, 5% (same) on ord., mkg. with intm. 8%, less tax (same). Net pft. for 1944 £589 265 (£439 594).

BRITISH ROPES, LTD.—Net pft. for 1944—subject to inc.-tax but after providg. E.P.T., deprecn. and all charges, £444 890 (£355 741). Fin. div. 7½% (same), mkg. 12½% (same).

DELHI ELECTRIC SUPPLY AND TRACTION CO.—The Delhi authorities have given notice that they will purchase the undertaking of the Delhi Electric Supply and Traction Co. at the first option date, namely, in March, 1947.

CROSTHWAITHE FURNACES AND SCRIVEN MACHINE TOOLS LTD.—Pft., 1944 (after deprecn., dirs.' fees, tax and chgs.) was £4 001, brot. in £2 720, mkg. £6 721. Div. 10% £2 448, bonus 5% £1 224, to gen. res. £500, fwd. £2 549.

REDPATH BROWN AND CO. LTD.—Net tradg. pft. £64 626 (increase £3 799) for yr. to July 31 last. Net pft. is up by £5 222 to £49 952. Pref. div. £5 250 net (same) and ord. tax-free div. £44 702 (£39 480), fwd. £172 244.

SLOUGH AND DATCHET ELECTRIC SUPPLY CO. LTD.—Trdg. blee. 1944 £89 579, plus amt. brot. in and int. £6 106, mkg. £95 685. To inc.-tax £34 620, int. on consumers' depos. £571, deprecn. acct. £25 603, res. £2 019, contng. acct. £12 000, div. 4½%, tax free, fwd. £1 522.

WINDSOR ELECTRICAL INSTALLATION CO. LTD.—Trdg. blee. 1944 £22 251, plus amt. brot. in and int. £2 610, mkg. £24 861. To inc.-tax. £7 654, int. on consumers' depos. £167, pref. divs. £2 927, deprecn. acct. £6 007, res. £469, contng. acct. £4 000, div. 4%, tax free, fwd. £1 037.

EGHAM AND STAINES ELECTRICITY.—Trdg. blee. 1944 £159 044, plus £10 773 brot. in. To inc.-tax £62 591, int. on consumers' deposits £956, pref. div. £11 250, deprecn. £53 691, res. £829, contng. acct. £10 000, div. 3½%, tax free, £25 900, fwd. £4 600.

ENGLISH ELECTRIC CO., LTD.—Net trdg. pft. for yr. £584 773, increase of £14 191. After charging fees, deb. int. and deprecn., net pft. is £434 984 (£419 346). To gen. res. £100 000. Pref. takes £73 830 and ord. £235 915 both (same). Fwd. £87 870 (£62 631).

BRENTFORD ELECTRIC SUPPLY CO.—Trdg. balce. 1944 £33 055, plus amnt. brot. in and int. £2 341, mkg. £35 396. To inc.-tax £13 883, int. on consumers' depos. £196, deprecn. acct. £7 168, res. £2 979, contin. acct. £5 500, div. 5%, tax free, fwd. £1 169.

L. GARDNER AND SONS.—Pft., 1944, after deprecn., taxn. and other res., £47 059 (£51 555), plus divs., etc., £19 364 (£18 811), mkg. £66 423 (£70 366), plus £240 373 (£228 498) brot. in. To pref. div. £5 041 (£5 041). Ord. div. 5% (same) £53 451, fwd. £248 304.

CHESHAM ELECTRIC LIGHT AND POWER CO.—Trdg. blee. 1944 £43 959, plus amt. brot. in and int. £2 600, mkg. £46 559. To inc.-tax £16 122, int. on consumers' depos. £545 deprecn. acct. £18,321, res. £147, contng. acct. £1 000, div. 3% tax free, fwd. £2 472.

UXBRIDGE AND DISTRICT ELECTRIC SUPPLY CO.—Trdg. blee. 1944 £226 302, plus amt. brot. in and int. £6 954, mkg. £233 256. To inc.-tax £81 806, int. on consumers' depos. £1 833, deprecn. acct. £78 793, res. £290, contng. acct. £9 000, div. 4½%, tax free, fwd. £784.



LLANELLY AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Operating pft. and other inc. 1944 £170 671. Managemt. exes. £6 089, Elec. Commissioners £2 925, dirs.' fees £1 800, pensions £4 105, lvg. pft. £155 752 (£149 300). Tax £53 913, deprecn. £55 494, to genl. res. £5 000, pref. div. £19 800, ord. div. 6% (same), £19 800, fwd. £3 881 (£2 136).

NOTING HILL ELECTRIC LIGHTING CO. LTD.—Gross rev. 1944 £217 022 and exes. £133 697, leavg. net rev. £83 325, plus £8 738 brot. in and £1 073 int. To deb. int., etc., £7 151, prem. on deb. stk. redeemed £81, to sinkg. funds "A" and "B" £19 726, inc.-tax £10 862, leavg. £55 317, subject to liabil. wh. may become due under Govt. contemplated war dmge. scheme.

AMAZON TELEGRAPH CO., LTD.—Dirs. in their report for yr. to June 30, 1944, state that the co.'s contract with the Brazilian Govt. expires on April 2 next, and, as it is not to be renewed, arrangements. are in hand for the co. closg. down on that date. Gross rev. to June 30, 1944, £22 864 (£25 172), exes. £32 640 (£29 578), leavg. loss £9 776 (£4 406). Debit blee. brot. down of £7 998 inc. to £17 774.

R. B. PULLIN AND CO. LTD.—Tradg. pft. for 11 mos. to Sept. 30, 1944, £90 373 (£131 468 for 12 mos.), plus int. £245 (£318), mkg. £90 618 (£131 786). To deprecn. £8 015 (£8 723), dirs.' fee £183 (£200), leavg. net pft. before tax, £82 420 (£122 863). To E.P.T., inc.-tax and N.D.C. £68 774 (£107 208), fin. div. 12½% (15), mkg. 17½% (20), gen. res. £5 000 (£6 000), fwd. £958 (£1 062).

GENERAL REFRACTORIES LTD.—Prelim. figs. gave tradg. blee. of co. and U.K. subsids. for 1944, £186 125 (£228 283). Net pft. £52 941 (£49 403) attributable to General Refractories of which £52 928 (£49 271) has bn. included in co.'s accts. To W.D.I. £917 (£1 528) and to gen. res. £35 000 (£25 000), surplus taxatn. res. at Jan. 1, 1944, £9 000 (nil). Div. of 7½% (same) is proposed, leaving £55 669 (£54 033) to be carried fwd.

MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION.—Pft. for 1944, £169 568 (£167 231), and fin. div. 6% (same), again mkg. 9%, less tax, on ord., payable Ap. 14. Balce. £49 646 is brot. in, mkg. pft. £219 214. Taxatn. takes £82 299 (£73 132) and deb. int. £19 500 (same). Trans. to res. is £20 000 (£25 000). Pref. div. absorbs £7 000, and ord. int. and fin. divs. £42 000 (both same), leavg. balce. of £48 415 fwd.

MATHER AND PLATT, LTD.—Pft. for 1944, £377 100 (£58 879 decrease). Provision for tax takes £60 000 less at £130 000, and after allocat. £44 438 (£45 731) for deprecn., £17 650 (£17 320) for deferred repairs,

£10 000 (same) off shs. in subsidy. cos. and £2 718 (£4 531) for W.D.C., net blee. £172 294 (£3 906 less). Ord. div. again requires £136 366. 5% div. takes £20 000, and after placg. £25 000 (nil) to res., £90 686 (£99 758) is carried fwd.

MIDLAND COUNTIES ELECTRIC SUPPLY CO., LTD.—Gross rev. 1944 from subsids. £632 543 (£626 438) and misc. receipts £7 305 (£6 789), mkg. £639 848 (£633 228). To exes, £13 259 (£17 680), dirs.' fees £7 000 (same), int. on ins. £6 388 (£6 401) and deb. int. £61 250 (same), leavg. £551 951 (£540 896). To in. tax £276 649 (£273 116), leavg. net rev. £275 902 (£267 779). To res. £60 000 (£46 000), to conting. £15 000 (£20 000), pref. div. £81 250 (same), ord. div. £120 000 (same), fwd. £24 766 (£25 115), fin. ord. rate 5% (same), again mkg. 8% less tax.

DORMAN LONG AND CO. LTD.—Pft. blc. for yr. ended Sept. 30, after taxatn. deb. interest and sinking fund, but includg. £106 860 surplus from past yrs., £1 147 666 (£894 830). Dirs. recommend 8% div., plus additional 8% on pref. ord., and 8% on ord., both same, and less tax payable Mar. 31, to holders reg. Mar. 1. £275 000 to deprecn. (same), £250 000 to gen. res. (£150 000), and £15 000 to pension fund (same). Carrd. fwd., £71 433 £63 171.

BRITISH INDUSTRIAL PLASTICS LTD.—Tradg. pft. to Sept. 30 (includg. receipts from subsids., int., divs. and fees) £240 107 (£327 852). To gen. exes. £65 802 (£62 899), research, etc., £17 578 (£11 583), pensions £3 406 (£2 813), dirs.' fees £400 (£867), deprecn. £15 417 (£14 426), army allowances £2 892 (£2 681), A.R.P. £3 031 (£4 789), war damage £3 877 (£6 635), inc. and E.P. tax £106 000 (£199 500), lvg. net £21 705 (£21 659). Pref. div. £1 482 (same), ord. div. 8% (same), £17 196 (£17 176), percentage to dirs. £1 032 (£1 030), to gen. res. nil (£500), fwd. £10 164 (£8 168).

### Company Meeting

SOUTHERN RAILWAY CO.—The annual general meeting was held in London on March 8. Col. Eric Gore Browne, the chairman, said that the net revenue for the year at £7 000 052 was £866 more than in 1943. The balance available for dividend on the deferred ordinary stock was £711 879, which would enable them to pay a dividend of 2 per cent., the same as for 1943. In future, the supervision of motive power would come directly under the traffic manager; this would lead to still closer control and be of assistance in the conversion of further lines from steam to electric traction. They were planning an extension of electrification for both passenger and freight trains.

# 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.

B. AND B. BATTERIES, LTD., London, S.W.—Feb. 19, £500 deb., to Kathleen M. Pelham, London; general charge. \*Nil. Dec. 31, 1943.

"NEW ERA" TIME AND TELEPHONE SYSTEMS, LTD., Manchester.—Feb. 17, £2 060 and £5 000 deb. stock., parts of an amount already reg. \*£20 000. Jan. 14, 1944.

## Notice of Intended Dividend

GILL, Hubert Jack, residing and carrying on business at 10, High Street, Keynsham, electrical engineer and radio dealer. Claims to be sent by March 26, 1945, to the trustee, Mr. Harold Wheeler, 26, Baldwin Street, Bristol 1, Official Receiver.

## County Court Judgments

NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.

SMITH, Philip E., 10, Blenheim Rd., Bedford Park, W.4, electrician. £53 0s. 11d. Jan. 28.

BRITISH AMERICAN RADIO SERVICES, 24, Stonecot Hill, Sutton, radio dealers. £33 3s. Dec. 29.

LAMB, — (male), 42, Widney Av., Selly Oak, electrical engineer. £14 18s. 6d. Jan. 15.

MARRIOTT, A. T. (male), 36, Charingsworth Rd., Sheldon, wireless dealer. £60 9s. Jan. 11.

## Satisfaction

BOWERS AND BARR, LTD.—Gt. Yarmouth, electns. Sat'ns. Feb. 19, of mortg. reg. Apr. 15, 1925, and June 26, 1930.

# Coming Events

## Friday, March 16. (To-day.)

I.E.E. LONDON STUDENTS' SECTION.—Visit to J. Stone and Co., Ltd., New Cross, 2.30 p.m.

BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION.—Connaught Rooms, London, W.C.2. Annual luncheon. 12.15 for 12.45 p.m.

I.E.E., MEASUREMENTS SECTION.—London, W.C.2. "The Temperature Compensation of Indicating and Recording Instruments," G. F. Tague. 5.30 p.m.

## Monday, March 19.

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel. Annual Meeting. "Distribution," D. P. Sayers. 6 p.m.

A.M.E. AND M.E., LONDON BRANCH.—39, Victoria Street, London, S.W.1. "Vibration in Rotation Electrical Machines and Some Failures Arising Therefrom," H. West. 4.30 p.m.

## Tuesday, March 20.

I.E.E., RADIO SECTION.—London, W.C.2. Discussion. "Apprenticeship and Trainee Systems in the Radio Industry," J. Grieg. 5.30 p.m.—N. MID. CENTRE, Leeds. "Operational Control of Electricity Supply Systems," W. Kidd and E. M. S. McWhirter. 6 p.m.

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.—E.L.M.A. Lighting Service Bureau, London, W.C.2. "Estimating and its Relation to the Economics of Electrical Contracting," W. H. Brooks. 6.15 p.m.

LUTON ELECTRICAL SOCIETY.—Town Hall. A resumé and discussion on the booklet, "Electrical Installations." 7.30 p.m.

## Wednesday, March 21.

I.E.E., E. MIDLAND SUB-CENTRE.—Loughborough. Short papers by junior members. 2.30 p.m.

ILLUMINATING ENGINEERING SOCIETY.—Imperial College of Science, South Kensington.

S.W.7. Joint meeting with the Royal Meteorological Society. "Measurement of the Photo-metric Properties of the Upper Atmosphere," J. M. Waldram. 5.30 p.m.

## Thursday, March 22.

I.E.E., N.W. CENTRE.—Chester. Joint meeting with the Mersey and N. Wales Centre and the Chester Engineering Society. "The Electrical Aspect of Farm Mechanisation," C. A. Cameron Brown. 6 p.m.

ROYAL INSTITUTION OF GREAT BRITAIN.—London, W.1. Lecture IV (course of 4 lectures); "Some Physical Problems of the Solid State," Sir L. Bragg, F.R.S. 5.15 p.m.

## Friday, March 23.

I.E.E.—Storey's Gate, St. James's Park, London, S.W.1. Joint meeting with the Institution of Mechanical Engineers. "Expanded Tube Joints in Boiler Drums—with Special Reference to the Battersea High-Pressure Boilers," W. B. Shannon, C. W. Pratt, T. B. Webb and W. B. Carlson. 5.30 p.m.—I.E.E., N.W. CENTRE, RADIO GROUP, Manchester. Informal discussion. "Recording and Reproduction of Sound," F. E. Williams. 6 p.m.—S. MID. STUDENTS' SECTION, Loughborough. "Electrical Technique in Resistance Welding." 6.30 p.m.

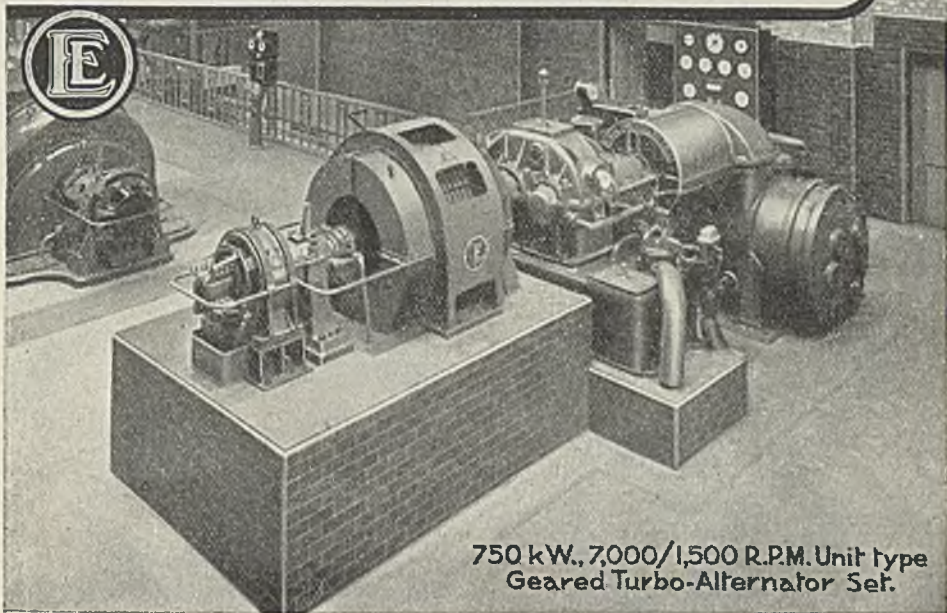
ILLUMINATING ENGINEERING SOCIETY.—Birmingham. "Some Visual Problems for Illuminating Engineers," W. D. Wright. 6 p.m.

INSTITUTION OF ELECTRONICS, N.W. BRANCH.—College of Technology, Manchester. "Pulse Generation," Dr. F. J. G. van den Bosch. 6.30 p.m.

## Saturday, March 24.

I.E.E., N.E. STUDENTS' SECTION.—Visit to King's College Electrical Laboratory.—I.E.E., N.W. STUDENTS' SECTION. Visit to Aerialite, Ltd., Stalybridge.

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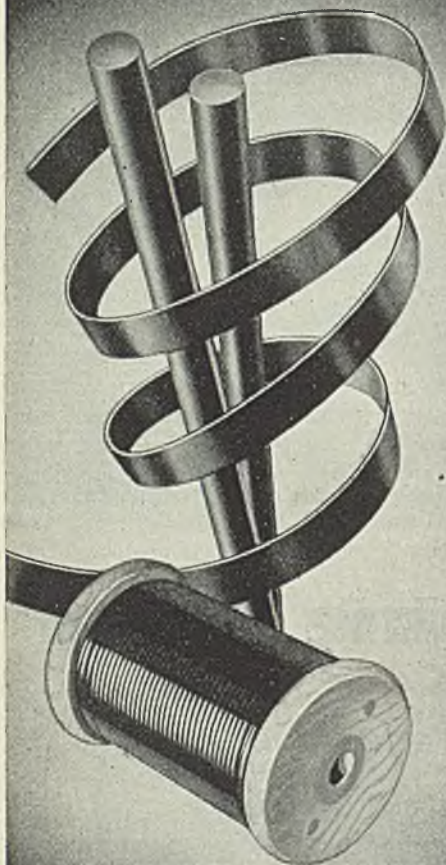
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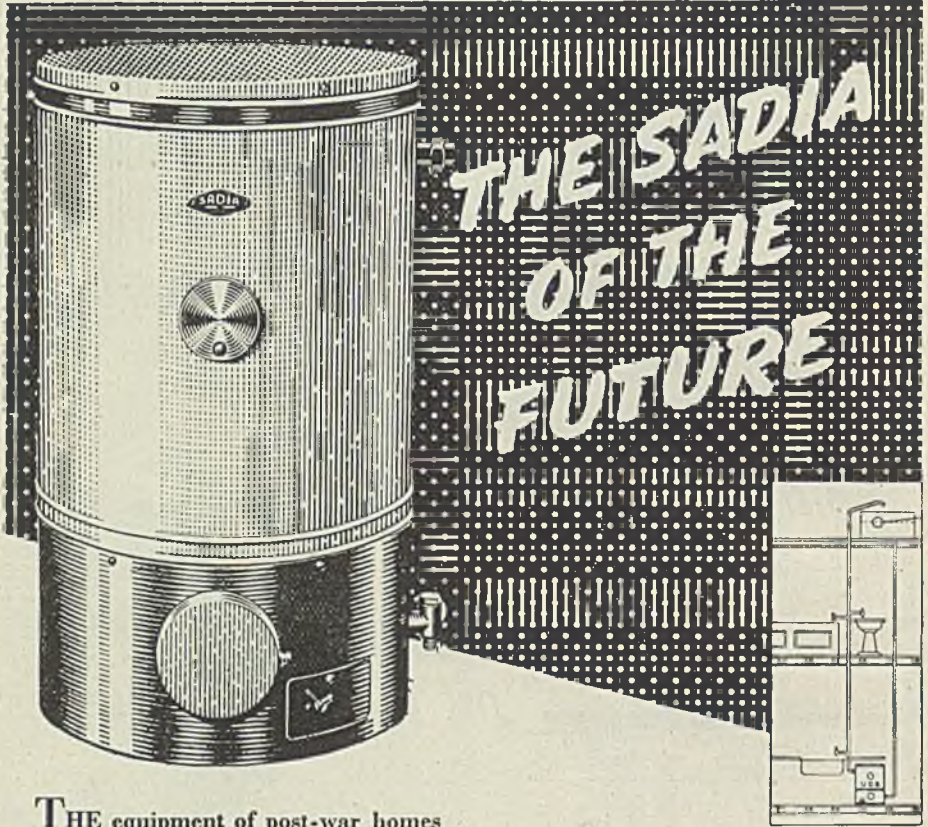
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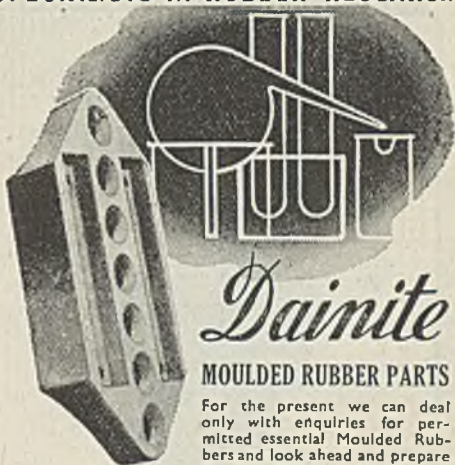
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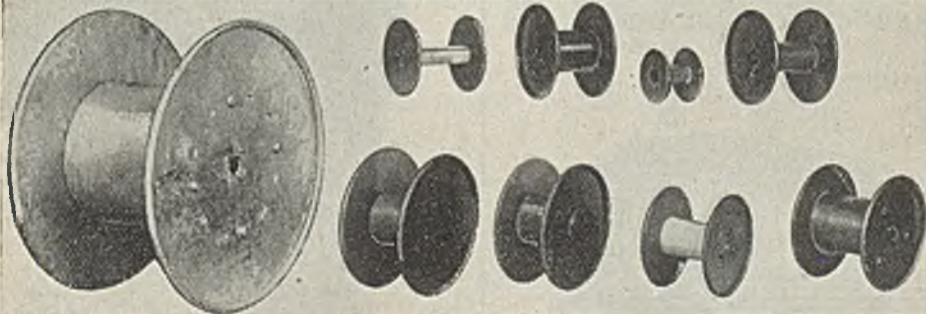
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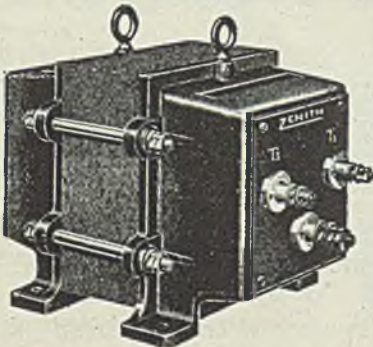


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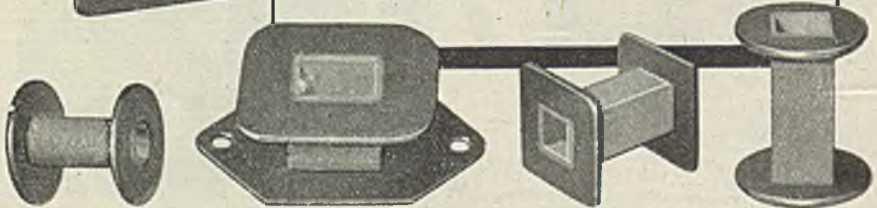
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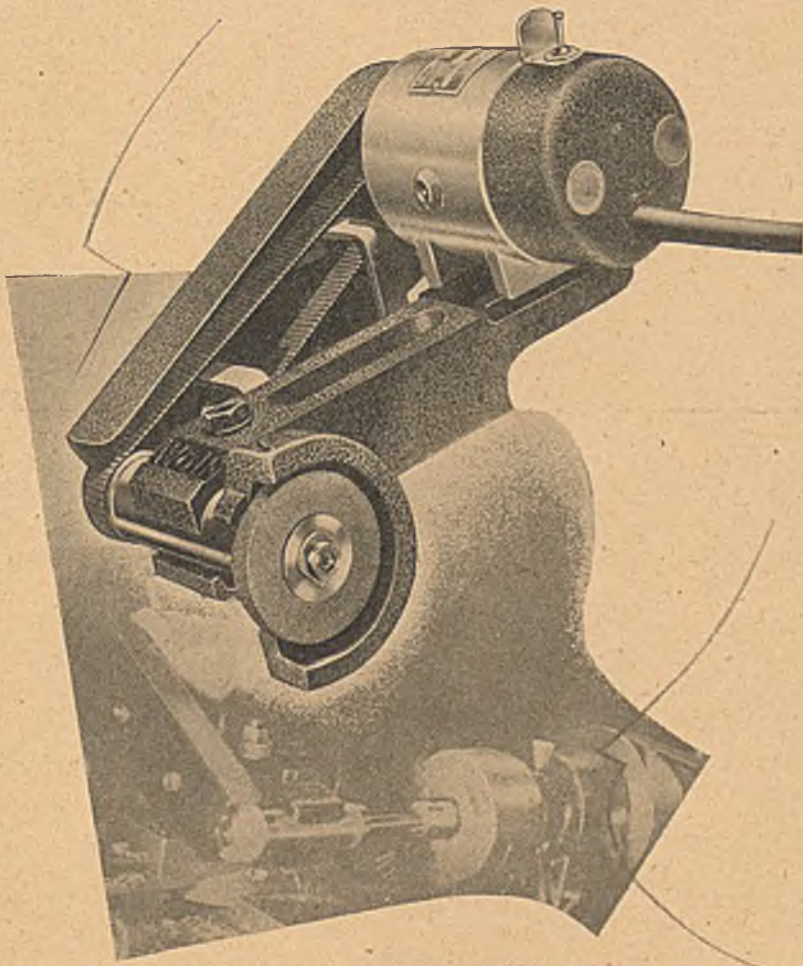
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Showing Trunnion blocks withdrawn



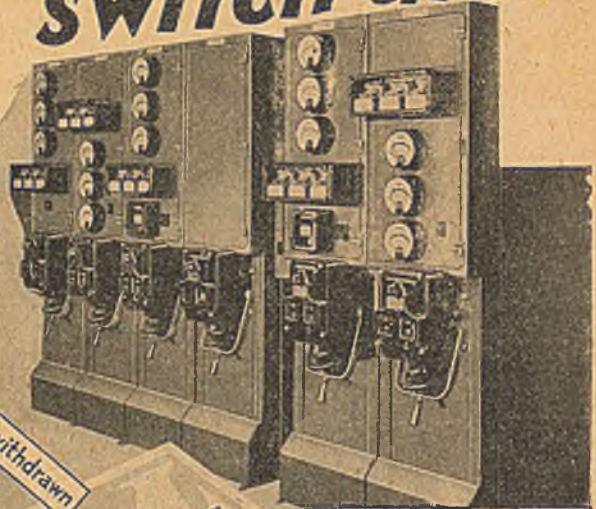
Circuit Breaker being racked down for isolation



Circuit Breaker Truck withdrawn from cubicle



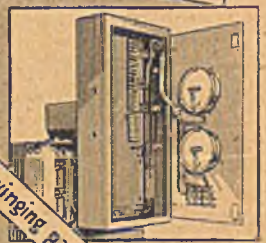
Circuit Breaker lifted for contact inspection



## TYPE VT



Front view showing easy access to cable box



Panel wiring accessible—swinging panel



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