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CHIEF CONTENTS OF THIS ISSUE

The I.M.E.A.

THE fiftieth annual report of the Incorporated Municipal Electrical Association which was presented at the annual meeting, yesterday, Thursday, shows that the association is making every preparation for a return to peace-time activities, including the resumption of its annual conventions. This is just as it should be for after the negative conditions created by the war, the municipal electricity supply industry has much to discuss from a technical point of view; many proposals to make for improvement in its already comprehensive service. The I.M.E.A., with its membership of 349, representing 95 per cent. of the municipal undertakings in the country, is the appropriate body for arranging a meeting where such discussion can take place, and a resumption of the association's annual conventions provides the opportunity.

The report, like most others published under war-time conditions, does not include references to the whole of the work which the Council have carried out during the year under review, though brief hints indicate the wide scope of the meetings which were attended by the various committees. Among the subjects dealt with has been the important one concerned with electricity supply to temporary housing schemes carried out as part of the Government's programme, and as the matter affects all public utilities, the Conjoint Conference has been asked to consider the matter in order that a common policy for all undertakings can be formulated.

The association this year reaches its jubilee and the Council are considering the most appropriate way in which to celebrate this outstanding event. Fifty years is a long time in the history of municipal electricity supply, and the association can justly claim to have put those years to good use, both with respect to public service and technical advancement. The formation of the association was brought about by Mr. JOHN H. RIDER at a meeting in July, 1895, since when it has assumed national importance. How much so is shown by the fact that at the first convention, at Brighton in 1896, Mr. ARTHUR WRIGHT, the president, when putting forward the reasons why the association was formed, pointed out that municipal electricity supply authorities "would soon probably exceed eighty in number and represent a capital outlay amounting to £4 000 000;" to-day the authorities number 375, and the capital, represented by 1938/39 standards, is £330 399 068.

The spirit of enthusiasm which permeated the conventions before the war just ended, was apparently, also in evidence at the first meeting before the South African war, for THE ELECTRICIAN of those days records the fact that "representatives of the Board of Trade attended and took part in the debates—

and everyone else who had the remotest claim to be listened to was urged to do likewise. So catholic indeed, was the spirit prevailing, that one almost expected to hear the President call upon any stray representative of the gas interest who might perchance be present, to say what he could in his own defence or—for ever after hold his peace."

As to the future, the Councils of the last fifty years have set an example of leadership, which, if followed, in the years to come, will ensure that the progress of municipal supply is not halted; will ensure that the development so far made is allowed to continue—without the political interference which now threatens it.

Edmundsons Accept a Challenge

WHEREAS the electricity supply industry has always welcomed criticism when given the opportunity to meet it, the black-out on statistics—only comparatively recently removed—has, during the last five and a half years allowed a good deal of misconception about the industry to become current. For instance, the industry has been accused of being in a state of chaos and muddle with the notable exception of the Central Board, and, it is said, nothing but nationalisation can put things right. Without attempting to name the reason for what is obviously a deliberate misrepresentation of the position, we commend for the attention of those who hold such views, the remarks made by Lord ROYDEN at the meeting of Edmundsons Electricity Corporation. Two weeks ago, we referred to the working of that group of companies as being not only highly successful but to the advantage of consumers also, and in dealing with the corporation's accounts at last week's meeting the Chairman showed how tariffs had been maintained at pre-war levels, and in some cases even reduced—despite increased war-time costs in generation and distribution.

Facts and Figures

THE record of this group of companies has for the last ten years been one of growing expansion and in case it should be assumed that the war, Government planning and controls have been responsible for the development of the last five years, attention is drawn to the fact that during the period 1934/39 the number of consumers increased by 82 per cent., the units sold by 149 per cent., and the average price per unit for domestic supplies was reduced by 35 per cent. During the war years conditions have, if anything, retarded rather than assisted progress for the percentages corresponding to those above were 14, 168 and 25, respectively. It is easy to make charges of inefficiency and to talk glibly of the necessity for drastic treatment of the industry, but the record of the Edmundson group of companies demonstrates, not only the elasticity and virility of private enterprise, but in addition, vindicates the industry from the charges so falsely made against it.

The Antrim Companies and the E.S.B.

AT the annual meeting of the Antrim E.S. Co., Ltd., last week, the chairman of the company, Mr. R. P. BEDDOW, drew attention to the fact that when the Electricity (Emergency Supplies) Act, 1942, was brought in to empower the Northern Ireland Government to, among other things, acquire authorised undertakings, the company was given to understand that unless emergency conditions made it necessary, the undertaking would not be taken over. During recent months, however, the Electricity Board for Northern Ireland has submitted to the Ministry of Commerce for confirmation under the 1931 Act, a development scheme which covers the whole of the supply areas of the Antrim companies. The potential dangers to the companies which would arise from the acceptance of such a scheme are obvious, for if the scheme is confirmed the companies will not know whether any, and if so, which of the undertakings may be compulsorily taken from them by the Supply Board. With this Sword of Damocles hanging over them it would become impracticable for the companies to proceed with the proper development of their areas. The companies have, therefore, lodged representations against confirmation of the scheme, and will be represented by counsel at the inquiry to be held next month.

Commemorating Victory in Europe

ALL those who, during the present war, have held office as President of the Electrical Industries Benevolent Association have combined to address the industry in general with the suggestion, first, that it would be fitting for all individuals and all electrical concerns

to make a thanks-offering gift in commemoration of victory in Europe, and, secondly, that such gift should be made to the E.I.B.A. which gives such comprehensive and humanitarian service. The signatories are Mr. P. V. HUNTER, Mr. E. E. HOADLEY, and Mr. J. N. STEPHENS, who have held office in that order, and they justifiably remind us that we could thus well mark our "gratitude for having come safely through a period when no-one's life was secure." The appeal has been issued to all with whom the E.I.B.A. is in contact but it is hoped that many more, learning of it, will spontaneously contribute in recognition of the fact that even if they have never helped the association before it is most fitting that they should start now. Contributions should be sent to, and copies of the appeal can be obtained from, the Secretary, 32, Old Burlington Street, London, W.1.

Another Triumph for Electro-Science

THE disclosure by an American journal of how G.C.I. (General Control Interception) and A.I. (Airborne Interception) equipment helped to defeat German night bombers has engendered further regret that the British Press is not allowed to give more details of our scientific and technical achievements. According to Mr. C. O. STANLEY, managing director, and Mr. C. A. W. HARMER, technical director, of PYE, LTD., the details so far published are only part, and by no means the most spectacular part, of the story. The G.C.I. equipment was produced under the direction of Prof. J. D. COCKCROFT, of St. John's College, Cambridge, and development began at the Pye works in the autumn of 1939. The equipment was used for putting the British pilots into the air at the time of the Battle of Britain, when contact with enemy aircraft was made visually, but it was realised that if night bombing started, and pilots could no longer see the enemy, after being placed within reasonable range of him, co-operation by means of another device would be required. Thus was developed the G.C.I.—A.I. combination.

Cathode-Rays Versus Enemy Bombers

AS a result of this important development losses inflicted on the enemy in the last big raid on this country were such that it would have been impossible for him to continue his attacks on the same scale. The G.C.I. device views the sky in a hemisphere about the station, and plots on the face of a cathode-ray tube any objects in the air. It also traces their course. From these indications, their direction and speed can be calculated, and additional apparatus is used for computing their height. When these dimensions have been determined, a night fighter is directed into the operation area by radio telephone, in such a way as to take him in the shortest time into a position of attack relative to the target. The course of the fighter is seen on the face of the cathode-ray tube in exactly the same way as is that of the enemy aircraft, and course, altitude, and speed are corrected when necessary, by radio telephone until the fighter has the enemy aircraft within range of his own airborne equipment. The pilot then signifies by radio telephone that he is taking over his own interception, and directs his course for the final attack by means of the equipment fitted in his own machine.

War Factories Change-over

WITH the end of the war in Europe, the demand for electric domestic equipment is growing, and a gleam of hope that official circles are becoming aware of the urgent need of the industry for an immediate partial change-over to peace-time production is to be found in the announcement made last week that of the further thirty-four Government factories to be allocated for civilian production, two will be devoted to the making of domestic electric equipment, a third to the manufacture of electrical equipment other than domestic, and a fourth for auxiliary water heaters and wash-boilers. It is probable that for some years to come many of the results of our manufacturing capacity so far as domestic appliances are concerned, will be required to meet the new building needs of the Ministry of Works and local authorities. Be that as it may, however, it will in all probability be to private building enterprise and the large numbers of householders, other than municipal or State tenants, that the industry must look for its most numerous customers. Obviously it should be in a position to supply their needs partially or wholly, within a reasonable period of time—and before American goods reach this country in appreciable quantities.

I.M.E.A. Fiftieth Annual Report

Jubilee Celebrations Under Consideration

THIS year the Incorporated Municipal Electrical Association reaches its jubilee and the Council is considering the most appropriate way in which to celebrate this important event.

Sir William Walker

This is announced in the annual report presented at the fiftieth ordinary general meeting of the association held at Kingsway Hall, London, yesterday.

Alderman Sir William Walker, J.P., of Manchester, succeeded Mr. W. P. Lilwall, Fleetwood, as president, and Mr. J. S. Pickles, county electrical engineer, Dumfries, was elected vice-president.

The report stated that the membership was 349, the equivalent of 95 per cent. of the municipal electricity undertakings in Great Britain. During the year the East Grinstead U.D.C. became a member.

The question of securing information on faults and breakdowns in the electricity supply industry had been considered, and, with a view to assisting in remedying and preventing faults in plant and materials and securing continuity of supply the E.R.A. was approached. They agreed in principle to act as a clearing house for fault records.

Representations had been made to the appropriate Government departments with a view to clarifying the meaning of certain paragraphs in the memorandum prepared by the Ministry of Health and the Ministry of Works for the guidance of local authorities, relating to the Government scheme for temporary housing accommodation. The Council was concerned as to the financial responsibility of electricity undertakings as to the laying and maintenance of installations, having regard to the fact that the houses have a ten-year life, and, in reply to a communication from the Council, the Ministry of Health stated that the laying of mains and services by undertakings would continue to be governed by existing statutory obligations and financial arrangements would have to be agreed in each individual case with the housing authority. In many instances the sites chosen for temporary houses would, after the ten-year period, be used for permanent houses, and the capital expenditure incurred in providing services would not be wasted.

As the matter affected all public utilities, the Conjoint Conference of Public Utility Associations had been asked to consider the matter so that a common policy for all utilities could be formulated.

Mr. W. Davies, electrical engineer, Tredegar, had given notice that he would move that the meeting request the Minister of Fuel and Power to consider the bringing into operation of the Special Committee which was appointed in 1939 under the chairmanship of Lord Sankey to inquire into the control of gas, water and electricity undertakings by holding companies.

Other motions on the agenda, in the name of Councillor A. Stephenson, chairman of South Shields Electricity Committee, were as follows:—

1. "That the resolution adopted at the extraordinary general meeting of the association, held in London on April 26, 1944, whereby the memorandum on electricity distribution with recommendations relating to future policy and practice, dated January, 1944, prepared on behalf of the association, the Provincial Electric Supply Association, the London Electricity Supply Association, and a group of power companies, members of the Incorporated Association of Electric Power Companies, as then submitted, was approved and ordered to be transmitted to the Minister of Fuel and Power, be rescinded so far as it relates to Part III of the Memorandum.

2. "That the Minister of Fuel and Power be informed that the associations and groups mentioned in the memorandum have been unable to reach agreement on the advice to be tendered to the Minister on the principles to be observed in relation to: (a) the ownership of distribution undertakings; (b) the ownership of generating stations; and (c) the establishment of a national standard bulk supply tariff; and that, in the circumstances, the Minister be asked to seek the separate views of the various associations and groups on these important matters.

3. "That this association re-affirms its faith in the continuation and extension of public ownership and control of the electricity supply industry, as set out in the association's memorandum of association, and that the Council be instructed to proceed in the conduct of the association's affairs in accordance with this declaration.

Electrical Rotor Failure

By T. H. CARR, A.M.I.C.E., M.I.Mech.E., M.I.E.E.

IN view of the electrical rotor troubles which have been experienced during the past few years, the following account of the failure of a medium output turbo-alternator rotor may be of interest.

The rotor winding failed without warning,

Fig. 1.—Turbine end of rotor, showing how top turn of coil has remained in position while other turns have pulled in towards centre of rotor

and the set had to be taken hurriedly off-load on account of loss of excitation. On testing the rotor winding with the set standing, it was found that an earth existed. The set was run up to speed and excited from an independent exciter and when the excitation current reached 70 A a short-circuit developed in the rotor winding and the alternator voltage dropped to zero. A test was then made of the voltage to earth from each slip-ring with the set still running, and a rotor current of 77 A. Voltages of 2.5 and 5 were obtained at the turbine and exciter ends respectively, which rather indicated the possibility of a second earth, in that no magnetic out-of-balance existed, and that the rotor winding was short-circuited. The readings obtained during an attempt to determine the open-circuit characteristic of the alternator were as follows :—

Rotor. Amps.	Voltage across slip-rings. Volts.	Rotor Resistance. Ohms.	Stator Voltage. kV.
40	24	0.60	2.5
60	30	0.60	3.1
60	34	0.57	3.5
77	8	0.01	0.0

The end bells were removed and a fault was found on the rotor end winding at the entrance to one of the slots at the exciter end—the accompanying illustrations, Figs. 1 to 5, show the effects of such faults. The rotor was returned to the makers' works for repair, and upon examination the end windings were found to have been bared. In addition to a fault on No. 1 coil of No. 2 pole, broken conductors of coil No. 2 on No. 1 pole were found.

The broken conductors had worked through the insulation, touching the core, but very little arcing had occurred. Both these faults were found at the exciter end of the rotor. The end cap—which was of nickel chrome steel—had welded to the faulty conductor on No. 2 pole. The makers' metallurgist reported five cracks at this point which did not disappear when the weld was ground down, and he did not consider it to be safe, without a detailed examination, for continued service.

In view of the necessity of having the set back in commission at the earliest possible opportunity it was necessary to consider the two methods of attaining this end, these were :—

1. Complete rewind of rotor. This would have entailed ordering new copper which would have taken at least six weeks to obtain, and the makers required four weeks to complete the work.
2. Repair with existing copper. This would have necessitated removing the damaged coil of No. 1 pole and repairing conductor. Reinforcing insulation would have to have been provided at the slot ends to avoid a repetition of the fault on No. 2 pole coil. The existing cap would have to have been proved. This method would have required three weeks for completion.

The makers considered the conductor leakage to be unusual, and felt that further

Fig. 2.—Turbine end of rotor, showing where bonding strips have broken at entry to slots

breakages were unlikely as the stresses were reasonably low. Taking everything into consideration the latter method was adopted.

The burn on the end cap was removed by filing and drilling, and the metal was polished and etched. After a careful examination and magnetic test there were

no signs of cracks or other defects. The mechanical stresses in the end cap were only slightly increased due to the additional hole and the cap was considered safe.

The rotor coils were heated and the rotor run at 20 per cent. over-speed, and the necessary balance adjustments made. The

Fig. 3.—Turbine end of rotor, showing how asbestos tape has been chafed away from top turn, exposing mica

rotor winding was tested at 440 V a.c. to earth, both standing and running, and found satisfactory.

The set was put into service and run at about half full load, the insulation of the stator and rotor, being tested at intervals during the first day. During the second day the set was run up to full load when the insulation resistance of the rotor was 1.2 megohms, and the stator 72.5 megohms. On the third day after re-commissioning, it was found when testing the voltage to earth from each slip-ring that an earth had developed on the rotor which disappeared when the speed of the set was reduced.

The following figures indicated that the earth fault was about one quarter of the way through the windings :—

Voltage across slip-rings	147
Voltage to earth :	
Slip-ring turbine end	30
„ exciter end	117

That the rotor should have failed so soon after repair was disappointing, but owing to the shortage of generating plant there was no alternative other than to take the risk of running the set until repair could be effected. It should be mentioned that the set had given over 15 years' satisfactory service prior to this failure.

The readings taken indicated that the earth fault was at the top of No. 3 coil in No. 1 pole, and it was thought that a repair on site during a week-end was possible.

Further tests taken with the set on load, using a Kelvin standard instrument produced the following :—

Rotor current	270A
„ voltage	162 V
Voltage to earth :	
Turbine end	19 V
Exciter end	143 V

These figures varied from those taken previously, and indicated that the earth fault either existed at or adjacent to the bottom of No. 2 coil of No. 1 pole. It is possible that the variation in the voltage drops on the two slip-rings was due to a variation in the resistance of the earth fault, and to the use of voltmeters of different internal resistance for the two tests.

Later tests were taken and the fault only occurred when the set was running.

Voltage Test (referring to Fig. 6).

240 volt range :		
T to E	161.2 V	
T to earth	14.0 V	162 V Ratio = 0.0946.
E to earth	148.0 V	
600 volt range :		
T to E	162.5 V	
T to earth	13.5 V	161.5 V Ratio = 0.0913
T to earth	148.0 V	

Bridge Test (balance was obtained with arms as follows) :

A	49 900 ohms.	20 000 ohms.	10 000 ohms.
B	5 334 „	2 144 „	1 044 „
Ratio B/A	0.107	0.107	0.104

The rotor was subsequently returned to the makers' works for complete rewinding. The set was later put into service, and the following tests indicate the approximate alternators rotor under full load conditions :

Tests taken to determine the resistance of alternator rotor under full load conditions.

The tests were taken with instruments of sub-standard accuracy, the voltage connection being made to auxiliary brushes on the slip-ring. The rotor resistance as measured by the makers at their works was 0.56 ohms at 13° C.

For five hours prior to the first readings being taken, the load on the alternator had been maintained at 20 MW, 0.9 p.f.

Time.	Load.	Exciter. Amps.	Exciter. Volts.	Resistance.	Calculated Temperature.
	MW.			Ohms.	° C.
2.30 p.m.	20	234	180	0.770	106
2.45 „	20	234	181	0.773	107
3.25 „	20	—	—	—	—
3.30 „	19	228	175	0.770	106
3.31 „	19	227	175	0.770	106
3.32 „	19	224	172	0.770	106

The alternator had been on commercial load for 24 hours prior to these figures being

Fig. 4.—Exciter end of rotor, showing where portion of top turn has welded itself to end cap, also where some parts of bonding strip have become welded to cap

taken, and the average load from 7.30 a.m. until 2.30 p.m. was 20.18 MW, with an average power factor of 0.924. The average load from 9.30 a.m. to 2.30 p.m. was 20.36 MW with an average power factor of 0.93. Other temperature readings were taken between 2.30 p.m. and 2.40 p.m. and were as follows:—

Air cooler outlet water	26.1 °C.
„ inlet water	22.2 „
Rise	3.9 „
Air cooler outlet air	61.7 °C.
„ inlet air	39.4 „
Rise	22.3

Stator thermo-couple readings taken on a multi-point indicator:—

1. Stator conductor	83.3 °C.
2. „ „	80.6 „
3. „ „	77.2 „
4. End winding point out of commission.	
5. Stator tooth	95.6 °C.
6. „ „	90.6 „

To obtain the rotor copper temperature the following figures were taken and the temperature acleulated therefrom:—

Slip-ring voltage	186 V
Rotor current	237.7 A
Resistance	0.783 ohms.

Temperature of copper based on 0.56 ohms at 13° C.—111° C.

The test figures were not obtained with brass wire brushes, and therefore include the brush drop which may modify the apparent position of the rotor earth fault.

The end windings of the rewound rotor were solidly packed in an endeavour to

Fig. 5.—Exciter end of rotor, showing position of earth fault and burning of part of core as the result of arcing; also where portion of top turn is missing

obviate the phenomenon of coil contraction, the makers contending that once the windings had pulled in sufficiently to take up the manufacturing clearance between the coils and the packings no further movement could take place. The amount of distortion which had occurred in service prior to rewind was small, and it would indicate that similar service conditions are not likely to result in any tendency to coil contraction. The condition most favourable to rotor coil distortion is that of frequent running up and down.

Distortion caused by combined thermal and centrifugal stresses, and degree of distortion, appears to depend on the number of times the electrical rotor is put through an operating cycle, i.e., started, loaded, unloaded and stopped.

The problem of copper contraction was discussed in a paper ("Deformation of

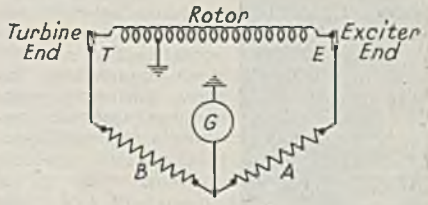


Fig. 6

Turbo-Alternator Rotor Windings due to Temperature Rise" by G. A. Juhlin—I.E.E. Journal, October, 1939, and I.E.E. Journal, 1940), and it was shown that the maximum tensile stress would be about 5 000 lb. per sq. in. Movement due to coil contraction can only occur if the operating conditions are such as to give rise to this phenomenon, i.e., if the operation temperature is high, and the set is started up and shut down frequently.

A.S.E.E. ACTIVITIES

The annual report of the Association of Supervising Electrical Engineers for the year 1944/5 shows among other things, that the periods of claims dealt with for sickness, distress and death benefits were longer, and the amount of benefit paid was about 19 per cent. greater than for 1943. The machinery of the association has been used considerably in dealing with salary questions and conditions of employment.

New branches have been formed at Coventry, Wolverhampton and St. Albans, and development generally has been so great as to justify the appointment of an organising secretary, Mr. T. E. A. Verity, who will take up his duties shortly.

On the educational and technical side of activities, it is noted that the branch papers scheme introduced in 1941 as a temporary measure is to be suspended at the end of the 1945/6 period when the W. E. Highfield Shield Competition will be reinstituted.

The report was presented at the annual conference of the association at Manchester, on May 12, when the following were elected to fill vacancies on the Executive Council: Messrs. J. F. Bridge, J. Flood, G. H. Parker, W. T. Partington and J. J. Smith.

Electrical Personalities

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

Mr. H. Warren, whose appointment as managing director of the British Thomson-Houston Co., Ltd., was announced in our last issue, in addition to his responsibilities for research and engineering, has been for many years in charge of the company's technical education and training system. He is a member of the E.R.A. Council, and of several committees of the B.E.A.M.A. and of the British Standards Institution. Mr. Warren is the author of numerous technical books and papers. He is a member of the Government Radio Research Board.

Mr. H. Warren

Sir George Nelson, chairman and managing director of the English Electric Co., Ltd., has been appointed chairman of the Production Census Committee set up by the President of the Board of Trade.

Miss Caroline Haslett is shortly leaving for the Middle East at the request of the Central Advisory Council for Education in the Forces. She will speak on housing, electricity, careers, and resettlement.

Mr. H. F. J. Thompson, general manager and engineer, Battersea electricity undertaking, who was eligible to retire on pension three years ago, has now arranged to leave the service of the Council on September 30.

Mr. T. J. Stewart, late of the British Thomson-Houston Co., Ltd., has been appointed technical representative for Stanelco Products for the Birmingham area.

Mr. R. Hugh Roberts has resigned from the board of Fisher and Ludlow, Ltd., after serving as chairman for 25 years. **Major E. Beddington Behrens** has been elected chairman in his place.

Mr. G. W. Godfrey has taken up duties with E. K. Cole, Ltd., as radio sales manager. He has been in the radio trade since 1923.

Mr. G. H. Moir (General Electric Co., Ltd., Belfast), has been nominated as chairman of the I.E.E. Northern Ireland Centre for 1945-46 and **Mr. T. P. Allen** (Municipal College of Technology, Belfast) as vice-chairman.

Mr. R. C. Golding, deputy electrical engineer and manager at Great Yarmouth, has been appointed borough electrical engineer at Wallasey. He succeeds **Mr. B. T. Hawkins,** who is retiring after 24 years' service as electrical engineer.

Mr. B. S. Hornby, of Bournemouth, electrical engineer, left £21 233.

Mr. T. R. Thomas (Cardiff) has been elected president, and **Mr. T. G. Dash** (Aberbargoed) vice-president, of the South Wales branch of the Association of Mining Electrical and Mechanical Engineers. The annual meeting was held at Roath power station, Cardiff, and more than 200 members of the branch inspected the new boiler and generating plant at the invitation of Mr. Edward Jones, the city electrical engineer.

On the completion of 45 years' service in the telegraph industry, **Lord Pender** has retired from active participation in the Cable and Wireless group of companies. The **Hon. Jocelyn Denison-Pender,** his son, has been appointed to a seat on the boards of all the companies within the group and joint managing director of the operating company, Cable and Wireless, Ltd.

Mr. I. R. Cox has been appointed managing director of Metropolitan-Vickers Electrical Co., Ltd. He is 54 years of age. He was apprenticed with the company and in 1913 was assistant turbine engineer. He served throughout the last war with distinction. In 1927 he went to Russia as chief mechanical engineer in charge of turbine work in that country and has since visited Australia and America on the company's business. In 1941 he was appointed joint managing director of the Metropolitan-Vickers Export Co., Ltd., and joined the board of the Metropolitan-Vickers Electrical Co., Ltd. in 1944.

Lord Inverforth, who has been president of Cable and Wireless (Holding) Ltd., since the telecommunications merger in 1929, has been appointed president of all the associated companies. **Sir Edward Wilshaw,** chairman of Cable and Wireless, Ltd., has accepted the appointment of governor and managing director of Cable and Wireless (Holding) Ltd., and becomes chairman and managing director of all the companies associated with it. **Lieut.-Colonel Ivor Fraser,** Press consultant to Cable and Wireless Ltd., has been appointed a director of that company and of the companies associated with the group.

Obituary

Mr. L. R. A. Le Bouyier, a director of manager of Lightalloys, Ltd., on June 7, aged 65 years.

Mr. L. R. A. Le Bouyier, a director of the Jerusalem Electric and Public Service Corporation

Electric Vehicles in France

By A. J. GIBBS SMITH

SOME interesting facts respecting the position of the electric vehicle in France are to be obtained from a paper by Mon. Maurice Bouchon, the director of the Société pour le Développement des Véhicules Electriques. As here, so in France, the electric vehicle has always been hampered by high prices due to production in small quantities, as well as the necessity for putting down charging stations. To overcome the reluctance of the French commercial user, however, organisations have been established for the hire to users of electric trucks. By this means users are relieved of all trouble due to necessary repairs, as well as of charging; moreover by grouping a considerable number of vehicles, it is possible to employ the necessary specialist staff, and to establish adequate stocks of batteries; neither of which is within the capacity of the owner of a single vehicle. One of the most important of such organisations was founded in Lyons in 1927 with a capital of two million francs, a few vehicles, and a single garage having a capacity of 36. In 1929 the capital was increased to five and a half million francs, and a second garage added; in 1939, there were three garages and a fleet of more than 100 trucks, while in 1944 the capital of the undertaking was sixteen and a half million francs, and it possessed 411 vehicles, of which 305 were located at Lyons.

When a commercial user employs electric vehicles in his own service, the running expenses are to a great extent buried in overhead charges. Such charges are not a direct charge upon production, and consequently as a general rule they are only recorded approximately. On the other hand, the undertaking which is dependent for its profits upon the hire of such vehicles requires to be very fully informed on the subject of such expenses, and as a natural consequence much more detailed and useful information is to be obtained from such sources than from the records of the average commercial user. In France, by the end of 1944, there were in existence 44 hire companies, operating in all more than 1 200 vehicles, so that any statistics from such sources rest upon a solid foundation.

Consumption.—There are, of course, two methods of measuring consumption. In the first place, there is the ampere-hour meter on the battery from which is obtainable the consumption in watt-hours per ton-mile, which may be regarded as a criterion of quality. This, however, does not give the cost to the user, which is obtained from the charging station meter. Between the two are a whole series of losses, as well as the charges for spare batteries. Hire companies are able to give very exact figures upon this point recorded over long periods, and such figures are summarised thus:—

Pay load	Consumption in kWh per km	per mile
1 ton ...	0.45—1	0.72—1.6
2½ ,, ...	1 —1.4	1.6 —2.24
6 ,, ...	1.45—2.25	2.3 —3.6

Such statistics show, as would be expected, that the consumption varies according to the service and in particular, according to the itinerary and the condition of the roads. In Toulouse, for instance, which is a level and well-paved town, the average consumption is 1.05 kWh per km for a fleet of which three-quarters are 2½-tonners and a quarter 6-tonners. Some typical examples of French tariff charges at night rates are:—

Place	1939 frs.	1944 frs.
Paris	0.257	0.423
Paris suburban ...	0.391	0.544
Lyons	0.194	0.354

Comparing the readings of the meter placed in the discharge circuit of the battery and the meter of the undertaking, the number of kWh finally furnished can be compared with that charged. This is 33 per cent. in good installations, but lower in others, which is a long way from the 75 per cent. quoted in some text books. Apart from the question of energy, there is also the depreciation of the battery to be considered. Prior to the war these were lead, guaranteed by French makers, for two or three years according to the type, or else alkaline batteries guaranteed for six years. After various fluctuations in quality, the accumulator makers had begun to supply batteries with a life equalling the guarantee, in fact when well maintained the life of certain makes even exceeded the guarantee, and there were instances of 37 and 59 months for lead accumulators according to the type, and of 13 years for nickel. At the present time, the quality of the accumulators obtainable in France is an exceedingly difficult question, and much remains to be done before the quality of the French battery approaches that of its British counterpart.

Repairs.—Maintenance and repair costs, whether mechanical or electrical, have been proved to be very low, and on the next page is tabulated the experience of one large hire company.

The tabulated results are broadly confirmed by figures obtained from other French hire companies, one of which against a total of 21 260 days shows 627

days stoppage or 2.95 per cent.; another from a total of 8 428 days had 220 days stoppages, or 2.64 per cent. These results, it should be emphasised, relate to the war period; a better supply of labour and better quality of materials would undoubtedly reduce these figures.

	Number	%
Total possible working days	9 880	100.00
Days of service	9 487	96.12
Days laid up	383	3.88
Analysis of causes of stoppages		
General periodical overhaul	112	1.14
Mechanical repairs	92	0.93
Repairs due to street accidents	103	1.04
Repairs to coachwork and general	76	0.77
	383	3.88

Life of Rolling Stock.—The life of the electrical chassis has been found to be considerable. The age of the vehicles used by one of the largest French hiring undertakings works out at 2 vehicles—6 years; 20 vehicles—13 years; 2 vehicles—14 years; 1 vehicle—17 years; 5 vehicles—19 years; 1 vehicle—20 years.

All the vehicles used by other hire companies date back to 1927, 1928 and 1929, and are still running. The organisation at Lyons alone has 50 vehicles 15 years old and over. It is naturally not possible to claim that nothing has been renewed or changed in these, but substantially they are the same.

It is unfortunately, not possible to quote figures regarding the life of chargers, but as none of the companies consulted had ever undertaken any repairs upon these a depreciation spread over 20 years would not appear to be too optimistic.

While the limited field of action is occasionally a point of criticism against the electric vehicle, an examination of the statistics relating to French conditions show that the requirements of the hirers or users are generally below the capacity of the trucks used. The percentage of battery-capacity used each day is in the order of 50 per cent. with most hire undertakings, and less in others. With this utilisation of 50 per cent., the average daily journeys vary from 27 to 33 miles according to the nature of the service. This is not to be taken as indicating that vehicles do not exceed these distances; a number do 54 to 62 miles, but there are others which do no more than 18 miles per day. By utilising 80 per cent. of the battery capacity, daily journeys would be possible ranging from 42 to 54 miles.

The future prospects in France for the electric vehicle, in the field for which it is particularly fitted, are regarded with optimism. Petrol is in short supply to an extent which is hardly appreciated in this country, and although the position in this respect will steadily improve, it is anticipated that for a long time to come such supplies will be absorbed by services of higher priority. This is supported by the natural desire after the French ordeal of the last few years, to rely more upon home resources and less upon overseas supplies for transport purposes.

Stud Welding Equipment

A PROTOTYPE equipment for stud welding has recently been shown to engineering, metal working and shipbuilding personnel on the Clyde by the English Electric Co., Ltd., demonstrations taking place in the premises of the Clyde Valley Electric Power Co., Ltd., at Yoker.

While admitting that the principle involved is not new, the sponsors claim that the application of the tool is new and that the type of equipment which has now been evolved by reasearch and practical experiment offers not only immediate advantages but a wide range of applications.

The aim has been to develop and operate an economic mobile unit capable of studding metal in sheet metal work, shipbuilding and engineering works, thereby eliminating drilling and tapping. The main feature is a gun tool holding and locating a stud which has a cap and ferrule, on to the metal to be studded. When the trigger is pulled, arcing takes place across the gap so created and melts the stud and the metal. At a predetermined time the stud is then released and driven home. The speed of operation depends to some extent on the nature of the work but in the case of a vital job four studs per minute could be achieved. That is not a rate which could be maintained, however, and practical tests are now being made to test the equipment under working conditions.

The main components of the equipment are an a.c. supply feeding a standard multi-operator arc welding transformer passing current through a three-phase rectifier, a welding regulator and mechanical timing combination, to the gun tool.

Apart from shipbuilding work, for which it is regarded as being particularly suited, the gun tool equipment has been used successfully for motor body building work, and the construction of armoured cars.

Answers to Technical Questions

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

If the voltmeter on the a.c. side of a single phase rotary converter reads 312 V, what is the approximate voltage on the d.c. side?

The voltage will be $\sqrt{2} \times 312 = 440$ V on the d.c. side. The above value may be found in the following way—a diagram of the winding of a rotary converter with two slip-rings is shown in Fig. 1, only half of the winding lying under one of the pole pairs of the machine being shown. The e.m.f. generated in a single turn of the winding as it moves past alternate N and S poles is alternating and has an average value of $4\ p\ n\ \Phi$ volts and an r.m.s. value of $\frac{\pi}{2\sqrt{2}} 4\ p\ n \Phi = 4.44\ p\ n \Phi$ volts

where p = number of pole pairs
n = revs. per second
Φ = flux per pole in webers (1 weber = 10^8 lines)

Consider first the e.m.f. appearing between the two slip-rings—reference to the diagram shows that this e.m.f. will be the sum of that in 9 turns. The other 9 turns which are not shown in the diagram will also be connected between the rings and

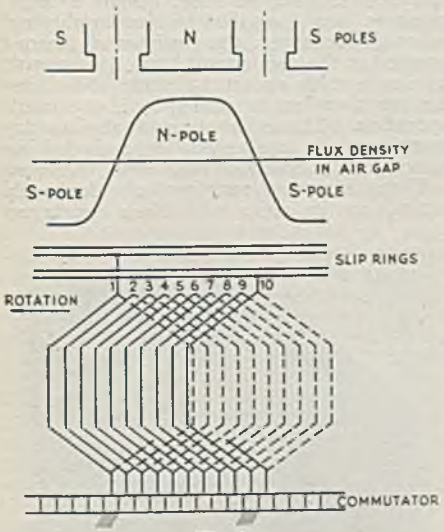


Fig. 1.

will, therefore, be in parallel with the first group and so will not affect the magnitude of the e.m.f. Each coil has its maximum e.m.f. induced in it as its centre line passes the centre of the pole. This occurs at different moments so that the e.m.fs. generated are out of phase with each other, that in turn 2 lagging behind that in turn 1 by $\frac{1}{9}$ of a half cycle, that in turn 3 lagging behind that in turn 2 by a similar amount and so on as shown in the vector

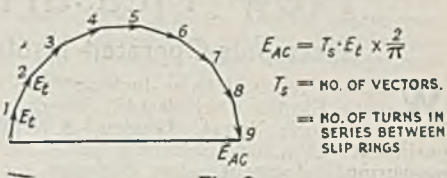


Fig. 2.

diagram of Fig 2. The total r.m.s. e.m.f. generated instead of being the arithmetic sum of the individual values of the e.m.f. per turn is the vector sum, E_{AC} The ratio of this total e.m.f. to the sum of the individual e.m.fs. is the ratio of the diameter of the circle to the circumference, i.e., $2/\pi$ this ratio being known as the distribution factor.

The e.m.f. appearing between the slip rings is, therefore,

$$E_{AC} = \frac{\pi}{2\sqrt{2}} 4\ p\ n\ \Phi\ T_s\ \frac{2}{\pi}$$
$$= \frac{4}{\sqrt{2}}\ p\ n\ \Phi T_s \text{ volts.}$$

Consider now the commutator—the e.m.f. between the brushes at the moment for which Fig. 1 is drawn is the sum of the e.m.fs. in each of the turns numbered 1 to 9. At the next and at any later moment a different set of conductors will occupy these positions and will provide the e.m.f. appearing between the brushes. These new sets of conductors will, however, occupy the same positions under the pole as the original numbers 1 to 9 and will, therefore, have the same e.m.f. induced in them. The e.m.f. appearing between the brushes will, therefore, always be the same although the conductors in which it is induced will change. A d.c. voltage will thus be obtained at the brushes. The magnitude of the e.m.f. will be the sum of the e.m.fs. in the 9 turns; each of these e.m.fs. will be different depending on the precise position of the turn relative to the poles but the total will be the average of the e.m.fs. multiplied by the number of turns. The average of all the e.m.fs. will be the same as the average value of e.m.f. in a single turn as it moves past the poles occupying each of the positions, i.e., $4\ p\ n\ \Phi$ volts. The total e.m.f. at the brushes is, therefore, $e = 4\ p\ n\ T_s \Phi$ volts, there being the same number of turns in

series between the brushes as between the rings, i.e., 9 in the case shown.

The ratio between the e.m.fs. on the a.c. and d.c. sides is thus:

$$\frac{E_{ac}}{E_{dc}} = \frac{4}{\sqrt{2}} p n \Phi T_s \Big/ 4 p n \Phi T_s = \frac{1}{\sqrt{2}}$$

If the machine is running on load there will be a voltage drop of a few per cent. due to the armature resistance and the voltage on the output side will be slightly less than that given by the above ratio.

A tap winding has been shown above but the ratio is the same for a wave winding.

F. O.T.

New Measuring Instrument

Electronic-Operated Insulation Resistance Test Meter

WE have received from Jackson Automatic Electric Controls Ltd., Windsor House, Victoria Street, London, S.W.1, particulars of a new electronic insulation measuring instrument, after a design by Dr. F. E. Planer; it is mains-operated and

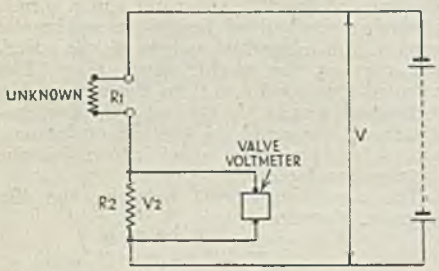


Fig. 1.

its measuring range is between 0.3 megohms and 50 000 megohms in 3 ranges. The range can be increased if desired and the instrument can be used on all a.c. mains supplies between 200-260 V. An indicating lamp shows when the instrument is energised.

The present instrument may be used for a large number of insulation testing purposes including research upon the type of materials to be employed, correction of insulation design, acceptance of insulation materials, bench testing of components, instruments, etc. It can be used, furthermore, on measurement of resistivity of fluids such as in the water cycle of power stations, in which case suitable electrodes and their associated equipment and material could be provided.

The principles of operation are shown in Fig. 1. A d.c. voltage is impressed on the unknown resistance and a standard resistance in series. The voltage-drop across the standard is a function of the current through the unknown resistance, the voltage-drop being measured by a valve voltmeter. Provided the input impedance of the valve voltmeter is high compared with the standard resistance, and from ordinary electrical theory, if two resistances R_1 and R_2 are in series as shown in Fig. 1 and a voltage V is across the combination and voltage V_2 across R_2, then

$$R_1 = R_2 \left(\frac{V}{V_2} - 1\right)$$

The valve voltmeter comprises a remote cut-off pentode to give a suitable scale law, and a negative feed-back circuit ensures reasonable freedom from supply voltage variations and changed valve parameters. The plate circuit is operated on a.c.. A second valve provides a test voltage of 500 V d.c. which is smoothed. If specified, different test voltages can be provided, in which case a selector switch permitting immediate availability of a number of test voltages would be incorporated. The live terminal is negative with respect to the earth terminal, and the circuit is arranged so that on short circuit a large negative bias is applied to the amplifying valve. Moreover the resistances incorporated in the test circuit limit the current to a safe value on short-circuit. No damage can therefore be caused by inadvertent operation. The calibration of the instrument may, it is claimed, be regarded as almost independent of replacement valves.

Three standard resistors, one for each range, are in series with their resistance

Fig. 2.—The new ohmmeter and insulation tester

under test and give multiplying range factors of 1, 10, and 100. They are of the cracked, carbon-film high-stability type and are claimed to be accurate to within 2 per cent., possessing low temperature co-efficients. For portable meters or where mains supply is not available the instrument may be supplied from a small battery and sealed-in type of vibrator, eliminating the cranked generator and slipping coupling. This feature is of value to electrical contractors as all that is necessary is to close the switch for the test voltage to be available.

Special safety prods or crocodile clips can be supplied as may be required. It is sometimes preferable to incorporate a switch in the test lead circuit to ensure that the prods are not alive before application of the equipment to be tested. This switch may be incorporated in the instrument or in the prod leads themselves.

The meter is provided with a moving coil 270° scale instrument. Alternatively a modern square case precision meter with 120° scale can be provided. This type of instrument adds to the general appearance and the choice is a matter of preference of the customer. The total power consumption is 10 W.

Multi-Channel Telephony

THE adaptation of a civil multi-channel carrier telephone equipment to meet service needs for a robust and portable equipment to give good communication facilities, is described by Mr. L. S. Crutch, of Siemens Bros and Co., Ltd., in an article in "The Post Office Electrical Engineers' Journal." He deals with the problem of providing these channels over aerial lines or cables, over short and long distances and under conditions peculiar to Service use. This equipment has had extensive use by the Army and R.A.F. in India, Africa, Italy and North-Western Europe.

Six years ago discussions took place between the authorities concerned, with a view to producing a system for Service use on aerial lines and embodying the main features of the P.O. Carrier System No. 4. This is a five-channel carrier telephone system in which one channel is obtained by simple voice frequency apparatus and four channels from the modulation of carrier frequencies between 6 and 16 kc/s. At this stage the contractors who had supplied the equipment were called in, and detailed discussions ensued on the necessary and desirable features of a new system.

Prototype equipments were constructed and subjected to very thorough tests. One of these prototypes served with the B.E.F. in the Flanders campaign of 1940, and the main production equipments were first used in the North African campaign. Even before the latter came into use it was realised that the rapid movement of modern warfare demanded equipment which was smaller and more readily transportable, and attention was given to the design of an equipment which should be much smaller than formerly but yet embody the same performance and have more general application under varying conditions which might occur in service. From this study Siemens Bros. and Co., Ltd., put forward proposals for the equipment which has since been manufactured in considerable quantities.

In the first place a considerable reduction in bulk was obtained. The Mk. 1 terminal equipment occupies three bays each 5 ft. 6 ins. high by 20½ ins. wide by 16½ ins. deep, weighing in all 11¾ cwts. and occupying about 52 cu. ft. The Mk. 2 equipment occupies two bays 2 ft. 10½ ins. high by 20½ ins. wide by 1 ft. 2½ ins. deep, weighing 6 cwt. and occupying 18 cu. ft.

Whereas the Mk 1 terminal was intended for open wire line operation and could be used on cable circuits only by adding additional panels to the third bay, the Mk. 2 terminal can be converted for either type of working by re-arranging U-links, an operation carried out in a few moments.

The Mk 1 equipment had a fixed group carrier frequency of 35- kc/s so that with more than one system on a route, the cross-talk between systems depended on the quality of the line. The Mk. 2 equipment provides alternative frequencies of 35 and 33.8 kc/s so that a frequency staggering is obtained with consequent improvement in privacy and signal-to-noise ratio.

Correspondence

A B.L.A. Appeal

[To the Editor]

Sir,—As Education Officer of a B.L.A. Unit I am trying to help all ranks to "Brush up for Civvy Street."

One of the best links between a man and his trade or profession is the trade paper, and as I have several requests for The Electrician I am wondering if one or two of your readers would be willing to help me by sending each week their copy of the publication, after they have finished with it, addressed to the Unit Education Officer, 165, H.A.A. Regiment, R.A., British Liberation Army.

Yours faithfully,

W. R. Bawden,
Captain, R.A.

News in Brief

Hospital Heating.—The Bournemouth Health Committee has called for estimates for electric heating to replace coal grates at the isolation hospital.

Change of Name.—The name of Frank Curtis (Electrical Engineers), Ltd., has been changed to Electrical Engineering Construction Co., Ltd.

New Telephone Line.—It is reported that one of the world's longest telephone lines, about 2 000 miles long, from Calcutta to Kunming, has been opened.

Loch Sloy Hydro-electric Scheme.—The constructional work in the Loch Sloy hydro-electric power scheme was inaugurated last Monday by Mrs. S. Johnston, wife of the former Secretary of State for Scotland.

TWENTY-FIVE YEARS AGO

FROM THE ELECTRICIAN *of June 11, 1920: Acting on the advice of the Borough Electrical Engineer, it has been decided to give a supply of electricity to all the houses to be erected on the Hammersmith Council's new housing estates through prepayment meters. One service will supply two houses, and the estimated revenue is 1s. 6d. per house per week.*

E.I.B.A. Annual Meeting.—The annual general meeting of the Electrical Industries Benevolent Association will be held at 2 Savoy Hill, Strand, W.C.2, by courtesy of the British Electrical Development Association, at 11.30 a.m. on June 29.

Trolley-bus Scheme Opposed.—The Wallsend T.C. has agreed to oppose a Bill promoted by Newcastle-on-Tyne City Council, which among other things, seeks powers to run trolley buses over additional routes into Wallsend.

Glasgow Wireless College.—It has been intimated that the Glasgow Wireless College and the Scottish Signal School have been incorporated. Entire supervision has now been taken over by Mr. Elliot MacIntosh.

Electricity Supply

Harrogate.—The Electricity Committee is to expend £570 on switches.

Cheltenham.—Supply is to be afforded to the Lynworth Farm estate at a cost of £12 905.

Rawtenstall.—The Electricity Committee is to provide a new feeder cable for the supply to Bacup.

Stockton-on-Tees.—A supply of electricity is to be afforded to the Albany Road housing site at a cost of £8 140.

Rugby.—The Leicestershire and Warwickshire Electric Power Co. is to construct overhead power lines at Copston Magna.

Sedgley.—The Midland Electric Corporation is to extend mains and provide a substation in connection with the supply to the U.D.C. housing estate.

York.—The Electricity Committee has obtained sanction to borrow £22 942 for buildings, mains and plant, and £400 for a supply to a farm at Beningbrough.

Charlottetown, Prince Edward Island.—Output of central electric stations in January amounted to 1 285 000 kWh, compared with 1 041 000 kWh in January last year.

Chester.—Sanction to borrow £2 730 for supply to farms and cottages in the Rushton and Ox Heys districts, and £7 000 for extensions in the Lache area, has been granted.

Sheffield.—Mains are to be extended at a cost of £1 578.

Burnley.—The electricity department proposes to spend £3 310 surplus from revenue to meet expenditure during the autumn on sub-station equipment.

Chester.—The Electricity Committee has asked the Electrical Engineer to prepare a scheme for constructing the remainder of the main switching sub-station at New Crane Street.

Chesterfield.—The Electricity Committee is to provide supply to farms at Grassmoor at a cost of £372, and has obtained sanction to alter the type and voltage of current supplied to consumers in the Holymoorside area.

Bexhill.—The Gas Committee has instructed the Gas Engineer to seek guidance from time to time from the Electrical Engineer with regard to the installation and maintenance of electrical equipment proposed for or used in the gas department.

Chester.—At a meeting of the Electricity Committee, the Electrical Engineer submitted applications from farmers and others in various parts of the rural areas, and it was decided to seek sanction to borrow £4 950 in respect of supply extensions in the parishes of Carden, Handley, Tattenhall, Utkinton, Waverton and Willington.

Electrical Affairs in South Africa

The Bethulie Project—Charges in Cape Town – Supply in Kimberley

ENGINEERS and surveyors are engaged on the preliminary work for the large conservation dam which is to be built near Bethulie on the Orange River, below the confluence of the Orange and Caledon Rivers. The dam will store enough water to irrigate one million morgen of fertile soil. Electric power will be generated at a very cheap rate, and it is believed that it will be possible to electrify hundreds of miles of railway from this source, beside supplying many industries with power. The site chosen is six miles upstream from Bethulie and four miles from the railway bridge over the Orange River on the main East London-Johannesburg railway line. It is believed to be the finest site in South Africa for the purpose. Because of the many advantages that will result from this scheme, the Bethulie Town Council has received many applications for factory sites.

The proposal to the Cape Town City Council that it should consider reducing electricity charges to consumers in view of the large regular annual profits, has not been adopted. In the last five years the electricity department had recorded a profit of £934 000. The cost of production had been reduced, but none of the savings so effected had been passed on to the consumers, who provided the revenue. On the other hand, the Chairman of the Committee responsible pointed out that the Council had taken all the undertaking's reserves. Production costs were much more than the increased revenue. If charges to the consumers were reduced, the stability of the undertaking would, it was considered, be endangered.

Kimberley City Council has approved of a provisional agreement to change the period of the Council's electricity agreement with the De Beer's company and to reduce the tariff. The Council is permitted to supply other consumers in the area covered by De Beers' electricity supply licence, excluding Kamfersdam, subject to the company's approval. The transfer of all the company's consumers in the municipal area to the Council is to be considered shortly.

The Association of Municipal Electricity Undertakings of South Africa and Rhodesia held its annual conference this year in Rhodesia. The conference began in Salisbury on May 15 and continued until May 19, when it was adjourned to Bulawayo, where it reopened on May 21 and ended the next day.

Baekeland Memorial Lecture

IN the first of the Baekeland Memorial Lectures, arranged by the Society of the Chemical Industry on May 30, Mr. H. V. Potter, managing director of Bakelite, Ltd., dealt with the inventor's life rather than with his scientific and industrial achievements.

Dr. H. Baekeland, after a brilliant school and university career, came from his home town, Ghent in Belgium, to this country. Having visited the Universities of London, Oxford and Edinburgh, he tried his fortune in the United States where he continued his research, particularly his work on photographic printing papers. After ten years, in spite of various vicissitudes, he invented a gaslight printing paper, by employing silver chloride, which he named "Velox." This became a serious competitor to the Eastman-Kodak paper, and eventually, Dr. Baekeland sold out to Eastman-Kodak. Speaking of the deal years later he said he obtained a million dollars.

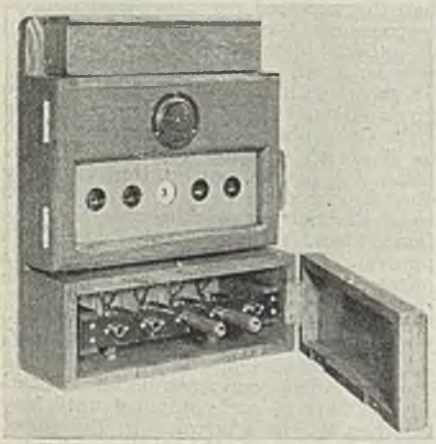
At that time, 1899, he purchased a substantial house at Yonkers on the Hudson River, where, after a refresher course in electro-chemistry in Germany, he established a new laboratory. After some successful work on the Townsend cell, he interested himself in the chemical reaction between phenol and formaldehyde. He discovered that by using small amounts of alkali as an accelerator—particularly ammonia which acted as a catalyst, he could control the process by spreading the reaction time, and could check the reaction at any stage by cooling. After five years' work on the reaction, he filed his famous patent in the U.S.A. in February, 1907. Dr. Baekeland gave the name "Bakelite" to this new synthetic resin, and came to the conclusion that if the new material was to be successfully applied to industry it would be necessary to make the initial product himself, and teach others, starting with a select few whose work he could watch.

Dr. Baekeland's sound financial position as a result of his "Velox" activities enabled him to establish his new "Bakelite" business in 1910 on a solid basis. His work stimulated further research in this branch of chemical science and he undoubtedly established the basis of the present plastics industry.

New Equipment and Appliances

An Improved Fire Alarm System—Plastic Buckets

MANY fire alarm systems are limited in scope by the fact that once the circuit has been closed (by breaking the glass in the alarm contactor) the whole system becomes inoperative until the glass has been replaced and the circuit re-opened.



Indicator panel of new fire alarm system, showing the plug and jack arrangement for isolating alarm bells and operating indicator lamp

It is often impracticable in some systems to carry out thorough tests without causing an alarm signal to be given. In a new fire alarm system recently developed by the **General Electric Co., Ltd.,** these limitations have been overcome. When an alarm has been given on a particular line, that line can be immediately isolated while the lines to other departments or buildings remain in operation. Servicing or testing of a large installation is facilitated, and, continuity tests can be made on each circuit separately, including the appropriate line indicator, without interrupting the availability of the system for instant operation. The indicator panel embodies line indicating movements with screens appropriately lettered, corresponding line-jacks, a warning bell and lamp and a relay, all mounted in a hardwood case. This panel gives both visual and audible indications when the fire alarm contact has been closed, and it also indicates by sound when the alarm contact has been restored to normal open contact.

One of the earliest cast phenolic plastics to be made commercially, Lorival "A," a product of **United Ebonite and Lorival, Ltd.,** has been supplied in the form of rods and sheet for the machining of small components and has been cast into suitable shapes for a variety of uses. As an example, thousands of Lorival "A" buckets are in use for processes connected with the manufacture of chemicals, tanning, electroplating and other industries in which corrosive liquids are employed. The standard industrial bucket is of 2-gallon capacity. It is claimed that the heat-resisting properties combined with the chemical resistance of this plastic make it eminently suitable for acids even at elevated temperatures. Many organic liquids used as solvents can be handled with safety in Lorival vessels. This plastic is not, however, suitable for use with caustic alkalis or with nitric acid.

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.

Torquay Electricity Department, June 18.—Supply of 11 kV indoor switchgear. Particulars from the Engineer and Manager, Electric House, Union Street, Torquay.

Littleborough U.D.C., June 19.—Supply and delivery of e.h.t. feeder cables (11 000 V). Specifications from the Electrical Engineer and Manager, Council Offices, Littleborough.

Burnley T.C., June 20.—Supply of (1) transformers and (2) e.h.t. cables. Particulars from Mr. T. B. Nutter, 43, Grimshaw Street, Burnley.

Maesteg U.D.C., June 21, Supply, laying and jointing of two l.t. feeder cables. Specification from the Engineer and Manager, Electricity Department, 35, Commercial Street, Maesteg, Glam.

Wrexham Electricity Department, June 22.—Supply of two 750 kVA and one 300 kVA transformers for a 6 600 V, 50 cycle system. Specification from Mr. J. W. Williams, Electricity Offices, Willow Road, Wrexham.

Gellygaer U.D.C., June 30.—Supply and delivery of house service units for one meter per consumer. Specifications from the Electrical Engineer and Manager, Electricity Offices, Hanbury Road, Bargoed, Glam.

Industrial Information

Hotpoint Change of Address.—The Hotpoint Electric Appliance Co., Ltd., are transferring their head office and showrooms to Crown House, Aldwych, London, W.C.2, on Monday, June 18. Telephone: Temple Bar 9973-8. Telegrams: Hotpoint, Estrand, London.

Erratum.—With reference to the illustrations of the electric kitchens on p. 513 of our last issue, it should be noted that the captions as printed are reversed. The upper picture illustrates the all-steel kitchen and the lower the kitchen of more orthodox design.

Extra Holidays.—All employees of Lorival Plastics, both works and staff, are to get an extra week's holiday with pay in addition to their 1945 summer holiday. In making this announcement the directors and management of the company, United Ebonite and Lorival, Ltd., Little Lever, Bolton, conveyed to the workpeople their appreciation of the contribution which all have made to the war effort.

Topical.—Coinciding with the opening of the General Election campaign, the Ekco lamp advertisement, illustrated on this page, was early in the field with its

An Ekco lamp "tie-up" with the election

apt and topical appeal to householders. Its bid for favour is not lacking in originality.

E.D.A. Bulletin.—Essays by two London schoolgirls, giving their ideas of an ideal kitchen after a visit to the E.D.A. exhibition of all-electric kitchens at the London Building Centre, are published in the May Bulletin. In addition to news from the areas, is a report of the opening, by Lady Herbert Lewis, of the Cardiff exhibition of the E.D.A. kitchens.

Notes for Contractors.—In the forthcoming reprint of the 11th Edition of the I.E.E. Wiring Regulations, Regulation 309 (a) prescribes that earth continuity conductors in flexible cords are to be coloured green and that brown will no longer be permissible for any purpose. The Council of the N.E.C.T.A., Ltd., recommends that members should continue to sign retail holders' agreements with the E.L.M.A.

Factories for Civilian Production.—Another 34 Government factories have been allocated for civilian production. Among the firms receiving allocations are Wright and Weaire, Ltd., for the production of radio components and domestic electric equipment, at South Shields; South Wales Switchgear, Ltd., for electrical equipment, at Blackwood, Wales; Hoover, Ltd., domestic electrical equipment, at Cambuslang, Scotland; H. Webb and Co. (Engineers) Ltd., auxiliary water heaters and wash-boilers at Broxburn, Scotland; and P. R. Mallory and Co., Ltd., batteries, at Castlereagh, N. Ireland.

Class "B" Releases.—An Electricity Commission circular states that the number of individual releases from the Forces of specialists under Class "B" of the Government scheme is being very strictly limited, and the allocation to the electricity supply industry is very small. The Commissioners understand that it will still be possible to obtain short periods of temporary releases for men who are not in the early Class "A" release groups, if their return is essential to enable some immediately vital work to be carried out. The further deferment of men born in 1914 or earlier will now be automatic.

Orders from New Zealand.—The British Thomson-Houston Co., Ltd., have recently received two orders from the Government of New Zealand Public Works Department. One is for five 30 000 kVA 750 r.p.m. synchronous condensers for operating on a three-phase, 50 cycle, 11 000 V supply, to be installed at the Otahuhu and Bunnythorpe sub-stations, North Island, and used to control the voltage regulation of 220 kV incoming transmission lines. These sub-stations are the interconnecting points between the existing 110 kV system and a new 220 kV system which will bring power from a group of generating stations in the Upper Waikato River. Each condenser set includes main and service exciters and a slip-ring induction type starting motor operating from the 11 000 V supply in series with the synchronous condenser windings. The machines are of the indoor type, each complete with air cooling and water cooling equipments. This order also includes the 11 000 V solenoid-operated switchgear and neutral earthing cubicles, control panels, relay panels, temperature indicating equipment and voltage regulating equipments for use with the condensers. The other order is for thirteen 600 A, 110 kV, 2 500 MVA oil circuit-

breakers, each with six bushing type current transformers and solenoid operating mechanism.

Export Control Relaxation. — The following articles have been deleted from the list of goods controlled under export licensing regulations: Fans, vacuum cleaners, washing machines, welding electrodes, wire, etc., insulating, etc., machinery, wire drawing machinery, wire rope and cable making machinery, wire weaving machinery, voltaic cells, zinc electrodes, bells, blankets, busbars, ceramic components, conduit fittings, control gear, cores, echo sounders, flat irons, furnaces, fuses, gramophones (as listed), hair curling appliances, lightning conductors, loudspeakers, microphones, motors, overhead line accessories, permanent magnets, resistances, searchlights, switchboards, switches, transformers, static transformer tanks, valveholders, wireless receiving sets, wiring accessories, X-ray apparatus. The following items have been deleted in part only or otherwise modified; accumulators, batteries, etc., apparatus, etc., used for domestic purposes, cooking and heating appliances, etc. The principal classes in the Machinery Licensing Schedule which are still covered wholly or in part by the export control list are:—42, apparatus for cinematograph projection; 53, electrical machinery, etc. (part only); 73, accumulators; 74, conveyors; 92, automatic private telephone exchange systems. In addition, the export control list still includes such ancillary equipment as pumps and compressors, and steam engines and turbines. Electro-medical apparatus is now free from control by licence.

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.*

ELECTRICAL MEASURING INSTRUMENTS CO. LTD., Hove.—May 11, £4 000 deb., to Duraspray Ltd.; general charge. £800. Dec. 27, 1943.

Satisfaction

SAMUEL PLATT, LTD., Wednesbury, engineers.—Sat'n May 26, of debs. reg. April 14, to the extent of £10 000.

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.*

LEWENT, Heinrich, 167, Anson Road, N.W.2, electrical engineer. £31 6s. 10d. April 11.

DIXON, G. H. (male), 76, Princess Road, Edgbaston, electrical engineer. £16 18s. 9d. April 9.

JENSEN, Wm. E., 42, Mellowdew Road, Coventry, electrician. £54 4s. 3d. April 5.

WITHERS, Raymond S., 47, Jasmine Gr., Anerley, radio mechanic. £11 9s. 2d. April 23.

HILLIER, Maurice (trading as Morehouse Radio), 486, Kingsland Road, London, E.8, electrical engineer. £16 13s. 2d. April 19.

Meeting of Creditors

RELIANCE LIFT AND ENGINEERING CO. LTD.—A meeting of the creditors of the above named company will be held at the office of J. R. Phillips and Co., Lloyds Bank Chambers, Hustlergate, Bradford, on July 2, 1945, at 12 noon, to receive the report of the Liquidators.

Metal Prices

Monday, June 11.

		Price.	Inc.	Dec.
Copper—				
Best Selected (nom.)	per ton	£60 10 0	—	—
Electro Wirebars ...	„	£63 0 0	—	—
H.C. Wires, basis ...	per lb.	9 7/8d.	—	—
Sheet	„	11 1/8d.	—	—
Phosphor Bronze—				
Wire(Telephone)basis	„	1s. 0 7/8d.		—
Brass (60/40)—				
Rod, basis	„	—	—	—
Sheet „	„	—	—	—
Wire „	„	11d.	—	—
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)...	per ton	£7 13 6	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ...	„	£28 5 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in. ...	„	£20 0 0	—	—
Galvanised Steel Wire No. 8 S.W.G. ...	„	£26 0 0	—	—
Lead Pig—				
English	„	£31 10 0	£5	—
Foreign or Colonial	„	£30 0 0	£5	—
Tin—				
Ingot (minimum of 99.9% purity) ...	„	£303 10 0	—	—
Wire, basis..." ...	per lb.	3s. 10d.	—	—
Aluminium Ingots ...	per ton	£85 0 0	—	—
Spelter...	„	£31 5 0	£6	—
Mercury (spot) Warehouse	per bott.	£69 15 0	—	—

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

COMPANY MEETINGS

ANTRIM ELECTRICITY SUPPLY COMPANY

War-Time Activities—Mr. R. P. Beddow's Review

The seventeenth ordinary general meeting of the Antrim Electricity Supply Company was held on Wednesday, 6th June, 1945, at 88, Kingsway, London, W.C. Mr. R. P. Beddow (chairman and managing director) presided.

After dealing with the accounts for the year ended 31st December, 1944, the chairman said:

The removal of the restrictions on the publication of information relating to electricity supply undertakings enables me to tell shareholders for the first time since 1940 something of the activities of the company and its subsidiary, the Antrim Electricity Distribution Co., Ltd., during the war years. Our gross revenue from sale of current has increased from £77,000 in 1939 to over £236,000 in 1944, and the units sold have increased from 8,600,000 to 31,700,000. Consumers connected have increased from 11,000 to 12,700, and capital expenditure from £754,000 to £847,000. We have been affording many important supplies in connection with the national effort, and the extensions which have been made to our mains during the war period have to all intents and purposes been confined to what has been necessary to afford this class of supply. In the national interests no efforts have been made by us to extend the use of electricity by domestic consumers, who, on the contrary, have been officially urged to reduce their consumption as far as practicable for the sake of fuel economy.

Emergency Supplies Act, 1942

An important Government war-time measure affecting electricity supply was enacted in 1942. The Electricity (Emergency Supplies) Act, 1942, empowered the Northern Ireland Government, *inter alia*, to construct and acquire generating stations and main transmission lines and also to acquire authorised undertakings. When the Bill was under consideration by Parliament, we were glad to receive the assurance of the Minister of Commerce that it was not his Ministry's intention to acquire our undertaking under the powers of the Bill, unless forced to do so by circumstances due to the emergency which he did not then visualise. I am glad to say that no such circumstances arose.

Bulk Supply

One of the steps taken by the Government after the Bill was enacted was to acquire the Larne Generating Station, as a result of which we are now taking our bulk supply from the Ministry of Commerce instead of from the Larne Electric Light & Power Co., Ltd. This supply is now afforded to us from the new station constructed by the Ministry during the war at Ballylumford, and the Ministry have been able to use the less efficient Larne Station merely for standby purposes. To facilitate the Ministry's arrangements for concentrating generation at more efficient stations, we readily agreed to the necessary change in the point of our supply, but, although those arrangements were made as long ago as 1943, we have not yet received any benefit from the more efficient generating costs of the Ballylumford Station. The Ministry of Commerce some time ago indicated the possibility of a reduction in the price, but this has not yet come about and we are still receiving our supply from the Ministry at the same price as we paid the Larne company. The price is considerably higher than the price paid by the Electricity Board for Northern Ireland for the bulk supplies which they take for distribution in neighbouring areas. The important bearing which the bulk supply price has on the charges which an undertaking makes to its consumers will be readily appreciated by all.

No. 8 Development Scheme

I feel it my duty to report to the shareholders circumstances which have arisen during recent months, and which may vitally affect the companies. I refer to the No. 8 Development Scheme which is being promoted by the Electricity Board for Northern Ireland and has been submitted to the Ministry of Commerce for confirmation under the Electricity (Supply) Act, 1931. The scheme covers the whole of the areas of supply of the Antrim companies, as well as the urban and rural districts of Limavady. The Antrim companies are, therefore, the undertakers primarily affected by the scheme.

The main object of the scheme is stated to be the promotion, co-ordination and improvement of the supply, distribution and sale of electricity within the area to which the scheme relates, but, even if the scheme is confirmed, it would in itself confer on the Board no power to distribute electricity in any of the areas of supply of either of the Antrim companies unless and until the Board acquires the company's undertakings. On the other hand, on the confirmation of the scheme the Board would become empowered by the Act of 1931 to acquire any of those undertakings at any time compulsorily. As far as the companies' areas are concerned, that appears clearly to be the main, if not the only, purpose of the scheme.

The main powers of the Antrim Electricity Supply and Distribution companies were conferred by a Special Act of Parliament in 1928 and by a Distribution Order granted in 1932. As is customary, the powers of the Supply company under the Act of 1928 are not at present purchaseable by any local or other similar authority; the undertaking authorised by the Distribution Order may not be purchased until 1974, when the local authorities will first become entitled to exercise the rights of purchase given them under the Electric Lighting Act, 1888. The Distribution Order was applied for before the Act of 1931 was passed, but was not granted until May, 1932, some twelve months after the passing of the Act. Before the grant of the Order, the financial stability of the companies was carefully inquired into by the Ministry of Commerce, and the Order—deferring the earliest date of purchase until 1974—was then granted to the Distribution company. It may be noted that had the Government desired the Electricity Board to be made responsible for the development of electricity supply in the area covered by the Distribution Order, that Order could have been granted to the Board which was in being at the time.

The Directors' View

It is our view that the Act of 1931 was not intended to apply to statutory undertakings such as ours which cover a wide and consolidated area, and are, moreover, now interconnected with the undertakings of the Electricity Board and of the Belfast Corporation. Furthermore, we maintain that we were entitled to take at their face value the powers which were granted to us by Parliament or under statutory authority, and we have

developed our areas on the faith of those powers.

We have borne the burden of the lean pioneering years, and if at this juncture the undertakings were to be compulsorily taken from us the companies would, in my view, be receiving a very raw deal which would not only be most unfair to the companies but would moreover not be calculated to enhance the credit for fair dealing of Northern Ireland. If the scheme is confirmed, the companies will not know whether any, and if so which, of their undertakings may be compulsorily taken from them at any time by the Electricity Board, and with this Sword of Damocles hanging over them it would become impracticable for the companies to proceed with the proper development of their areas.

The companies have, therefore, lodged the strongest representations against the confirmation of the scheme, and will be represented by counsel at the Inquiry which is to be held by the Ministry of Commerce in July.

In conclusion, I should like to say how well our short-handed staff has worked, not only during the past year but during the whole of the European War. They deserve your thanks for the services which they have rendered. Some 23 per cent. of the men and women who were with us at the outbreak of war joined the Services, and in expressing our gratitude to them we must not forget what we owe also to those who remained with us on whom fell the burden of carrying on the essential work of our undertakings under the most trying and difficult conditions.

The report and accounts were unanimously adopted.

Callender's Cable and Construction

Proposed Amalgamation

In the course of his statement issued to stockholders of Callender's Cable and Construction Co., Ltd., in connection with the annual general meeting to be held today, Friday, the chairman, Sir Malcolm Fraser, Bt., C.B.E., reports a profit of £503,185, as compared with £465,115 last year (an increase of £38,079). The directors recommend a final dividend of 10 per cent., and a cash bonus of 5 per cent., making 20 per cent. for the year.

The chairman's statement continues:—

The problems produced by the magnetic mine, the disappearance of natural rubber, and the demand for cables suitable for transmitting alternating currents for Radar and similar purposes (having frequencies which could not be contemplated by the cables in use in pre-war times) have presented problems of the first magnitude. In the solution of all these problems your company has taken the lead.

Among numberless war activities is one which your company, together with one or two other cablemakers with waterside factories, were able materially to assist the Government in the production of the celebrated "Pluto" oil-pipe lines which have transmitted a million gallons of petrol a day across the Channel.

What will interest stockholders is the proposed amalgamation of Callender's Cable and Construction Company with the British Insulated Cables Company, under the combined name of "British Insulated Callender's Cables, Ltd."

The complete amalgamation of Callender's and British Insulated Cables, Ltd., excluding Callender's Trust, is the logical consummation of past policy of collaboration which will have, as its main objects: the avoidance of future duplication of capital and revenue expenditure; the pooling and speeding up of research; the achievement of the maximum efficiency in up-to-date production, sales, distribution and administration; the rationalisation of orders permitting longer and continuous runs of the same types, thus eliminating unnecessary duplication of process lay-outs, etc., with a reduction in production costs and delivery dates, and the consequent strengthening of the competitive capacity in the export markets overseas.

So far as our exports are concerned, it is the considered opinion of our expert advisers that if the two companies concerned combine their export departments here, and distribute more widely their overseas selling and technical forces, the volume of post-war export sales should be substantially increased.

The terms of the amalgamation provide that a holder of £100 Callenders Ordinary stock will receive 270 Ordinary shares of the new company, and 46 shares of Callender's Trust, Ltd., together with any small cash payment in respect of his fractional share of the proceeds from the sale of those shares of Callender's Trust which cannot be distributed among the Ordinary stockholders.

The Callender Ordinary stockholders who retain their Trust Company shares can reasonably hope that, all things being equal to the pre-war years of trading and profit they should obtain not less than the 20 per cent. dividend received during the four out of the past 25 years when they were content with a dividend of 15 per cent.

London Electric Wire & Smiths

War Contribution

The thirty-sixth annual general meeting of the London Electric Wire Company and Smiths, Ltd., was held on 8th June in London.

Mr. W. J. Terry (chairman and managing director) said that the profit for the year was lower by £1,384 than for the previous year. During last year the prices of their commodities, many of which must be imported, had remained fairly constant.

Throughout the whole of the period of hostilities, the company had been solely engaged on essential work for the war effort. In the company's factories very many millions of miles of wires had been produced in various forms and coverings for use in aircraft, anti-aircraft defence, communications, and for many other purposes. Large quantities of de-gaussing strips (urgently needed at the time to combat magnetic mines), shell bands, cadmium copper line wires, earth rods, flexible tubing, special wires for the heating of airmen's clothing and many other products were also supplied to the various Services. The company also took a leading part in encouraging in this country the manufacture of diamond dies.

In consequence of labour shortage home sales were slightly lower than in 1943. Export sales were also lower and considerably less than in the pre-war years because of Service demands.

In the immediate future there would be a heavy demand upon the electrical industry for additional plant and replacements urgently needed for the home market, also for electrical machinery required for the rehabilitation of Europe.

The report was adopted.

COMPANY MEETING

EDMUNDSONS ELECTRICITY CORPORATION

Amazing Progress During the Last Five Years

The forty-eighth ordinary general meeting of Edmundsons Electricity Corporation, Ltd., was held on Friday last at the offices of the company, 24-30, Gillingham Street, London, S.W.

The Rt. Hon. Lord Royden, C.H. (the chairman), presided.

The chairman said: Ladies and gentlemen,—Under war-time regulations the corporation has not been allowed to issue its accounts since March, 1940. Five years have elapsed since I last addressed you. Which makes it a greater pleasure to lay before you the record of the corporation's activities during that veiled period.

Our report and accounts, in addition to giving the balance-sheets and profit and loss figures for the years to 31st March, 1944 and 1945, also give consolidated figures for the Edmundsons group of companies for each of the years to 31st December, 1939 and 1944 inclusive. It provides in the most concise, yet complete, form possible a picture of the corporation's progress during the period when accounts could not be published. In giving you a comprehensive view of the situation, I will begin with the consolidated accounts and the statistical data.

Spectacular Increases in Business

The following facts need no emphasis from me to indicate the immensity of the tasks which your companies performed successfully during the periods reviewed:—

1. Total assets were increased from just under thirty-three million pounds to over forty-six million pounds.
2. Revenue from sale of current increased from under five million pounds to over eleven million pounds;
3. Units sold annually to consumers increased from eight hundred million units to two thousand, three hundred million units;
4. Provision for taxation was increased from ninety-five thousand pounds to over one million and seventy-six thousand pounds;
5. The average cost of coal per ton increased from twenty shillings to thirty-seven shillings;
6. The average price of units sold for all purposes has decreased from 1.27d. to 1.08d.;
   For domestic and commercial purposes the decrease was from 2.77d. to 1.94d.;
7. Net profit to Edmundsons decreased from five hundred and eighty-two thousand pounds to five hundred and thirty-five thousand pounds;
8. Not one tariff has been increased; many have been reduced.

Such spectacular increases in business are reflected in the figures in the consolidated assets statement for sundry debtors and for stock and work-in-progress. The cash position is exceptionally interesting—and with cash I include tax reserve certificates and Treasury bills. In 1939 the balance of cash was £808,000; by December, 1944, it had reached a figure of £4,306,000.

Preliminary and Issue Expenses

The last three items in our consolidated statement of assets consist of preliminary and issue expenses, change-over costs and expenditure under assisted wiring schemes. These were growing continuously until the outbreak of the war. There have been some additions to these "dead-wood" assets during the war, but our policy and revenue have enabled us to deal with them fairly drastically. At the outbreak of the war the total of these three heads of expenditure was £793,000. It is now only £424,000. The major proportion of this amount is in the balance-sheets of the two power station companies, both of recent formation. By virtue of their special circumstances neither will be able to write off their preliminary and issue expenses, except over the period of the operation of the sinking funds created to redeem their debenture issues.

In the consolidated liabilities statement perhaps the most striking feature is that Edmundsons' own issued capital has not altered since 1939, notwithstanding the large increases in total assets. These increases have been financed by an addition to the debenture capital of £2,200,000 and by the utilisation of sums set aside for depreciation and contingencies, reserves for War Damage Contributions and the like.

Consolidated Profits Statement

Turning to the consolidated profits statement, it is disclosed that:

The consolidated net profit has risen steadily from £656,000 in 1939 to £758,000 in 1944. As the corporation's issued capital has not been increased, obviously the equity behind that issued stock has been strengthened.

Out of the consolidated net profit in 1939 more than £73,000 was utilised for writing down fixed or intangible assets, in increasing the subsidiary companies' carry-forwards, etc. In 1944 £223,000 was used in the same way.

In view of the facts and figures placed before you, you may ask why the net profit of the corporation has not shown comparable increases. I would explain that at the outbreak of the war we formulated a policy from which we have not departed. That policy was a determination not to increase the tariffs if this were humanly possible. In that policy we have been successful despite the general increase in all costs, and especially the alarming increase in the cost of coal of which last year we used over one and a-half million tons. Furthermore, we have been able to announce several decreases in tariffs. Maintenance of the Ordinary dividend has also been possible, although with less margin than in pre-war years.

Participators in Company's Profits

With regard to profits, I must add, in justice to our shareholders, it is seldom realised that a much greater share goes to those who have not invested one penny in the business than to the Ordinary stockholder, whose money is at stake. In this connection I invite you to examine the following record of payments made in 1944:—

In taxation	£1,414,334
In local rates	451,000
Total	£1,865,334
On Funded debts, less tax	£272,650
In Pref. dividend, less tax	£134,306
In Ord. dividend, less tax	£209,341
Total amount paid to all classes of stockholders (including Funded Debt) in 1944, less tax...	£616,297

Who is the real beneficiary?

Before leaving the subject of our group figures I want to impress upon you that they have only been possible because of the type of organisation which we have created. It has been our policy for many years to secure a co-ordination of financial and technical development by our operating companies in such a manner that all within the group give strength to each other. The wisdom of that policy has been proved by our achievements.

You will recall that in 1939 a Select Committee of the House of Lords, under the distinguished chairmanship of Lord Sankey, was in process of investigating, *inter alia*, questions as to the place and value of holding companies in public utilities. Unfortunately, the outbreak of war prevented completion of that Committee's task, and accordingly we never learned what, if any, complaints could be made against our type of organisation, nor was any evidence produced to show on what grounds any allegations could be justified. In 1939 we welcomed the opportunity of meeting any criticism which might be made of us, and we hope, therefore, the Committee may soon resume its deliberations. If this is done those who, through lack of information or any other motive, express doubts as to our place in the industry will have their answer—if indeed the accounts which are in your hands are not in themselves the complete answer!

Balance-sheet

Turning now to the corporation's own balance-sheet, this shows comparatively little change from the figures of the previous year, such changes as appear are of a routine nature. For example, there is an increase in the reserve, due to the usual appropriations from profits and to the redemption of debentures. The amounts of debenture stocks show their usual decline, through the operation of the sinking funds; the amounts due to and from subsidiary and associated companies continue to decline—which has been usual in the last few years. There is, however, a significant difference between some of these figures and those which appeared in the last balance-sheet published before the war. The reserve then stood at £522,531, compared with the £1,036,254 to-day. The amount due to associated companies was £1,761,540, while only £536,019 was due to them at 31st March, 1945. On the assets side, there was due to the corporation from subsidiaries in March, 1939, £3,066,067; in 1945, this sum, including advances, had decreased to £757,519.

The figures appearing in the profit and loss account call for little comment. In view of the policy which we have pursued during the war little change could be expected. During the period under review we did a great deal of work for various Government Departments. In addition to the small profits yielded by such contracts, our receipts included sums paid for consultative and contract work, not only for our associated companies and others in this country, but also for foreign Governments and on overseas contracts.

Interesting Comparison with Pre-war Figures

The figures which I have been reviewing cover a war-time period and, in case it should be assumed that the war, Government "planning" and controls have been responsible for the development we have achieved, it may be well to present corresponding figures for a similar pre-war period. I have selected the figures for 1934, 1939 and 1944.

You will thus see that war-time conditions have not been responsible for our amazing progress. During the last five years our growth and improvement of service to our consumers have been retarded rather than improved by the existence of additional Government control and purely war-time consumption of electricity.

	1934	1939	1944
Number of consumers	243,746	442,727	504,433
Increase % ...	—	82	14
	£	£	£
Gross revenue ...	2,618,778	4,965,436	11,358,823
Increase % ...	—	90	129
No. of units sold, incl. sales to C.E.B. (millions)	457	1,138	3,048
Increase % ...	—	149	168
Average price per unit sold:			
All purposes (ex C.E.B.)	1.37d.	1.21d.	1.08d.
Decrease % ...	—	12	10
Domestic and commercial	3.98d.	2.58d.	1.94d.
Decrease % ...	—	35	25
Consolidated capital expenditure	£ 17,831,792	£ 28,279,658	£ 37,378,889
Increase of ...	—	10,447,866	9,099,231

In view of the above, you can imagine our astonishment when we learned a month ago from Mr. Herbert Morrison (then Home Secretary) that—"apart from the part played by a public Board whose operations have been notable for efficiency and enterprise—the Central Electricity Board"—a state of chaos and muddle existed in the electricity supply industry. The indisputable facts and figures which I have placed before you disprove his outrageous statement. The electricity supply industry mastered all the war-time difficulties confronting it, and succeeded in meeting the enormously increased demands.

If the last five years have done nothing else, they have demonstrated the elasticity, efficiency and virility of the industry. They are a denial of the accusation of a state of chaos and muddle and the claim that nothing less than nationalisation will enable us to solve peace-time problems.

I apologise to you for taking up your time in dealing with these allegations of chaos and muddle which to all who are unbiased are obviously untrue. Unfortunately, however, the propaganda technique of alleging distress and chaos and exaggerating out of all proportion minor and easily adjustable anomalies was proved by totalitarian countries to be so successful that there is a risk of these methods being copied here.

It is easy to make charges of inefficiency and to talk glibly of the necessity for drastic treatment for our industry, but in this country facts and figures (however hateful they may be to the doctrinaire) have always been considered of greater value than unsubstantiated invective.

The facts and figures disclosed by our accounts make clear how difficult it has been for us to refrain from giving the lie direct to those who, during that period of five years when we were precluded from giving a single fact as to what we were doing, sought to make political capital out of our alleged and entirely unproved and unprovable inefficiency.

Despite our diversified area, which covers over a quarter of England and Wales, the great number of aerodromes, Government factories, war camps and every other kind of demand for electricity, we have never once kept consumers waiting. Always have we had a supply available before the consumer was able to take it.

Extension of Generating Stations

You will observe that the installed capacity of our generating stations has risen from 269,000 kW in 1938 to 586,000 kW in 1944. Apart

from extensions of our generating stations at Upper Boat and elsewhere, this has been done by the building of two entirely new modern stations, one at Little Barford and one at Llynfi.

I cannot let this occasion pass without telling you that the construction of the Llynfi station by our corporation created a record which we believe has not been surpassed anywhere in the world. From the date of the first sod being cut to the commencement of commercial operation of the station only 19 months elapsed. Speed was essential if vital war supplies were to be delivered, and to your corporation the Central Electricity Board entrusted the task of fulfilling that urgent necessity.

Functions of Central Electricity Board

To some of you it may be necessary to explain the functions of the Central Electricity Board in relation to generating stations. It is, unfortunately, the belief of not a few that the creation and operation of generating stations is entirely a matter for the C.E.B. That is not so. The Board own only one generating station. This was erected by them during the war, and it is operated for them by your corporation. All other electricity supply generating stations are owned and operated by companies, municipalities and certain ad *ad hoc* bodies.

The Central Electricity Board act as wholesalers of electricity. The manufacturers and retailers of electricity are those companies, municipalities and *ad hoc* bodies who were given by Parliament powers to generate and distribute electricity in certain areas. The Grid, which cost about £40,000,000, is the only real asset of the Board.

"Artificial Creatures of Statute"

All generating stations are designed, built and paid for by or to the orders of the various company and municipal owners under instructions from the Board. Apart from that the only responsibility of the Board is to act as wholesalers of electricity, and the Board's scope of proving their extreme efficiency or enterprise is therefore limited. I hope that you will bear this limited scope in mind when ill-informed people seek to cite the Board as an example of what nationalisation, or rationalisation, or any other of the "ations" of the planners, can do. Such artificial creatures of statute have never proved to be the panacea for all ills. The facts and figures which I have placed before you provide proof of the truth that profit-motive and free enterprise are not all evil. They can be of still greater value to consumers than any State-created so-called non-profit-bearing form of organisation whose results are still a matter of opinion.

Plan for Rural Electrification

During the last five years we have been prohibited from connecting new consumers except for purposes directly or indirectly connected with the war effort. We look forward to the time when we, as pioneers of rural electrification, can be free again to set about our task of completing the rural electrification of our areas. That goal would by now have been reached had there been no war restrictions. But we shall spare no effort to make up for lost time.

All our plans are made, and we propose to spend, directly or indirectly, on rural electrification about £17,000,000 during the first five years after labour and materials are available. That is a heavy task, but it is one which will be faced with the same skill and zeal as have produced the figures it has been our privilege to place before you to-day. It is a task, too, which in our view must be carried out so that your corporation may be in the position to show how, without expense to the taxpayer—national or local (indeed to his advantage, as witness the taxation and rating figures—the blessings of electricity service may be brought to rural industries and dwellers alike. This can, and will be done provided the electricity supply industry is not made a political football.

Changes Inevitable

A certain measure of evolutionary changes in the industry are desirable, nay urged by us. In recommendations based on the McGowan Report, which the Incorporated Association of Electric Power Companies has placed before the Government, it has been shown how, with the minimum of dislocation, true progress and development of the industry can be attained. Consumers of electricity are not, in our view, interested in having tried out on them the political theories of those whose sole concern is to see nationalisation of some kind or another in all forms of industry.

To conclude this review of our activities I wish to refer to the fact that 3,200 of our employees have served or are serving in H.M. Forces, of whom, alas, over 100 will never return. As our pre-war staff numbered only 9,700, you will realise how great has been the strain placed on those who were left to produce the results to which I have referred.

We look forward to the return to our employment of all those now with the Forces. There awaits them a welcome and a real job of work to be done under conditions of employment which we hope and believe are nowhere better in the electricity supply industry.

Tribute to Executive and Staff

I wish to express on behalf of all of us stockholders our great appreciation of the splendid work done by our managing director, General Hayes, and the officials of the company at head office and in the provinces. The record of their achievements is now before you, and it is in every way a noteworthy one. Results such as I have had the privilege of laying before you are not achieved without much vision, much ability and much hard work on the part of all, from the highest to the lowest, who serve in Edmundsons and its associated companies, and I am sure you will wish me, on behalf of all of us, to convey to them our sincere thanks.

The report and accounts were unanimously adopted.

Coming Events

Saturday, June 16.

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS (N.W. LONDON BRANCH).—Comedy Restaurant, Panton Street, London, S.W.1. Annual luncheon.

Monday, June 18—Sunday, June 24.

ROYAL SOCIETY FOR THE PREVENTION OF ACCIDENTS.—National Safety Congress. Institution of Civil Engineers. Annual meeting, June 21, *5 p.m.*; opening address to industrial sessions, June 22, *10 a.m.*

Tuesday, June 19.

I.E.E., TRANSMISSION SECTION.—Connaught Rooms, Great Queen Street, London, W.C.2. Informal dinner. *5.30* for *6 p.m.*

Thursday, June 21.

I.E.E., DEVON AND CORNWALL SUB-CENTRE.—Grand Hotel, The Hoe, Plymouth. "A Survey of the Problems of Post-War Television," B. J. Edwards. *3 p.m.*

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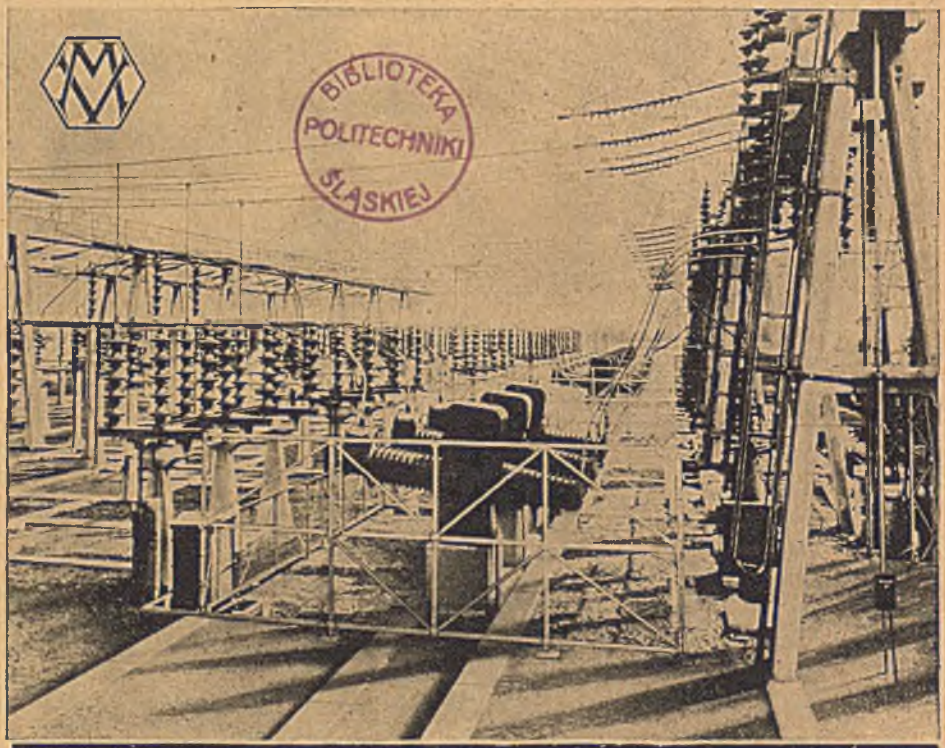

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