THE
ELECTRICIAN

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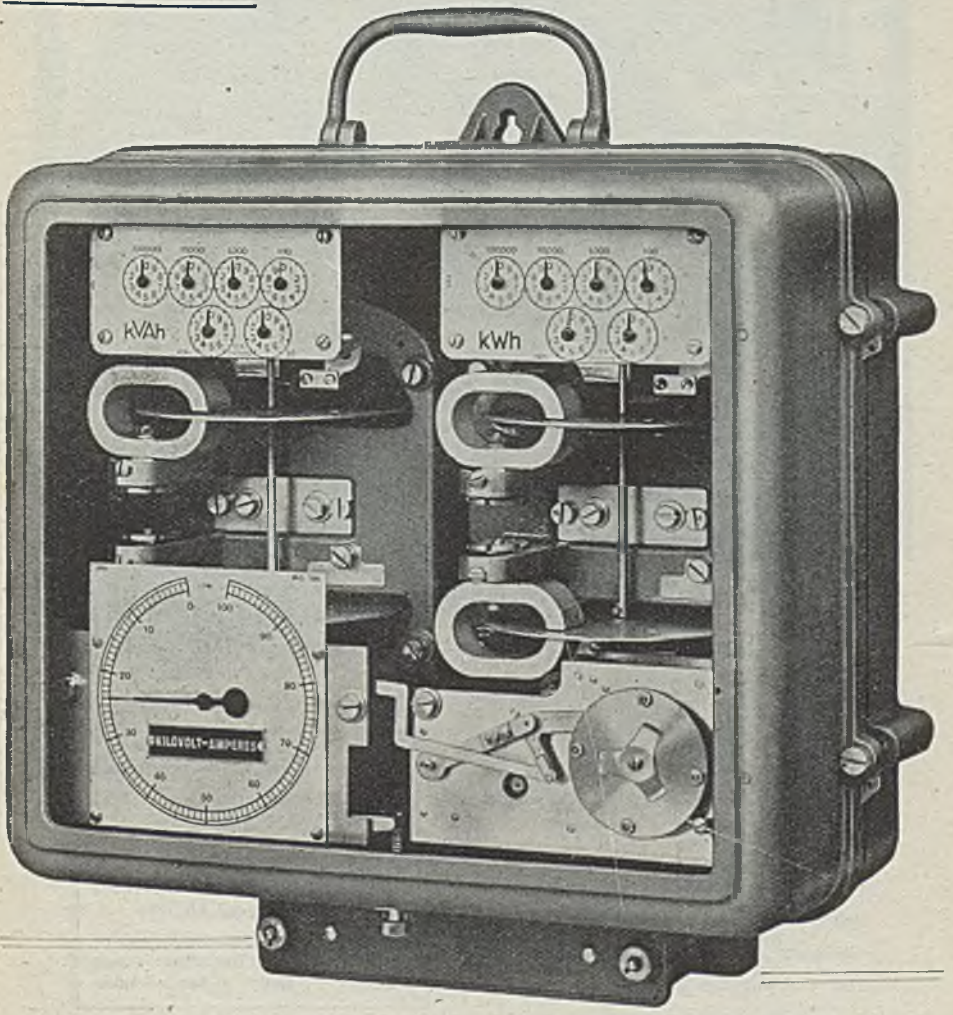

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MISCELLANEOUS ADVERTISEMENTS

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CITY OF LEEDS
ELECTRICITY SUPPLY DEPARTMENT.

APPOINTMENT OF DEPUTY CITY ELECTRICAL ENGINEER AND MANAGER.

APPLICATIONS are invited for the post of Deputy City Electrical Engineer and Manager at a commencing salary of £1 100 per annum, with maximum salary of £1 300 per annum.

The person appointed will be required to assist the City Electrical Engineer and Manager in the operation and administration of the Undertaking and to give his whole time to the duties of the post.

Candidates (preferably Corporate Members of the Institution of Electrical Engineers) should have had a sound mechanical and electrical engineering training, and be experienced in the construction, operation and control of a large Electricity Supply Undertaking.

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

Applications, stating age, qualifications and particulars of training and experience, together with copies of not more than three recent testimonials, forwarded in sealed envelopes and endorsed "Deputy City Electrical Engineer and Manager," must reach the undersigned not later than Saturday, 12th May, 1945.

Canvassing in any form, either directly or indirectly, will be a disqualification.

F. NICHOLLS, M.I.E.E., F.I.F.,
City Electrical Engineer and Manager.
1, Whitehall Road, Leeds 1.

MISCELLANEOUS

ELECTRIC Clocks, Clocks, Clockwork Controllers and Time Switches, Watches, Recording Instruments, Exposure Meters and every kind of Clockwork Appliance repaired, overhauled and guaranteed.—J. W. & R. E. HUGHES (Clockwork Engineers), 58, Victoria Street, London, S.W.1. 'Phone: Victoria 0134.

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THE ELECTRICIAN

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CHIEF CONTENTS OF THIS ISSUE

Our Empty Shelves

THE electrical industry has for a long time displayed keen interest in the promotion of improvement in industrial designs, and where its own products are concerned has in many instances set examples which have later been followed by the industries of other countries. Included in the broad term of industrial design, is, of course, the finish, the shape, and dimensions of domestic appliances, and where these are concerned, rival fuel interests long ago paid the industry the compliment of making their appliances comparable in appearance, but not in convenience, with those dependent upon electricity for their operation.

During the war years, design has given way to improvisation, but the subject was raised last week by Sir THOMAS BARLOW, when speaking at a luncheon of the Design and Industries Association, when he claimed that good design is one of the chief weapons by which private enterprise can support its right to conduct its own affairs and give the best service to the community.

The war years have so lowered stocks of consumer goods, that for some time to come it will be possible to sell, within reason, practically anything, of good design or not; and the opportunity will thus be presented for building up, without risk, good will and reputation for the future. Under the pressure of war needs there have been tremendous developments in scientific and industrial technique, and, given the necessary raw materials, many of these are capable of being exploited for the benefit of the consumer.

With the end of the war, will enter the buying field, a generation whose unprecedented experiences have given it a new outlook. Hundreds of thousands of young men and women will be starting up new homes with the experience of precision engineering works, the operation of predictors and other instruments on gun-sites, the handling of weapons of war unequalled by any others in their efficiency—all of which will have influenced these potential buyers into expecting of every ordinary domestic appliance a high performance, and the days when, as before the war, the market was flooded by dangerous fires, irons and kettles of anonymous make will, we hope, never return.

The British electrical manufacturer has always erred—if err it may be called—upon the side of safety; his products have always been comparable both in finish and price with those of equal quality produced in other countries, and the question now arises, how soon will he be permitted to once again meet the needs of the public? We can see in the United States one of our biggest competitors, and in that country peace-time production is to some extent already in operation. When shipping becomes available it is reasonable to anticipate that

the domestic market in this country will be looked upon as a potential field for the sale of American-made goods, and with our shelves still bare because the British manufacturer cannot obtain the necessary raw materials wherewith to make the goods to fill them, officialdom seems to be presenting the United States manufacturers with an amazing opportunity, and their British namesakes with a handicap it will be hard to overcome.

A Grid Milestone

THE report of the Central Electricity Board, an abstract from which is given elsewhere in this issue, marks an outstanding milestone in the history of the grid. For the first time the balance carried forward from the net revenue and appropriation account — a sum of £6 337 905—exceeds the total interest, amounting to £6 132 529, paid out of borrowed money in earlier years. This satisfactory state of financial stability is the result of wise budgeting during a period of over ten years. The total quantity of electricity generated at public supply stations in Great Britain in 1944 was 38 354 million units, an increase of 1 403 million units, or 3.8 per cent. on the output for 1943. The increase since 1939 has been 11 945 million units or 45.2 per cent. of the output in 1939. This is a very creditable achievement in the face of war-time difficulties, and particularly a coal situation which has continued to militate more heavily against the electricity supply industry than any other section of the community. In this connection it is now disclosed by the Board that early last year, following the South Wales coal strike, which emphasised the danger of small margins of stocks of fuel, they requested that the Government should prepare in advance a programme by which restriction of supplies of electricity could be governed throughout the country should a shortage of coal make it necessary.

Extensions Programmes Delayed

THE position in regard to the Board's programmes providing for new generating capacity to be brought into operation during the period ending in the autumn of 1948 to meet estimated load demands is still far from satisfactory and it is stated that there is reason to believe that the completion of the programmes may be seriously delayed. Government sanction has yet to be received to proceed with the manufacture of roughly a million and a half kW of plant. There is still a great shortage of labour both on the civil engineering side and in the manufacturing works, and until the war in Europe is over there is very little prospect of improvement on the building side. Other public utilities are in very much the same position. In addition to these and other difficulties, another cause of delay, and one that promises to be even more obstructive in the post-war period, is the attitude of town and country planners, who are becoming more clamant in their demands that the developments of the grid and selected stations should conform to their æsthetic ideas, irrespective of technical and economic requirements. They overlook the fact that this is essentially an industrial country and industry is mainly dependent upon electricity.

Mobile Power Stations

WHEN in the early days of the war it was expected that our power stations might be put out of commission by the enemy, arrangements were made by the electrical industry for the building of a number of mobile units, and though these were never used in this country, they have, nevertheless, done useful work in contributing to beat the Nazis. In the days when the Russians were retreating from the Germans, the scorched earth policy and the ravages of war played havoc with the U.S.S.R. power supplies, with the result that when the ground was regained some quick and ready means of re-establishing electricity supply was called for, and our mobile power stations were sent to Russia to fill the need. These transportable units were made by a number of firms, as has already been indicated in the series of articles entitled "Manufacturers' Activities," but representative of the stations, is the description given elsewhere in this issue. Mobile power stations were, of course, used before the war, but so far as our knowledge goes, these were in fact little more than the generating plant of some vessel whose draught permitted it to stand inshore at any sea or lake port which might be short of power supplies. Transportable units of the type sent to Russia are, we believe, a product of the war, and we foresee in them a considerable future in meeting the needs of remote towns in undeveloped countries, to

say nothing of the immediate requirements of the liberated cities of the European battlefield.

The B.E.A.M.A. Report

THE report which the Council gave of their stewardship during the past year, at the annual meeting of the B.E.A.M.A. yesterday, Thursday, shows that though still very much engaged in affairs connected with the war, the problems which will beset the manufacturers when peace returns have not escaped its attention. Among these will be the disposal of surplus Government stocks, and it is the considered view of the Council that both the Board of Trade and the Ministry of Supply are likely to be sympathetic to the suggestions already made by the association. Export trade has also claimed a good deal of attention during the past year, and it is interesting to note that the Council has communicated to the Board of Trade its views on certain aspects of overseas marketing as it will affect the various sections of the industry. The Council has, too, shown commendable liveliness in keeping its views before those responsible for the Government sponsored housing schemes, with the result that standard types of equipment have been designed, and large orders placed, for meeting their electrical needs. The report obviously falls short as a description of all that the Council has done during the past year, but, even so, sufficient is made known for it to be realised that the interests of the industry are being carefully watched.

Spreading the Electrical Gospel

RECENT happenings associated with the electrical industry indicate that something of the pre-war ability to spread its gospel is returning. On Monday, Mr. H. W. GRIMMITT spoke on electricity and agriculture at the Farmers' Club, and on April 25, Mr. W. FORDHAM COOPER, is to address the Midland Section of the Coke Oven Managers' Association on planning for electrical maintenance and extensions. This is not the first time that Mr. FORDHAM COOPER has addressed the coke oven managers, for the I.E.E. paper on Industrial Fire Risks is an amplification of the remarks made to the C.O.M.A. some time before, when such interest was apparent that he has been asked to contribute another address. Such speaking on electrical matters outside the immediate electrical field, is likely to do much to bring about a better understanding of the problems which arise in various forms of industry, and because the opportunities for such fraternisation have been practically nil during the last five years, no chance should be missed in the future. By the willing acceptance of suitable speakers to address their members, the various academic and trade associations have indicated their eagerness to learn.

The Profit Motive

IN these days when profit-making is looked upon in some quarters as almost a crime against the community the realistic utterance of Sir GEORGE NELSON, the retiring president, at the annual meeting of the F.B.I., came as a refreshing breeze across the arid field of economics. He said: "I am not ashamed of defending the profit motive which runs throughout life in all sections of the community, and if the spirit of initiative and adventure is to be encouraged there must be an adequate reward for success, for industry always has to shoulder the losses which inevitably arise, whereas publicly-owned services collect their losses from the whole community, and are not subject to real tests of their efficiency." Those are fundamental truths which must be taken into account in any policy for the successful rehabilitation of industry in the post-war period.

Electrical Sign Makers

BY the recent formation of the body called the Electrical Sign Manufacturers' Association to take the place of the electrical section of the Master Sign Makers' Association, it is reasonable to assume that the electrical sign makers believe the future to hold so much in store for them that they need their own organisation. The new body, we are informed, represents at least 90 per cent. of the pre-war manufacturing capacity for electrical signs and is, therefore, fully representative of the industry. With so much reconstruction to be done in the electrical sign world, the activities of the association will be watched with interest. Like other sections of the electrical industry, that concerned with signs has brought about a number of new devices and developments as a result of the war, which will doubtless have peace-time applications of outstanding appeal, both in commercial, aerodrome and other fields.

The B.E.A.M.A. Annual Report

Post-War Problems—Reshaping the Industry

IN their report for 1944, presented at the annual meeting of the association yesterday, the Council of the British Electrical and Allied Manufacturers' Association stated that at an extraordinary general meeting of the association in September, the constitution of the Council was altered by increasing the number of elected members from 18 to 24, and the number who might be co-opted from 7 to 10. It was hoped that this change would result in a better representation of the specialist manufacturers on the Council and also adequate representation of the increased number of sections, a reflection of the rapidly increasing membership of the association.

Changeover Problems

For the fifth successive year, the activities of members had been largely directed to meeting the requirements of the Government for war purposes; but the increased signs of approaching victory in Europe had resulted in both the Government and members turning their attention towards the problems of re-shaping the industry on a sound basis when the requirements of goods for war purposes declined in favour of demands for goods for industrial and domestic needs. It was clear that many difficult problems would arise in connection with the change from war to peace conditions, and the Council, on behalf of all members, had during the year had many consultations and discussions with various Government departments on this subject. In addition to this direct approach to Government departments and officials, the association had been represented on many committees of the Federation of British Industries, which had discussed the same problems with the Government from the wider angle of industry as a whole.

One serious question which was bound to arise was connected with the disposal of Government surplus stores. Discussions with the Board of Trade and the Ministry of Supply had been carried out with every indication that the responsible departments were anxious and willing to meet the views which were first submitted by a sub-committee of the Council.

In October, a letter was received from the Board of Trade asking for the views of the B.E.A.M.A. on a number of problems which were bound to affect export trade in the immediate post-war period. A reply, giving the views of the Council on those problems as they would affect the various sections of the industry, was made that month. The export groups had continued to function to the maximum of the limited extent now possible, and certain changes had been made resulting in closer co-operation between the Electrical Machinery and Electrical Goods and Apparatus Export Committees, and the appointment of a joint secretary to the two committees.

The association had been in constant touch with the Ministry of Works concerning equipment for the Government-sponsored houses shortly to be erected. Standard types of equipment had been evolved for those houses, and large orders had already been placed with the industry. Various types of equipment had been installed in demonstration houses erected in several parts of the country. A committee consisting of representatives of all sections of the association interested in domestic electrical appliances had been formed for the purpose of furthering the use of such equipment generally, and of co-operating with the E.D.A. and other kindred bodies.

The association, through the F.B.I., had kept in touch with the B.O.T. concerning the Government's intentions regarding the control of prices in the immediate post-war period, and it was believed that as a result of the representations acceptable methods would be agreed with the whole industry.

Joint Committee Set Up

Discussions took place with the E.D.A., the C.M.A., and the E.L.M.A., and the Council was of opinion that a joint committee to consider questions relating to the development and use of electricity for domestic purposes was necessary, and that publicity and propaganda in that connection were advisable. A committee of the four associations was therefore set up and had held meetings at which questions of joint interest had been examined.

At the request of the Ministry of Labour and the British Council, the association had undertaken to ascertain members' views on the advisability of accepting for training in the post-war period students from overseas, and, if possible, to put forward a scheme to the Ministry of Labour for the industry as a whole. A questionnaire had been sent to all members, and reports would be made to the Ministry when the replies had been received and co-ordinated.

Three new sections had been formed, namely, the Electric Resistance Furnaces, Small Switch and Fuse Gear, and X-ray Apparatus Sections. Twenty-three new members were elected during the year.

Mobile Power Stations

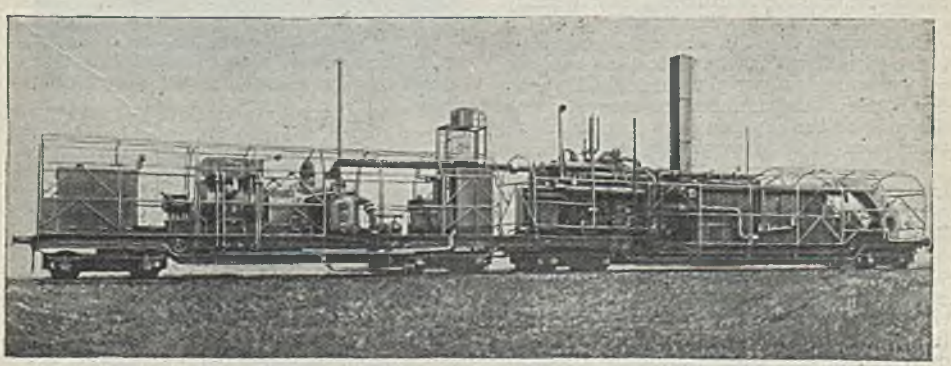
British Train Units Operating in Russia

MOBILE power stations for operating on railway tracks, supplied by the Metropolitan-Vickers Electrical Co., Ltd., through the Ministry of Supply, for the U.S.S.R., are facilitating the process of reconstruction in Russia. Many more are in assembly or in transit.

Designs prepared early in the war for temporary power units mounted on road wagons and on barges for emergency operation of essential services in this country in the event of extensive damage to power installations were altered to meet changed requirements in Russia, and in order to cater for the varied conditions, both of fuel available and capacity required, it was decided to standardise on four classes of units, namely, 1 000 kW coal-fired, 1 000 kW oil-fired, 2 500 kW coal-fired, and 5 000 kW oil-fired. It was stipulated that these units should be completely self-contained, requiring only supplies of fuel and water on site.

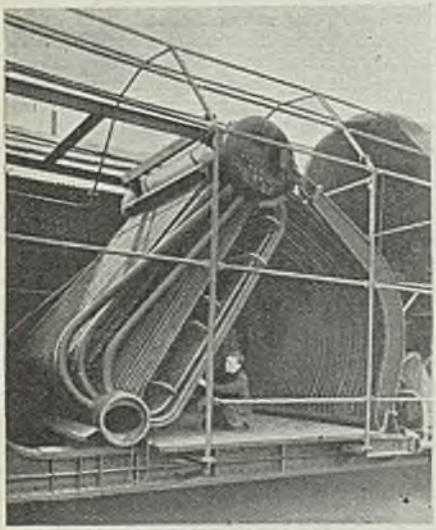
The train unit consists of a boiler.truck, a power truck, and a standard wagon to carry loose items and spares, with in some cases an additional truck to carry a number of the auxiliaries. The design provides for speedy starting up. These units, whose dimensional limitations are dictated by necessity, operate with an efficiency comparable with that of permanent land stations of like capacity. In the case of coal-fired units, moreover, fuels of low calorific value had to be allowed for. The 1 000 kW coal-fired boiler manufactured by John Thompson, Ltd., is of their mobile, water-tube type, consisting of boiler tubes, steam and mud drums, water-cooled combustion chamber, side and roof walls, together with integral economiser. The stoker is of the motor-driven chain grate type, and has a door at the rear for the removal of ashes by hand. Coal is raised to the stoker hopper by a motor-driven belt conveyor. Motor-driven f. and i.d. fans are provided. The boiler feed pump is of the motor-driven centrifugal type for normal operation, but a steam-driven reciprocating pump is included for stand-by purposes. The boiler is fed as far as possible by the condensate, and the requisite feed make-up of crude water is passed through two John Thompson "Kennicot" type slug feeders for chemical treatment: a live steam h.p. heater is interposed between these slug feeders to raise the temperature of the feed admitted to the economiser. This boiler has a m.c.r. of 16 750 lbs./hr., generating steam at 382 lbs./sq. in.g. at superheater outlet, and 690° F., based on a low-grade fuel of calorific value 7840 B.T.U./lb.

The 1 000 kW oil-fired unit is supplied from a La Mont type water tube boiler manufactured under licence by the Ivor Power Co., Ltd. It is built in two distinct sections, the first being the combustion chamber cooling tubes, and the second the boiler convection elements arranged in two banks to provide space for the superheater. Water circulation is obtained by a steam-driven turbine pump, taking water from the under side of the steam and water drum, and discharging to the boiler distribution headers. The oil-burning detail consists of two burners fed from a motor-driven rotary pump and a steam-driven vertical type pressure pump. Forced draught is provided by a motor-driven fan. Boiler feed make-up is supplied from a single-effect evaporator heated by live



A 1 000 kW oil-fired mobile power station ready for shipment, but with shrouding removed

steam through a reducing valve. The feed-water heater is of the h.p., tubular type supplied by the exhaust from the steam-driven boiler auxiliaries, and is used



The tubes and drum of a Foster-Wheeler 5 000 kW boiler being assembled on the truck

as a vapour condenser for the evaporator. This boiler has a m.c.r. capacity of 17 500 lb./hr., generating steam at 390 lb./sq. in.g. pressure and 690° F.; the oil fuel has a specified value of 17 650 BTU/lb.

The boiler for the 5 000 kW equipment is of the Foster-Wheeler design, manufactured under licence by the Ivor Power Co., Ltd. It has a m.c.r. capacity of 65 000 lb./hr., generating steam at 392 lb./sq. in.g. pressure and 700° F., with a calorific value of 17 500 BTU/lb. for the fuel.

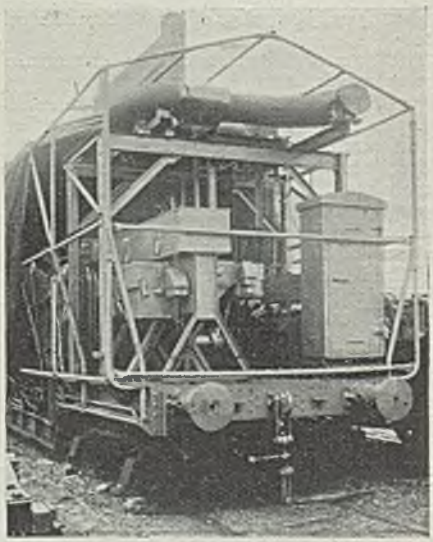
The power units for the several capacities differ in little but their size. Fabricated construction is utilised freely in many of the components. The turbine is of the self-contained type, in which the condenser is made integral with the turbine exhaust to economise in weight and head room. Apart from the number of stages which depends on the capacity, the turbines of all three sizes follow much the same lines.

The condenser is of the single-shell surface type with an effective cooling area of 806, 1 470 and 2 540 sq. ft., respectively, for the 1 000, 2 500 and 5 000 kW sizes of unit. The m.c.r. is based on a vacuum of 27.6 in. hg. pressure and circulating water, at a temperature of 60° F. in respective quantities 800, 2 300 and 4 020 galls. per min. The supply of cooling water is delivered to the power station by a motor-driven centrifugal pump mounted on a separate bedplate, so that it can be placed near the water source.

The alternator is of turbo type with a four-pole salient pole rotor. It generates at 6 300 V, 3-phase, 50 cycles, 0.8 power factor, 1 500 r.p.m. and gives its rated capacity with closed air-circuit ventilation. The exciter, which is direct-coupled to the alternator shaft, is a standard shunt wound generator designed for stability over a wide range of voltage.

The generated supply voltage—6 300 V—is not suitable for operating the auxiliary motors and an oil-immersed, naturally-cooled, outdoor type transformer is provided to transform down to 380 V. The rating for this is normally 75 or 150 kVA.

The h.t. switchgear is self-contained in a weatherproof kiosk of conventional type; the main generating panel and two or more feeder panels are accommodated in its separate chamber. The protection elements include overcurrent and restricted earth fault relays with rectifier detail and a "Metrosil" surge diverter. The l.t.



End view of auxiliary truck of a 2 500 kW power station, showing h.t. switchboard, a d.c. generator kiosk and, in the background, the auxiliary transformer

switchgear consists for the most part of distribution items incorporated in the control board.

The control gear comprises the control board and the boiler auxiliary panel. The control board consists of two oil circuit-breakers for the auxiliaries, together with one or more breakers on l.t. feeders for operating local services at users' request.

Central Board's Report

The Coal Situation—Grave Difficulties Foreseen

BECAUSE of their anxiety regarding coal supplies to the generating stations in the early part of last year the Central Electricity Board repeated a request, which they had made previously, that the Government should prepare in advance a programme by which the restriction of supplies of electricity could be governed throughout the country, should a shortage of coal make it necessary. This is revealed in the Board's seventeenth annual report for 1944. Such a programme would involve prolonged restrictions of supply as distinct from short-time restrictions over the peak period.

Further details of the contribution of the grid to the war effort and of the effect of the war on the grid, which could not be published in the four earlier reports, are given in an appendix to this report.

Out of programmes comprising some 3 394 000 kW of additional generating plant estimated to be required to meet the anticipated demands for electricity up to 1948, over 1 500 000 kW awaited Government release for manufacture at the end of the year.

To delays caused by statutory requirements and shortage of labour there had recently been added the expectation of those interested in town and country planning that developments of the grid and the selected stations should conform to their wishes, which did not always appear to be consistent with technical and economic requirements.

Nearly 4 per cent. Increase in Output

The total quantity of electricity generated at public supply stations in Great Britain in 1944, was 38 354 million units, which was 1 403 million units, or 3.8 per cent., more than in 1943, and 11 945 million units, or 45.2 per cent., more than in 1939. Of the electricity supplied by the authorised undertakers in the country (excluding North Scotland), 99.03 per cent. was produced at stations which were generating for the Board. At the end of the year there were 141 selected stations, with an aggregate installed capacity of 11 254 081 kW, associated with the grid, while 48 others were operating for the Board under temporary arrangements. The grid comprised 5 142 miles of transmission lines, 3 614 operating at 132 000 V and 1 528 at 66 000 or lower voltages, and 348 switching and transforming stations with an aggregate transformer capacity of 13 422 750 kVA.

The maximum simultaneous demand on the grid system, which occurred on December 29, was 8 351 000 kW, as compared with a maximum demand of 7 867 000 kW in the previous year. The amount of plant out of service on that day exceeded 18 per cent. of the aggregate output capacity, as compared with the pre-war percentage of approximately 6 per cent. On the two occasions in November, when, owing to the demands for electricity due to exceptionally cold weather, it had been necessary for short periods to shed load in the

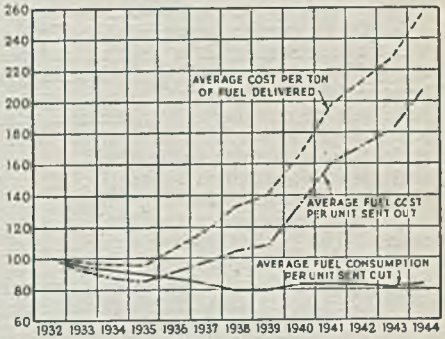


Diagram illustrating the trends of price and consumption of coal since 1932

southern part of the country—on each occasion 200 000 kW, representing about 2½ per cent. of the load on the system—plant out of service from all causes amounted to 2 657 000 kW and 2 368 000 kW, representing 26 per cent. and 23 per cent., respectively, of the aggregate output capacity. The load factor of 47.6 per cent., was about the same as in 1943.

Although the increase in the consumption of electricity involved an increase in the amount of coal required, coal stocks were built up to a maximum of only 3 550 000 tons, as compared with 3 860 000 tons in the previous year. The replenishment of stocks during next summer to the extent necessary for safety would present grave difficulties. There was continued difficulty in obtaining supplies of suitable qualities, and the total reduction in generating capacity due to this cause had been as high as 300 000 kW. During the war, the national average price of coal at the pithead had been raised by some 85 per cent. over the 1938 figure. As this had been brought about by flat rate in-

creases, the rise in the price of coal delivered to electricity supply stations had been relatively greater than that in the home market as a whole, to the prejudice of the electricity supply industry. The average cost of coal per unit sent out in 1944 had risen by some 99 per cent. over the 1938 level.

The revenue was sufficient to meet all outgoings and to increase the credit balance on the net revenue and appropriation account by £1 154 653, after setting aside £500 000 as a further provision towards the cost of deferred maintenance, and £1 000 000 in respect of prospective liability for taxation. The balance of £6 337 905 on net revenue and appropriation account now exceeded the total interest, amounting to £6 132 529, paid out of borrowed money in earlier years.

In the appendix covering the Board's war-time activities, it is pointed out that the grid enabled supplies of electricity to be available on the outbreak of war to hundreds of new factories with individual loads up to 50 000 kW, as well as to barracks, encampments, searchlight stations and aerodromes which sprang up all over the country, and the Government were able to select sites in the less vulnerable areas. The pool of reserve equipment dispersed in thirteen stores in different parts of the country, included 94 transformers, 350 switch equipments, 118 miles of single-core cable, 39 miles of overhead line components, mobile cranes, etc.

National Control from Lift Shafts

The first war damage to the grid lines was occasioned by fouling by cables of escaped barrage balloons. From the outbreak of the war to the end of 1943, there were 1 979 faults attributable to war causes, of which nearly 73 per cent. were due to barrage balloons, about 13 per cent. to low flying aircraft, shrapnel from anti-aircraft guns and military exercises, and only some 14 per cent. to enemy action. More than two-thirds of the faults were cleared without interruption to supplies. The first occasion on which one of the steel latticework transmission towers was totally destroyed by bombs was in February, 1944.

An emergency control room built in London for the South-East and East England areas was rendered uninhabitable and the staff and equipment were transferred early in 1941 to safer accommodation in two disused lift shafts leased from the London Passenger Transport Board. Additional facilities were incorporated to provide for a national control centre. The emergency control room in Birmingham for the Central England area was twice destroyed. Communication for control was always available in each district. The nearest approach to a complete dislocation of the communicating system in any district occurred in South-East England following the raid on the night of May 10, 1941, when 34, out of a total of 63, private lines were put out of action.

Fifty-two Shipments from U.S.

Damage to the Board's sub-stations was less than had been anticipated and in only a few cases involved prolonged interruption of supplies. The loss of generating plant caused by air raids was less than had been feared. The most serious incident was at the Fulham generating station on September 9, 1940, when bombs fell on the engine room and put 190 000 kW of plant out of service. Fortunately the Board's sub-station and the inter-connecting transformers and cables were undamaged and it was possible to resume within a few hours and thereafter to maintain local supplies from the grid system. The loss of output capacity due to enemy action had never exceeded 400 000 kW at any one time.

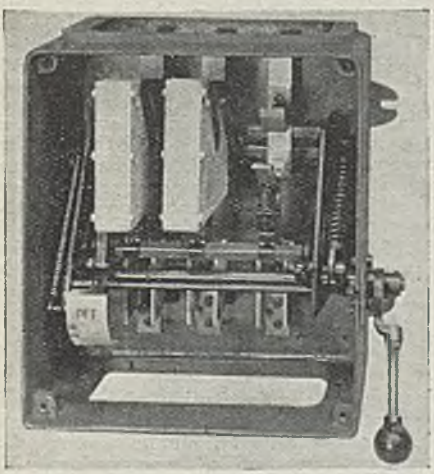
Following the establishment of munition works in the west the rapid increase of demand was met by the construction, during 1941 and 1942, of 363 miles of additional 132 000 V transmission lines designed to transfer energy into the areas in which the new factories had been built from the areas which had experienced a reduction of load. Contracts for the towers and the cadmium copper required for the conductors had to be placed in the U.S.A. Of the 52 shipments only two, involving 346 tons of steel towers and 104 tons of cadmium copper, were lost owing to U-boats. A further 30 tons of steel towers and 100 tons of cadmium copper conductor were destroyed by air raids after they had been landed. During the same period, 71 miles of 132 000 V lines and 58 miles of lower voltage lines were provided to take supplies to large new war factories.

Before the war, the South-West England and South Wales area was an exporting area, the exports under winter peak conditions in 1938-39 amounting to 7 000 kW, while the South-East England area was an importing area, the imports in that winter amounting to 96 000 kW. On the outbreak of war the position was reversed. The load in South-East England fell off to a greater extent than in any other area and so released plant capacity for export, particularly to South Wales, where a considerable concentration of war factories was rapidly being established. In the winter of 1942-43, the exports from South-East England rose to their highest figure of 292 000 kW and the imports by South-West England and South Wales rose to a maximum of 244 000 kW.

New Equipment and Appliances

New Range of Switches—Electric Flush-Action Washer

TO comply with B.S.861, medium-voltage air-break switches must be suitable for switching substantially non-inductive loads, and the standard range of HH switches made by **A. Reyrolle and Co., Ltd.**, is good



Medium voltage switch for inductive and capacitative loads

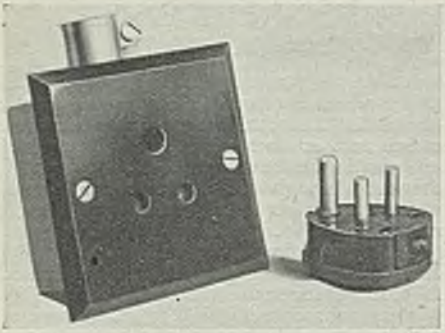
for this duty up to 600 A. Conditions of load and operation often require, however, that switches should be suitable for making and breaking inductive and/or capacitative loads, such as those of a.c. motors, condensers, welding transformers, and so on; and a new range of Reyrolle switches has been developed expressly for this duty. Each phase is fitted with an arc-control device, and there is an arc-screen inside the lid to prevent arcing to the earthed case. The main contacts are high-pressure butt contacts, of heavy copper section, and with strong backing-springs to ensure good contact. Arcing-contacts are also fitted to make before and break after the main contacts, thus considerably reducing wear on the latter. The mechanism has a high-speed quick-make and quick-break action. A flag indicator is fitted to show when the switch is on, or off, through a glass window in the lid. Switches of three ratings are available, namely 100, 200, and 400 A; and they are, respectively, interchangeable with standard HH units of the same rating.

Instead of beating the fabric with an agitator, the Versco electric washer, manufactured by **Universal Boilers and Engineering Co., Ltd.**, flushes out the dirt by surging water action alone. It derives its washing (and rinsing) action from an impeller which is of special design and totally enclosed. Thus, no moving part whatever comes into contact with the clothes, which are washed without wear. The impeller is driven through an automotive shock-absorbing clutch by a ½ H.P. sleeve-bearing motor, the speed of both the power unit and the impeller being 1 425 r.p.m. The drive is extended to the wringer transmission, giving reduction to 25 r.p.m. The washing chamber, which is of an unconventional shape, can be supplied either in anodised aluminium or in porcelained steel. It is supported by an outer casing in cabinet form 24 in. square and about 30 in. deep, fitted with strong rubber-tyred ball-bearing castors capable of standing up to heavy work and allowing easy movement. The whole machine stands firmly and is almost noiseless when in operation. A multi-position power wringer, with automatic drip-tray and "feather-touch-instant-release" mechanism, is in the final stages of development.

Versco electric flush-action washer

A range of new shuttered domestic socket outlets is being produced by **Victor H. Iddon, Ltd.** (in association with **Cooke**

and Ferguson, Ltd.) The illustration shows the 5 A B.S.S. sunk, type fixed to



Shuttered domestic socket-outlet

the insulating cover of a 2¾ in. square by 1¼ in. deep sheet metal box by two captive 4 BA countersunk head screws or 2⅜ in. centres, as suggested by the M.O.W. for factory-made houses. Apart from the mounting of the socket on the cover of the box, a new feature of the design is the patent anti-flash shutter which gives greater protection than the conventional type. Only by the insertion of all three plugs can contact be made with the live tubes. Because of the shaping of the three wings of the shutter an anti-clockwise motion is started by the insertion of the longer earth pin of the plug top and is completed by the shorter current-carrying pins. In the event of uprating being adopted this socket outlet can carry 10 A continuously. To satisfy demands other than those for factory-made houses the new safety socket is manufactured as a standard type to be used as either a surface or semi-sunk outlet. This is available in 5 A or 15 A sizes, and to fill the gap between these two B.S.S. standards, prototypes of 3 kW all purposes socket-outlets have been made in accordance with the recommendations contained in paragraph 84 of No. 11 of the Post-war Building Studies dealing with electrical installations.

Engineers and Politicians

IT is customary for the president of the I.E.E. to be the guest of honour at the annual luncheon of the Installations Section of the institution, but in the absence of Sir Harry Railing, due to a business engagement, Sir Stanley Angwin, the immediate past-president, occupied that position on April 12. He was unable to attend during his year of office, and the chairman, Mr. G. O. Watson, caused a ripple of laughter by calling upon him to deliver his "delayed action bomb." Sir Stanley reminded him that speeches were not allowed, but referring to his recent extensive tour of the Dominions, said that although that mission had as its basis the improvement of communications in the Empire, it necessarily had something of a political flavour. While on that mission two things struck him particularly. The first was that wherever they landed—and they called at nearly all the Dominions, India and many of the Colonies—he always seemed to find an engineer, and usually one who was a member of the institution, waiting on the landing stage to welcome him. That was always a very happy augury. He also found that very often the discussions started on a rather definite political plane, in which he swam with the greatest difficulty, but by putting over a purely technical or engineering aspect one sometimes found a solution that appealed to the politicians, and he thought there was something to be gained from that approach. In that particular section of the institution they discussed such problems as the distribution and installation of electric power and he believed even that had some political repercussions. He thought that in that and in other problems, in the long run, if one could look at the matter from the attitude of the engineer, and if the practical business side was put, apart from the political issue, in the course of time by persistency in looking at the scientific and engineering background, one could make a useful contribution without getting embroiled in the purely political side.

Following this line of thought, Mr. H. L. Kirk, chairman of the Radio Section, said he firmly believed that where truth was properly used and brought out it would be effective in guiding the political side. The recent Commonwealth Communications Conference attended by representatives of the Dominions, showed how valuable it was to meet together from such widespread parts of the world to discuss technical matters and attempt to get some basis of standardisation of procedure for all the Dominions. They felt it was an excellent idea to ventilate their particular technical questions and he was sure that in the future, if the British Commonwealth of Nations could get together for discussions it would be good for all and help to keep our end up in the struggle that was going to take place after the war.

Electricity in Agriculture

Present and Future Aspects Discussed

AT a meeting of the Farmers' Club, on April 16 a paper was read by Mr. H. W. Grimmitt on "Present and Future Aspects of Electricity in Agriculture."

Since the MacGowan Committee issued their Report on the distribution of electricity in 1936, he said, general development proceeded quite satisfactorily up to the outbreak of war. The Government received the Report, but since its publication they had not had any time to consider the large-scale reorganisation of electricity supply. The present Minister of Fuel and Power had asked the different associations concerned with the supply industry for their views on reorganisation. While they differed in some respects, they were unanimous in the suggestion that full and complete rural development should be carried out.

No Large Tracts Without Supply

Before the war there were approximately 12 million dwellings in the United Kingdom; there were also 10½ million electricity consumers of which 85 per cent. were domestic consumers. In 1939 in rural areas in England and Wales there were 768 000 consumers of electricity; the total number of dwellings, according to the 1931 census, was 1 220 000, i.e., 63 per cent. having electricity. When the Ministry of Agriculture published the result of their census we should know precisely how many farms had a public supply. There were no large tracts of country without a public supply, the countryside was fairly evenly covered, and practically all villages down to a population of 350 had electricity.

It was safe to say that electricity was now easily available to 75 per cent. of the dwellings in rural areas. More than 75 per cent. of the work had been done, and the main backbone of mains had been erected —in all, over 40 000 miles.

The early days of rural development were not easy, not all farmers wanted a supply, and when a supply was taken to a village only 20 per cent. of the dwellings became consumers in the first year; it took nearly five years to get 75 per cent.

There was a marked difference between electricity supply in this country and some Continental countries. Here we had made every effort to encourage the use of what might be termed heavy-current consuming apparatus, such as cookers, sterilizers, motors, radiators, wash-boilers. The industry had planned its systems to cater for all predictable electrical loads. Whereas, for example, in France very little more than electric lighting was provided, our industry as a whole had for a long time definitely departed from the policy of small mains and a small number of units sold at a high price. It was essential that the price per unit should be kept to a minimum so as to encourage the full use of electricity; it was only by this means that economies in generation could be maintained.

The one country in the world that had made a concerted effort to deal with rural electrification was the United States.

What was required, and what would undoubtedly develop, was active co-operation between farmers, the electrical associations and the agricultural implement manufacturers. Rigid standardisation, with compulsion to use the standardised mains and apparatus would effect a saving, but this was too drastic a measure and was unnecessary.

The cost of all fuel would tend to increase; therefore electricity must always be used with economy, and that was of the best advantage to both the farmer and the industry.

Standard Tariff Needed

It would be helpful if the industry, through its associations, could produce a uniform method of arriving at a farm service charge, and the next step would be a standard form of tariff. This would save much trouble and many complaints. A number of undertakings employed an engineer who devoted all his time to farms, and this arrangement had proved very successful. The great difficulty was to get serious technical publicity to the farmer.

In proposing a vote of thanks to the speaker, Mr. J. Beresford said it was encouraging that the farming community should be regarded by the distribution industry as a large potential market for electrical machinery and current. He emphasised that a cheap and plentiful supply must be available to the whole of the farming industry.

Opinions expressed during the discussion suggested that there should be the closest co-operation on the part of the supply authority and the farmer; that the farmer in many instances was unwilling to carry out new schemes even when electricity was available; the formation of a national grid, and a more uniform and cheap rate throughout the country. Another speaker suggested a uniform tariff, but did not agree that it should be under one control.

Insulated Cables

Will Synthetics Set a New Standard?

AT the informal meeting of the I.E.E. on March 26, Mr. T. R. Scott opened a discussion on "The Future of Synthetic and Thermoplastic Insulated Cables." He said that if an alternative to rubber were introduced, giving a safe operating temperature of, say, 190° F., with no serious drawbacks and with normal rubber cable expectation of life and without appreciable increase in cost, this insulant might sweep the market to the exclusion of natural rubber. It appeared to him that such a development was a reasonable possibility.

Summarising his main argument, Mr. Scott made the following points: (a) Omitting consideration of wires and cables for special purposes, and considering the main bulk of production, there was a serious possibility, although so far there was no definite evidence, that synthetic materials would set a new standard of high working temperature and improved ageing. (b) This standard might be set at a price comparable with that of normal rubber cables. (c) Vulcanised synthetics were more likely than thermoplastics to bring about the situation expressed in (a), but thermoplastics, such as polyethylene, might come into the picture and P.V.C. would then be at some disadvantage. (d) Before synthetics were generally used, much work would be necessary to change cable specifications, codes of practice, etc., from those founded on rubber to specifications founded on material X, where X was any material which would do the job. This would take time, and the introduction of synthetics on a large scale might be delayed thereby.

The general discussion revealed that whereas P.V.C. had been found satisfactory for several years when used on fine wires, in the case of larger cables subject to appreciable temperature rise, there was a tendency for the conductor to cut through the insulant owing to the softening of the latter. It was asked whether any research had been carried out to remedy this. The position likely to arise in this respect under tropical conditions was referred to.

Specifications received considerable attention, and there was general support for the view that new specifications should not be just a modification of specifications for rubber cables. This, it was thought, would do something to remove the impression too often held that cables insulated with synthetic insulants were necessarily inferior to those used with natural rubber. Another speaker put forward the view that the chemical and electrical side of synthetic insulation should not be subordinated to the mechanical, his point being that the tendency for the cable to cut through the insulant under temperature rise could be limited by mechanical protection.

The possibility of synthetic insulation competing with impregnated paper was also put to Mr. Scott, as was the point that with low voltage cables it had been found that synthetic insulation could be used direct in the ground without any lead sheathing, it being impervious to moisture. The advantage of this, if synthetic insulation could be applied to higher voltage cables, was commented upon.

From the household wiring point of view it was felt by one speaker that the average wireman would prefer natural rubber, and it was thought that in this field synthetic insulation had much prejudice to overcome before it could compete with natural rubber.

The importance of economic considerations was stressed and the resources of the Empire were referred to, one view being that in times of peace we could well rely upon them. Objection was taken to the use of the word "substitute" in relation to synthetics, and special uses for synthetics were mentioned in which rubber might not be suitable, as for instance, the use of polyethylene for submarine cables. The possibility of countering ice loading on cables by synthetic insulation was also mentioned.

Mr. Scott, in reply, said there was one very simple answer to all the criticisms that had been made, and that was for the users to state definitely to the manufacturers what they required. The result of that would be that the cable engineer would consult the chemist, and in due course the most suitable and economic material for the particular job would be forthcoming. There should be a specification for each type of cable. He emphasised that a broad view must be taken, and the necessary research would follow. Research chemists, he added, might well have already solved the problem of icing on cables, since certain types of material had been developed which inhibited moisture deposition. The temperature problem did not worry him and he mentioned that 4 kV and 20 kV cables with synthetic insulation were being used in America. Whether synthetic insulation would be better and cheaper than paper insulation remained to be seen. Owing to economic considerations we should not be unduly bound by the specifications for rubber cables as they now existed.

The Earthing Problem

By "SUPERVISOR"

REFERENCE has been made, both editorially and in this column, to the many outstanding and unsettled problems confronting the installation industry—the ring main, the fused plug to a new standard; etc.—and which demand attention before the post-war push on building and wiring starts. It must not be forgotten that there are, in addition, some problems carried over from the pre-war era, notably the question of earthing in domestic premises. This was never settled to anyone's satisfaction, and the present would seem to be as good an opportunity as any to look over this matter once more.

Intensified Safety Problems

Earthing is generally looked at as a whole, and its desirability reckoned from the standpoint of power engineering. Transmission, power station and factory needs, and the requirement to protect buildings against lightning appear to obscure the fact that earthing in a domestic installation presents entirely different problems. It is true that the regulations demand earthing in connection with portable appliances, and for fixed equipment below a height of 8 feet, but they do not forbid the use of the lampholder plug or the simple two-pin wall socket—their use is merely deprecated. The interpretation of even this simple rule varies in confusing variety; whereas it is quite common to find that the vacuum cleaner has been earthed, it is far less common to discover a metal standard lamp with an earth connection.

It has to be agreed that the existence of unearthed electrical equipment, even a standard lamp, alongside earthed equipment sets up intensified safety problems, and which are reflected in the proviso found in the Note to Reg. 1001 (A). The earthing of the reflector of any radiant type of heater sets up risks not apparent if the appliance is left in an unearthed state, and fatal accidents have occurred from the unintelligent carrying out of the regulation. Domestic earthing should not be contemplated unless it can be made universal and complete; if inherent defects in our method of solid earthing render this inadvisable, then alternative methods of protection must be devised.

Electrical connections are made with the greatest of ease by any consumer who has tampered with a radio receiver, or connected electric lamps to his bicycle. Apparatus purchased by a consumer will rarely be fitted with an earth wire, even if every socket and plug is three-pin and three-core flex is primarily connected to the appliance. I have in mind the case of an electric kettle, used in conjunction with an earthed cooker; the kettle is equipped with 2-core flex, and the consumer has found that a two-pin 5-A plug will fit quite well into the 15-A socket on the cooker control panel. Safety would be more apparent if the earth connection to the cooker were removed.

In connection with cookers, the position is somewhat intensified by the fact that the sub-circuit fuses are omitted on the Ministry of Works electric kitchen unit, a matter that has occasioned some surprise. According to records which have recently been published earth faults resulting in the blowing of cooker sub-fuses amount to a high proportion of all cooker faults. One supply engineer states that records of 25 000 cookers show that in the months of February and March, 1940, faults of this nature accounted for 39.75 per cent. and 31.40 per cent. respectively. Apart from the fact that risk of inconvenience to consumers alone seems to require the retention of circuit fuses, the point now arises that in future all these earth faults will occur on circuits protected only by 30 A fuses. Earth fault currents will clearly reach much higher values, and it is reasonable to expect complete destruction of some equipment; unless, of course, earth connections are omitted from cookers in the future.

Unearthed Small Appliances

Regulations may prohibit, and individuals may be informed of the risk of using unearthed electrical equipment, but the fact remains that a large amount of equipment and possibly the majority of small appliances are used in an unearthed state. A lead in this direction is sometimes given by the highest authorities and I read from an attractive brochure issued by one of the most progressive municipal suppliers in the country the following: "You can connect the iron to any of the small plug points in the house, or, by means of an adaptor, to any lampholder within reach." This publication also calls attention to the fact that the ironing can be done in the most pleasant part of the house; it is reasonable to assume that in winter this may be the kitchen.

It is certain that any remonstration to the effect that the iron should be earthed will be countered by the consumer on the grounds that the electricity supply engineer says he can use it from an adaptor—and where he likes in the house. These

notes are being written in a small room that has no form of heating whatever, but there is a lighting point and in the stores a small 600 W bowl fire. Shall I put this satanic temptation behind me, or flout all regulations and be warm? I feel that the reaction of the average consumer, or engineer, will be the same as my own, in spite of the existence of earthed non-electrical equipment within a few feet.

A Snare and a Delusion

In theory, the safeguard provided by earthing is attractive, and its application appears simple. In practice, however, we know that earthing, especially in connection with small domestic appliances, is a snare and a delusion, if only for the reason that a quick and effective test of the protective circuit cannot be made, nor can any such test be automatic. If protection cannot be guaranteed 100 per cent. and if, on the other hand it introduces serious risks of its own—not least the enhanced fire risk—is it worth retaining for the small amount of protection that it can afford in those rare cases when everything is intact?

In connection with portable tools, too, the industry seems to be going out of its way to make electrical appliances as unpopular as it can. From the "Electrical Contractor" for April, the Gloucester branch of the E.C.A. seems to be having some trouble in getting certain certificates signed, and the secretary reported that he had been informed by head office that it was absurd of the E.T.U. to suggest that employees who signed the declaration were giving away their rights under the Compensation Act. The director said it was up to the employer to use all means within his power to make his employee aware of the danger of using tools that are not effectively earthed. The director also suggested that where employees refuse to sign the undertaking he advises that the membership should record in a register the date on which they issued a form to the man and the date they refused to sign. It is not known what the certificate involves, but one can understand the employee looking round for a pneumatic tool, even if a member of the E.T.U.

Insulation is, of course, the real solution of the problem, but until portable tools and all domestic appliances can be made of non-conducting material, some other form of protection may be necessary. It is at least questionable if we are affording it by means of solid earthing, however suitable this may be for the power station and the heavier fixed equipment. Not much has been heard over the past few years concerning leakage protection by control of leakage voltage, except in rural areas, but there is no doubt that properly applied this would at least provide a solution until the days of complete insulation arrive.

Apart from the effective control of voltage on metal casings, the ability of this method to afford complete and easy test, at any moment, of the whole protective circuit, and which may even be made automatic, brings it into the front rank for immediate attention by the industry in its search for safety. The writer would rank this simple and easy test as of greater value than even the close limit placed on leakage voltages, as it is the main direction in which solid earthing falls down. Surely we are not to continue indefinitely with the half-hearted application of earthing, or its evasion altogether, or even the filling up of indemnity forms when electrical equipment is used, in installations of the future.

Outlook of Industry

AT the annual meeting of the Federation of British Industries on Apr 11 Sir Clive Baillieu was elected president in succession to Sir George Nelson, who held that office for two years.

Sir George Nelson said he thought that when peace came there would be in the minds of all two objectives of sufficient strength to maintain the co-operation and common effort which had served us during the years of warfare. The first was to maintain peace and prevent a repetition of the suffering of the last six years. The second was to restore prosperity by providing stability of employment and a satisfactory standard of life.

Industry would have to re-equip its factories to bring them all up to date and this task would need great expenditure. The Government had recognised this by pursuing a taxation policy which would encourage initiative and enable the building up of the necessary reserves to keep industry continuously up-to-date, and they were very grateful for the valuable help to industry envisaged in the recent Income Tax Bill. He trusted that was the forerunner of other measures of taxation relief which would help to place the country and industry on the soundest possible financial basis.

He was not ashamed of defending the profit motive which ran throughout life in all sections of the community, and if the spirit of initiative and adventure was to be encouraged there must be an adequate reward for success, for industry always had to shoulder the losses which inevitably arose, whereas, publicly-owned services collected their losses from the whole community, and were not subject to real tests of their efficiency.

Illumination Requirements

Some Factors Affecting Design for Building Interiors

A PAPER by R. O. Ackerley on " Some Factors Affecting the Design of Electric Lighting Installations for Building Interiors " was read at the meeting of the I.E.E. Installations Section on April 12.

The author examined the methods which should be adopted in order to answer the various questions which an engineer should ask himself when designing an electric lighting installation. The paper stressed the importance of careful task analysis in the first instance to determine exactly what is the visual problem for which suitable lighting must be provided, and went on to discuss methods of lighting, factors affecting illumination requirements, the selection of appropriate lighting fittings and lamps, and the calculations necessary to determine their location and wattage. The paper also dealt with probable trends in lighting in the post-war period and the light sources and materials for light control that are likely to influence them.

Mr. A. H. Young called attention to the large number of existing premises in which the lighting installations should be overhauled and modernised, as distinct from planning entirely new installations. After reading the paper, he said, he was more than ever convinced that a large scale programme of education in its broadest sense was necessary. There were two extremes, one represented by the physicist and research workers, and the other by the practical engineer. The former were familiar with all the intricate details of the science of lighting but rarely had an opportunity of putting their theories into practice. The practical engineer was inclined to take a great deal for granted and he should have the opportunity of acquiring the fundamental knowledge which the author had emphasised. It was essential to marry these two extremes, and this brought in the whole question of education. E.L.M.A. had done valuable work in this direction in the past and hoped to resume it when conditions permitted. The Illuminating Engineering Society was considering plans for the theoretical and practical training of illuminating engineers. Having acquired this information, it was necessary for the engineer to pass it on to the public, who were remarkably ignorant about the question of lighting, and still were content to have degrees of illumination which were harmful to their eyes and general well being. There had been permanent injury to the eyes of millions of people in this country by inadequate lighting.

Mr. Howard Robertson (R.I.B.A.) spoke of the enormous amount of material in the paper which was of great value to architects and suggested that more might have been said of æsthetic considerations. One point about which he had been puzzled for a long time was whether the effect of an efficient lighting system eventually wore off; whether, as the eye became accustomed to good lighting, it finally did not benefit by it, and he wondered whether there was a medical as well as a psychological aspect. With daylight, there were passing clouds which caused variations in the amount of daylight, but this variation did not apply to artificial lighting, and might there not be a fatigue of the eye due to the monotony of an efficient lighting system, although perhaps not to the same degree as with indifferent lighting. Could the author throw some light on the possibility of varying the artificial lighting in a building in a similar way to variations of daylight? Monotony was not good for the human organism in this respect.

Dr. C. C. Patterson (General Electric Co., Ltd.) spoke of the need for higher intensities of lighting as one got older and disagreed with the suggestion that artificial illumination should be varied from time to time. It was acknowledged that in going from a badly lighted room to a well lighted room one became much more cheery, but he preferred to feel cheery all the time and to have an efficient system all the time. He emphasised the value of fluorescent lighting to supplement daylight, and said this seemed to be one of the most promising outlets for the illuminating engineer in the future. He had hoped something would be said on this by architects because they had such a desire to make every part of the building satisfactorily daylighted that they were prepared to distort it in the most extraordinary way to achieve that object.

Mr. R. B. Giles, referring to the question of education on illumination, said the electricity supply industry should first take the mote out of its own eye. There had been a great deal of assisted wiring, disguisedly called " free wiring " prior to the war, and it would, no doubt, come in again. In these installations scant attention had been paid to standards of illumination, and he suggested that this point should receive very close consideration in the future.

Mr. J. S. Dow (hon. secretary, Illuminating Engineering Society) referred to the author's method of evaluating the limits of glare and said he favoured a rather simpler rule, viz., that the illumination should not exceed 1 c.p. per sq. in. for every f.c. used. Consideration should also be given to the relation of the installation to the surround-

ings. A point in connection with glare, not touched upon in the paper, was reflected glare, whilst there was another point not generally appreciated, viz., discomfort glare. The object of the I.E.S. Code was to try to get something which would make lighting better, and it was hoped to have some simple recommendations supplemented by specific information with regard to particular cases.

Mr. H. G. Jenkins (General Electric Co., Ltd.) said that high voltage fluorescent lighting had peculiar attractions which at present could not be reproduced in the mains voltage type of fluorescent lamp. He was referring to the mixed colour units, and although some people were fearful of the gaudy effect, he had seen it used in the most dignified surroundings, and this form of lighting could be very beautiful if it were suitably installed. Colour lighting with the mains voltage type of fluorescent lamp had also a useful application and he believed there would be a big demand for it in the future by architects and others, who wanted a little colour in their lighting. One difficulty with regard to fluorescent lighting in the home was in using it for local lighting for needlework or reading, and there was need for a well designed fitting for domestic use in this way.

Mr. A. Cunnington said illuminating engineering problems were so complex, and varied so much with the conditions surrounding industrial installations, that books of tables were no substitute for experience, and very often the best possible had to be done according to the circumstances. He mentioned an instance of the use of fluorescent lighting to supplement day lighting which concerned the work of compositors and said that by means of a photo-electric cell, the artificial daylight was switched on when required and all the previous difficulties had disappeared.

Mr. W. J. Jones (E.L.M.A.) suggested that the institution lecture theatre afforded an excellent opportunity of studying the problems of lighting, the intricacies of which had been mentioned by the author, and said he looked forward to a return to better lighting there. Regarding the tendency towards higher illumination levels in the future, the author had expressed the hope that the bogey of glare would be settled by the newer light sources. He shared that view because as long as the old levels of illumination were maintained, the question of glare would be one of the greatest difficulties.

Mr. E. N. F. Grant asked the author to say something on possible developments with fluorescent lamps, and said that in planning for the future, engineers should have some idea as to what sizes of lamps might be available in the post-war period. When planning an installation to-day it was only possible to base calculations on the lamps available. There might be considerable changes between the planning and completion of a building.

Mr. Forbes Jackson, referring to the training of lighting engineers, said that whilst the workshop and factory and even schools could be looked after by engineers who were reasonably competent for the job, the ordinary domestic householder had no one to turn to for unbiased advice. Therefore, he suggested that supply authorities should organise an advisory service and deal with lighting as they dealt with cooking.

Mr. F. C. Smith. (a past-president of the Illuminating Engineering Society) said that there were still far too many rule-of-thumb lighting engineers, and therefore education for illuminating engineering was essential.

Sir Harry Railing (President of the I.E.E.) said there was one point which had been raised to which he could better reply than the author, and that was the lighting of the institution lecture theatre mentioned by Mr. Jones. The explanation for the not very good illumination was war conditions and lamps, which had been put aside, would be used again as soon as conditions permitted. As to the portraits which used to hang on the walls, the Council had discussed when these should be hung again. He hoped that very soon the gloom in the lecture theatre would be dispersed.

The author, replying to the discussion, said the great problem was to get the information produced by the research laboratories throughout the country over, first of all to the practising engineer, and secondly to the public at large, and also to the specialists who were dealing with allied problems. He did not think the eye, as had been suggested, became accustomed to good lighting and did not benefit from it. The position rather was that good lighting was appreciated and more was desired. Automatic photo-electric control should make very much better lighting conditions generally. He would not dare to answer Mr. Grant's question as to possible immediate developments with the fluorescent lamp beyond what was in the paper, viz., that shorter lamps might be expected in the future, but exactly what length they would be remained to be seen. Improved gear might also be expected for lamp holders, but when that would come depended on the release by the Government of labour and materials. As to the suggestion by Mr. Forbes Jackson that there should be an advisory service on lighting to householders, a number of supply authorities were already giving that, but whether it was on a sufficiently extensive scale, he did not know. One very large supply authority would be doing it in the near future.

Aluminium Conductors

Distribution of Tensile Load in Relation to Temperature and Sag

THE subject of discussion at the meeting of the I.E.E. Transmission Section on April 11 was a paper on "Distribution of Tensile Load in Relation to Temperature and Sag of Steel-Cored Aluminium Conductors," by Mr. E. W. W. Double.

The main objects of the investigation described in this paper may be summarised thus:—(i) To determine the effects of temperature and tension upon the sharing of the tensile load between the steel and aluminium components of a steel-cored aluminium (s.c.a.) conductor; (ii) to ascertain whether variations in the load distribution seriously affect the normal sag and safety of the conductor; (iii) to propose measures for ensuring that the normal sag remains unaffected after the stringing of the conductor. Tensions in the steel and aluminium at various points along typical s.c.a. conductors were measured by a magnetic method; a single length of steel-cored copper (s.c.c.) conductor was also included in the tests. The effects of load-distribution changes were estimated by noting the corresponding variation in the elastic modulus E_c of the conductor. Adhesion between the steel and aluminium was also examined.

The results indicated that the final load distribution is determined by the rate of creep in the aluminium wires, and is independent of the stringing temperature. Although more data concerning creep are required, the tests suggested that it will be some years before creep has any marked effect. It was found that the inelastic stretch of a conductor can cause large increases in sag which far outweigh those that might result from creep. Most of the inelastic stretch was removed when the conductor was tensioned up to the maximum design load, and pre-stressing of the conductors before final stringing was therefore strongly recommended.

The steel core appears to carry slightly more than its share of the total load, but since its safety and that of the conductor are not threatened thereby, no change in the B.S. Specification governing the strength of s.c.a. conductors was advocated.

Discussion

Mr. C. O. Boyse (Callender's Cable and Construction Co., Ltd.) said the ultimate object of the paper was to ensure that the desired margin of safety on the conductor was provided under the conditions of maximum loading and also that the calculated maximum sag in still air, was not exceeded. As to safety, the author had assumed throughout that the breaking load of steel-cored aluminium conductors given in the B.S.S. was beyond question, and there was no evidence in the paper to suggest that these results were not correct. A great deal depended on the interpretation of the Commissioners' Regulations. These required a certain factor of safety under certain loading condition based on the breaking load of the conductor. Did this mean the ratio of the breaking load to the total load on the conductor as a single ratio, or did it mean the ratio of the breaking load of the steel to the working load of the steel on the one hand, or another ratio of the breaking load of the aluminium to the working load of the aluminium? If the first interpretation was taken, viz, the ratio of the breaking load to the total load, there was still a margin of safety at any particular tension. If the ratios had to be taken separately, then the results in the paper suggested there was need for an alteration in the B.S.S. figures for one thing, and in general practice for another. The author suggested that the B.S.S. implied or required a factor of safety of 2.2 as applied to the steel core, but he did not understand how this came about, because there was nothing in B.S. 215 about factor of safety. Further, with regard to temperature range, B.S. 215, in connection with the modulus of elasticity and coefficient of expansion, gave a range between 32°F. and 86° F., whereas the calculations in the paper were based on a range from 22°F. to 122°F. He had never been enthusiastic about pre-stressing, and the paper did not contain anything which would encourage spending time and money on doing something to the conductor which ordinary service conditions would do for nothing. Congratulating the author on his ingenious magnetic method of measuring tension, he suggested its possible use in connection with guys on high masts.

Mr. E. Ambrose (Highfield and Roger Smith) said that J. S. and W. E. Highfield devised the mechanical means referred to in the early part of the paper, for determining the relative movement between the steel core and the aluminium. The whole object of this mechanical device was to see whether the calculations made by the Highfields were correct, but the results of the tests indicated that the conditions were very different from what the Highfields had assumed. The author's magnetic method was most ingenious, and he did not see why a similar method of measuring stress in stay wires should not be used.

Mr. S. Whitehead (E.R.A.) said the temperatures mentioned in the B.S.S. were

low compared with the temperatures to which a line could reasonably be loaded and to which there was no reason why a line should not be loaded. The main problem arose from ice loading and, therefore, he imagined the author felt there was no danger to be apprehended from anything happening at the time he was dealing with the higher temperature. Experiments that had been going on for some years, entirely confirmed the view expressed in the paper that the creep of aluminium wires did not become a serious problem provided the load did not exceed a certain value. That load or stress was of the order of 40 or 50 per cent. of the ultimate stress and in these circumstances it could be said that a different conclusion from that drawn in the paper would not have been arrived at had the period been longer than one year.

Mr. W. J. Nicholls (C.E.B.) asked whether the author had any opinion as to whether there was any real physical difference between the yield of aluminium and creep. He imagined there was a difference as it appeared that yield began at a lower stress than what was commonly called yield. As to adhesion, had consideration been given to steel-cored aluminium cables with a coating on the steel core? It might be that the lack of adhesion between the aluminium and the steel had an appreciable effect on the yield of the whole conductor. He thought pre-stressing was a good idea, because one knew exactly where one was with regard to sag after pre-stressing, but cost ruled it out. After an average 12 months' service a line not pre-stressed originally would give about the same results as a pre-stressed conductor.

Mr. E. T. Painton (M.A.P.) pointed out that the author's ingenious magnetic method of determining stress confirmed the results obtained with the graphical method. The author had extended his research into abnormal conditions and had found some very interesting things. To engineers the word " creep " was rather frightening. It was very definitely limited and, as far as he could see, creep could be looked upon as an additional factor of safety. If by any chance the stress in the aluminium exceeded half the working load and the load was prolonged, then automatically that excess load would be taken off the aluminium and put on the steel, which was capable of taking it. The author strongly advocated the ideal of pulling the conductor up to the fullest possible tension, i.e., that of the design load. Everybody would agree that that was good, but there were mechanical difficulties with steel-cored aluminium cable and some other way of doing it would be preferable. The right solution was to find out either by measurement or assumption what was the amount of permanent stress to allow for, and then allow for it in the sagging.

Mr. W. Tubb (J. L. Eve Construction Co., Ltd.) said it was disappointing that further conditions of the conductor in service had not been included in the investigations. In particular, the effect of vibration, or slight flexing of the conductor which would occur in all weather conditions. This was likely to reduce the bond effect of the wires and yet probably cause further yielding of the aluminium so that the " load ratio " was still uncertain. Pre-stressing beyond the maximum load was very desirable, but it did not appear to be a practical operation for the erector, and the manufacturer might find difficulties on his part.

The author, in reply, said in the paper he had regarded pre-stressing as a sort of ideal cure and had pointed out that it was desirable and certainly necessary under conditions where it was known the conductor would be subject to very high tensions, but it was not always necessary to do this. However, in cases where the maximum design load was reached for anticipated wind and ice loading, unless the conductors were pre-stressed up to that maximum design load, one must expect some increase in the normal sag, and it would be interesting to know what degree of pre-stressing—or any other method—had been carried out on conductors where permanent increases had been definitely recorded. The interesting point had been made that if the manufacturers or some independent body carried out a series of tests and measured the permanent extension or inelastic stretch on typical conductors, it might be possible to draw up a table correlating the maximum permanent stretch to be envisaged against the conductors that were likely to be used in practice and, further, from such a table it was simple to make due allowances when stringing the conductors. As a matter of fact, that was already partially done although, perhaps, not with such scientific accuracy that the line was over-tensioned, but such a procedure could be carried out by an independent body, or the manufacturers, because it was difficult to pre-stress under maximum design load under the many conditions which might be met in practice. The magnetic means for determining the tension of steel mentioned in the paper was a laborious process and many snags had been encountered, but it could be applied to guy ropes as suggested.

The chairman, Mr. H. W. Grimmett, said, in reply to Mr. Boyce's question, as far as the Commissioners were concerned the breaking load was that set out in the B.S.S.

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. A. V. Cannon has retired after 40 years' service with the G.E.C. and over 50 years in the electrical industry. He joined the G.E.C. as manager of the bell and telephone department at Manchester in 1904, after 10 years with the National Telephone Company. Four years later he came to the bell and telephone department at the company's head office in Queen Victoria Street, London, and has been associated with that department as technical adviser ever since.

Mr. A. V. Cannon

The Earl of Gowrie, V.C., has joined the board of Siemens Brothers and Co., Ltd.

Mr. D. W. Kent, secretary of the Igranic Electric Co., Ltd., has joined the board.

The engagement is announced, and the marriage will take place in July, of **Albert E. L. Mash,** of The Weald, Betchworth, and **Julia,** younger daughter of **Sir Ernest Benn** (chief proprietor of THE ELECTRICIAN) and **Lady Benn,** of Morven, Oxted.

The **Duchess of Kent,** attended by Lady Herbert and Mr. W. D. Short, H.M. inspector of factories, recently visited the works of Johnson and Phillips, Ltd., at Charlton., and was received by Mr. G. Leslie Wates, chairman and managing director; Mr. W. Glass, deputy managing director and general manager; and Mr. F. O. Townsend, inspector of factories. The Duchess saw women welding transformer, switchgear and condenser tanks and other employees engaged on the stranding of cables for fighters and bombers, the manufacture of submarine cable laying and picking-up gear, and various types of cables for electricity bulk supply and for the Services. Her Royal Highness was also shown some of the large J. and P. kiosk substations ready for despatch to Russia. Some of the oldest employees and several departmental managers were presented to the Duchess who later signed the visitors' book in the board room.

Mr. W. A. Satchwell has retired from the Manchester Post Office engineering department after 47 years' service with the National Telephone Co. and the Post Office.

E. K. Cole, Ltd., announce that **Mr. Frank Allen** is appointed general works manager (radio division), and will control the company's radio factories. Mr. Allen joined E. K. Cole, Ltd., in 1941.

Mr. Robert Lonsdale, Birkenhead, has been appointed deputy electrical engineer and manager of Paisley electricity department. He has been with Birkenhead electricity department for the last seven years. There were 44 applicants for the post.

Mr. C. J. Jones is the new secretary to the Electrical Machinery Export Committee, the Electrical Goods and Apparatus Export Committee, and the Arc Welding Electrode Export Group, 36, Kingsway, London, W.C.2.

Mr. Alfred Clark, chairman of Electric and Musical Industries, has been elected by the newly established Radio Industry Council as its first president. Mr. Clark began his career in Edison's laboratories fifty years ago. He introduced the phonograph to Europe.

Mr. C. Eric Stewart, of Johnson and Phillips, Ltd., has taken up duties with the company's branch at Bombay. Mr. Stewart is a son of the late Mr. Charles Stewart, for many years a director of Johnson and Phillips, Ltd.

Left to right: Mr. F. O. Townsend, Mr. G. Leslie Wates, the Duchess of Kent, Mr. W. Glass, Lady Herbert and Mr. W. D. Short at the works of Johnson and Phillips, Ltd.

Mr. Edward George Brooke, a director resident in Australia, of Cable and Wireless Ltd., and of Cable and Wireless (Holding) Ltd., has completed 60 years' of unbroken service in overseas telegraph

communications. Mr. Brooke joined the Eastern Extension Australasia and China Telegraph Company in 1885.

Mr. H. M. Sutherland, secretary, has been appointed a director of Davy and United Engineering Co., Ltd.

Science masters at the Lighting Service Bureau

Mr. G. H. Whitehead, joint chief electrical engineer and manager of the Oldham electricity undertaking, will retire on superannuation at the end of this month. He began service with the Oldham Corporation in 1907, and on the retirement of Mr. F. L. Ogden, in 1941, was appointed, with Mr. E. Binns, station superintendent, to the position of joint engineer and manager.

The prize winners in A.S.E.E. Branch Papers Competition for 1944-45 are announced as follows:—1, "District Heating" by Mr. J. F. Bridge (Manchester); 2, "Recording of Maintenance" by Mr. C. Rhodes (Leeds); 3, "Post-War Domestic Installations" by Mr. F. S. Ibbs (Liverpool). These papers will be read by the authors at the Association's meeting at the Lighting Service Bureau, Savoy Hill, London, May 15, at 6.15 p.m.

The Telcon Repertory Players, under the direction of Michael Le Grice, presented at the Telcon Works Concert Hall, London, on April 5, their thirty-fourth performance of Kenneth Horne's comedy "Love in a Mist." The play was well received by a large audience which included Sir Geoffrey R. Clarke, managing director, and other senior officials of the company. The players have performed to all branches of the British and Allied Forces and have augmented the Telcon Comforts Fund by approximately £130.

Mr. Norbert Merz, chairman of the board of directors of A. Reyrolle and Co., Ltd., has retired after 44 years' service. He was secretary of the company from its formation in 1901 until 1912, and has been a director since 1918 and chairman since 1939. **Mr. George Wansbrough,** deputy chairman, has been made chairman. He has been a director of the company since 1934, and is also a director of C. A. Parsons and Co., Ltd., British Power and Light Corporation, Ltd., Morphy Richards, Ltd., Ross, Ltd., and other companies. **Col. B. H. Leeson,** director and general manager of A. Reyrolle and Co., Ltd., has been appointed managing director. He has been with the company since 1919.

Some 50 science masters, from public and secondary schools all over the country, visited the E.L.M.A. Lighting Service Bureau on April 11, to hear lectures by Mr. E. B. Sawyer, acting manager of the Lighting Service Bureau, and by Mr. A. D. S. Atkinson. This visit was arranged as part of the three-day annual meeting in London of the Science Masters Association. The party inspected the demonstration rooms and showed particular interest in the daylight and warm-white fluorescent lighting installations.

Supply Cost

THE E.R.A. have published in report K/T112 (price 10s. 6d.) a method of classifying electricity supply cost, the author being W. A. Carne.

In the course of research into various aspects of electricity supply economics it has been found that one of the prerequisites of systematic approach is a correct and uniform system of cost classification. This report presents the principles of a system of classification founded on scientific considerations, and may thus provide the basic material from which, after discussion by the industry, a standard system of costing and accounting can be devised.

The system put forward is based on the chronological order of functions and the natural sequence of processes, being the only one that lends itself readily to the production without duplication both of details for operational control and of bulk figures for accountancy purposes. It is also easily adaptable to changing and expanding requirements.

A series of model cost statements serves to describe the method in a condensed form, at the same time illustrating its utilisation for local administration purposes, accountancy control, and inter-undertaking comparison. The detailed cost-classification scheme forming the basis of these cost statements is set forth in full in an appendix.

Amongst other matters dealt with by way of appendices are a general exposition of the various requirements of a cost-classification system, and a comprehensive coding-scheme which not only enables the elements of costing to be produced under the appropriate heads of the classification system adopted, but also caters for the many and varied aspects of cost segregation.

News in Brief

X-ray Analysis.—Sir L. Bragg, F.R.S., is to deliver a lecture on " X-ray Analysis; Past, Present and Future," before the Royal Institution, London, W.1, on May 11, at 5 p.m.

East African Power Scheme.—It is reported that on May 1 the East African Power and Lighting Company will apply to the Government for a bulk supply licence authorising the purchasing of electrical energy at Moa in Tanganyika. This is regarded as a preliminary step in the inauguration of an electrical power line between Kenya and Tanganyika.

I.M.E.A. Scottish Centre.—The annual meeting of the Scottish Centre is to be held in Glasgow, on May. 23.

Library Lighting.—The Chesterfield Libraries Committee has asked the Electrical Engineer to make experiments for the improvement of the lighting at the library.

Electrical Firm's Donation. — The Wessex Electricity Co. have subscribed 25 guineas to the Abingdon, Herks, Gratitude (Welcome Home) Fund for the men in the Services.

Electrical Exhibitions.—The Chester Electricity Committee has agreed to contribute £250 towards the cost of a July exhibition under the auspices of the Electrical Development Association. The Southport Electricity Committee has authorised the Electrical Engineer to obtain on loan for display purposes various types of post-war electric kitchens, at a charge of five guineas per week, the Committee to bear the cost of erecting and dismantling.

Power in the Highlands.—It is announced that the two committees appointed under the Hydro-Electric Development Act to examine the effect on local amenities and fisheries of the proposed damming of the Rivers Tummel and Garry at Pitlochry for the Highlands hydro-electric scheme urged in the reports issued recently that the proposal should be abandoned. The Hydro-Electric Board announces that it does not intend to accept the recommendation. A public inquiry is, therefore, to be held in Edinburgh, on April 25.

Northern Ireland Power Scheme.—It is claimed that about £1 000 000 would be saved by the co-ordination scheme proposed to operate in Northern Ireland in electrical undertakings after the war. One of the safeguards is that Belfast would not be called upon to pay higher for its electricity services than if it were generating for its own requirements, and the only generating stations could be acquired by agreement. It is further claimed that a reduction in the quantity of stand-by plant would result in a saving of possibly 30 000 kW of generating capacity, which would represent a saving of upwards of £1 000 000.

Hospital X-ray Installation.—The Essex Health Committee is to purchase a deep X-ray therapy set for Oldchurch Hospital, Romford, at an estimated cost of £3 000.

Cheltenham Jubilee.—The Electricity Committee is to give publicity to the achievements of the Cheltenham electricity undertaking which reaches its jubilee next month.

Post-war Electrical Scheme.—The South Shields Borough Electrical Engineer has submitted to the Electricity Commissioners an estimate amounting to £14 919 for post-war electrical development.

Post-war Street Lighting.—The Stoke Newington Highways Committee recommends approval in principle to the future lighting of streets by Electricity, and the preparation of a detailed scheme for this purpose. The Aberdeen Watching and Lighting Committee has decided to instruct the City Engineer to remove the star lighting which is at present in use in the principal streets in the city so that preparations can be made for a return to full lighting.

Electrical Engineering Apprentices.—As the result of a series of joint conferences between the E.C.A. of Scotland and the Electrical Trades Union on the future of the apprenticeship problem in the electrical contracting industry in Scotland, a Joint Apprenticeship Council has now been set up. Arrangements are being made for the technical education of apprentices during their period of service, for interim reports being obtained at the end of three years, and for transfer of particular apprentices when such transfer is desirable in the interests of the apprentice.

TWENTY-FIVE YEARS AGO

FROM THE ELECTRICIAN *of April 16, 1920: The French Ministry of Industrial Reconstruction has received a proposal from M. L. New to substitute the importation of electric energy from England for the importation of coal. A large generating station would be erected near Dover and energy would be transmitted by submarine cables to the Nord.*

Post-War Installations

Plea for a Compact and Silent Lighting Control Switch

"POST-WAR Electrical Installations" was the subject of a paper by Mr. E. J. Sutton, read before the Association of Supervising Electrical Engineers on April 17.

It had been recommended, he said, that the incoming service to the small house or flat should be capable of supplying a load of 16 kW, and for this purpose a .0225 sq. in. twin cable was required. Whether the service to the small house was overhead or underground, it was the supply authorities' responsibility to instal the necessary cables but this was not always so in the case of the internal services supplying a number of individual flats grouped in one building. It was probable that the accepted practice for post-war flat development schemes would be for these services to become the responsibility of the respective supply authorities, and the author saw no reason why they should not also supply and instal the consumer's control unit, at which the incoming service terminated.

Adequate Wiring Channels Needed

As it was desirable to standardise the unit to be installed in any one supply area, most of the suggested designs provided for a pre-payment meter to be incorporated. This seemed to make the unit unnecessarily cumbersome, and the author suggested that the meter be housed separately, thus enabling the wiring contractor to have a more flexible choice of entry for the sub-circuit wiring.

Although the Post-War Building Study No. 11 recommended connecting the socket outlets to a ring circuit, it was still open to question whether this was the most efficient method to be adopted as a standard for all types of domestic dwellings. The author would much rather see ample provision made for easy wiring extensions to enable additional outlets to be installed at a future date. This would necessitate the provision of adequate wiring channels in the building structure. These could be provided in the skirtings and door architraves, so that all wiring was concealed and adequately protected, and always accessible.

Ample provision should be made for the use of portable electric appliances in all rooms by the installation of an adequate number of socket outlets. In the living rooms no wall space exceeding 6 ft. in length should be without an outlet. The normal five-roomed house (excluding kitchen and bathroom) should be provided with not fewer than 15 general purpose socket outlets. In his opinion, as a practical engineer without any manufacturing bias, it seemed that the most logical solution of the controversy regarding the choice of a standard socket outlet was to produce an entirely new standard outlet with the fuse located in the plug. A range of three sizes of aperture to take fuse cartridges capable of dealing with normal loadings of up to 600 W, 1 kW, and 3 kW, should cover most portable appliances. Whether the pins of the new standard plug were round or flat seemed immaterial, but the use of the flat pin merited serious consideration.

Possible Developments

Suggesting the production of a lighting control switch of more compact design, with silent operation, the author said this would facilitate its being housed in the door architrave, and do away with the unsightly switch plate at varying distances from it.

Discussing the subject of new schools, the author said the framework of the buildings would be constructed of light steelwork, and with the adoption of the standard unit, modern methods of prefabrication were likely to be utilised to a maximum degree. Close co-operation between the services engineers and the architects was therefore imperative in the design stage.

After referring briefly to the possible needs of new hospitals and other buildings, the author dealt with internal distribution in the various types of buildings. It was difficult to foresee, he said, any startling departures in accepted practice in connection with the internal distribution in the various types of building. It was essential to provide ample self-contained ducts and enclosures to house the main feeder cables and such provision must be considered early in the design of the general structure. In multi-storey buildings particularly, substantial rising mains would be required, and they would, no doubt, see increasing use made of bus-bar systems for the risers, and probably in some instances for the lateral feeders from the main switchroom.

They could safely anticipate a few developments in fuse distribution boards where they were to be used on the standard 400/230 V supply system. With the common adoption of a two-part tariff it became unnecessary to segregate the final sub-circuits supplying lighting and general purpose outlets. Since it was fairly safe to assume that the I.E.E. Wiring Regulations would be amended to permit the use of the ring circuit, the protecting fuse for which might be of 30 A capacity, there would probably be a need for the fuseboard to be capable of housing fuses up to this size. That called for the standardisation of fixing centres and bus-bar connections of fuse bases so that they might be interchangeable.

Electricity Supply

Birkenhead.—The Transport Committee is to purchase battery charging equipment at an estimated cost of £400.

Lowestoft.—The Electricity Committee is seeking sanction to borrow £30 000 for mains and services, sub-stations and meters.

Scarborough.—The Electricity Committee is to increase the capacity of transformers at various sub-stations at an estimated cost of £979.

Liverpool.—To meet industrial and housing developments, the Electricity Committee has approved an extension scheme costing about £350 000 for two large new distributing centres as well as the laying of 33 000 V cables underground. This will ensure a distribution of electrical energy throughout the 142 square miles of country which draws its supplies from the city's undertaking. It will provide energy for any new factories and post-war housing.

Chesterfield. — At a meeting of the Lighting Committee it was reported that the cost of trunk road lighting if controlled by means of synchronous type solar dial time switches, would be about £8 058, with an additional £618 if the lighting were to be controlled by means of the ripple relay system. The Electrical Engineer was asked to obtain tenders with statements as to the additional cost of controlling the lighting by means of any special relay system which they could instal.

Wick Electricity Supply.—Wick Ratepayers' Association are to ask the T.C. to ascertain from the Hydro-Electric Board what progress has been made with the proposed distribution supply for Caithness referred to by Mr. A. E. MacColl, vice-chairman of the Board, when visiting Wick last year, and when such supply would be available. The association has also discussed the advisability of the T.C. selling the electricity undertaking to the Board.

Northern Ireland.—According to the statistics for 1944 issued by the Electricity Board of Northern Ireland, units purchased and generated rose to 110 683 000 from 53 249 000 in 1939; units sold, 90 000 000, or more than double since 1939; the average price of units sold was 1.38d., the total revenue £617 460, compared with £316 465 five years ago. The cost of current rose from £90 277 618 because of the increased cost of coal. There were increased extensions of h.t. and l-t. lines and other work necessarily taken in hand. Reductions of tariffs were made to industrial users, and guaranteed revenue in respect of extensions was reduced from 20 to 12½ per cent.

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.

Cleethorpes T.C., April 23.—Supply, delivery (and erection of high tension, low tension switchgear) for the following: (a) H.t. switchgear; (b) l.t. switchgear; (c) 500 kVA transformer and (d) h.t. cable. Specification from Mr. B. S. Lord, Electricity Showrooms, Grimsby Road, Cleethorpes.

Liverpool Electricity Department, April 27.—Supply of h.t. and l.t. switchgear for sub-stations. Particulars from the City Electrical Engineer, 24, Hatton Garden, Liverpool, 3.

Manchester Electricity Department, April 30.—Extensions to 33 000 V switchgear at the Barton generating station and Benchill sub-station (Spec. No. B.145). Particulars from Mr. R. A. S. Thwaites, Electricity Department, Town Hall, Manchester; deposit, £1 1s.

Glasgow City Council, April 30.—Supply and erection of three electrically-driven centrifugal pumps, one exhauster for priming same and one portable electrically-driven centrifugal pump. Specification from the Manager, Sewage Department, 50, John Street, Glasgow, C.1.

Grimsby Electricity Department, May 1.—Supply of two e.h.p. switchgear (Spec. 425), two l.p. switchgear (Spec. 428), three transformers (Spec. 429) and 5 000 yds. e.h.p. and l.p. cable (Spec. 430), for sub-stations. Specifications from Mr. G. W. Parker, Electricity Works, Moss Road, Grimsby.

Formby U.D.C., May 3.—Supply and delivery of 1 400 kVA outdoor type transformer. Specification from Mr. D. L. Leonard, Council Offices, Formby.

Plymouth City Council, May 5.—Supply and delivery of l.t. underground network disconnecting boxes. Specification from the City Electrical Engineer, Armada Street, Plymouth.

Industrial Information

Improved Lighting at Manchester Works.—In their works at Upper Brook Street, Manchester, William Arnold, Ltd., have, with their own electrical staff, carried out a new lighting installation of 72 points, planned by B.T-H. lighting engineers. It consists of Mazda 80 W 5 ft. fluorescent lamps in Mazdalux F.139 continuous trough fittings mounted at 12 ft. above floor level. The fittings are suspended from the roof trusses, which are at 12 ft. 6 in. centres. The installation was designed for a service intensity of 12-15 f.c.

Fluorescent lighting in a Manchester works

Aluminium Development.—The main object of the newly formed Aluminium Development Association is to develop new and extended uses for aluminium alloys by initiating or assisting in the production of prototypes, encouraging research of all kinds, and by undertaking propaganda designed better to inform the public of the many uses to which this metal should be put. It is announced that the Wrought Light Alloys Development Association will be absorbed at a later date within the more comprehensive body.

Panel of Technical Advisers.—The Ministry of Supply announces the formation of a panel of technical advisers to assist the Director General of Machine Tools on special technical problems associated with particular types of machines. The members of the panel are as follows:—Messrs. H. W. Smith (B.S.A. Tools, Ltd.); G. W. Nash (Buck and Hickman, Ltd.); J. G. Petter (Cincinnati Milling Machines, Ltd.); H. T. Millar (Churchill Machine Tool Co., Ltd.); H. A. Chambers (Associated British Machine Tool Makers, Ltd.).

E.D.A. Bulletin.—Further details of the electrical equipment of Birmingham's experimental post-war houses are given in the March number of the E.D.A. Bulletin. The visits of the Queen and members of Parliament to the exhibition of electric kitchens at the Building Centre, Maddox Street, London, are reported.

Fuel Efficiency.—"Water Treatment" is the subject of Bulletin No. 39, issued by the Ministry of Fuel and Power, the main object being the saving of fuel and maintenance costs by maintaining steam-raising plant in satisfactory running condition by the prevention of scale and/or corrosion in the boiler and auxiliary plant.

Metal Prices

		Monday, April 16. Price.	Inc.	Dec.
Copper—				
Best Selected (nom.)	per ton	£60 10 0	—	—
Electro Wirebars ...	,,	£62 0 0	—	—
H.C. Wires, basis ...	per lb.	9 7/8d.	—	—
Sheet	,,	10 7/8d.	—	—
Phosphor Bronze—				
Wire(Telephone)basis	,,	1s. 0 1/8d.	—	—
Brass (60/40)—				
Rod, basis	,,	—	—	—
Sheet ,, ...	,,	—	—	—
Wire ,, ...	,,	10 7/8d.	—	—
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	,,	£26 10 0	—	—
Foreign or Colonial	,,	£25 0 0	—	—
Tin—				
Ingot (minimum of 99.9% purity) ...	,,	£303 10 0	—	—
Wire, basis...	per lb.	3s. 10d.	—	—
Aluminium Ingots ...	per ton	£85 0 0	—	—
Spelter...	,,	£25 15 0	—	—
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 News

VERITY'S LTD.—Div. 7½% (same).

PACIFIC GAS AND ELECTRIC.—Qtrly., 50 cts. on com.

ELECTROLUX CORPN.—Net pft. 1944, $848 962 ($456 634).

NEWTON, CHAMBERS AND CO., LTD.—Fin. div. on pref. and ord. 10% (same), payable May 9, mkg. 15%.

JARROW AND DISTRICT ELECTRIC TRACTION—Pft. 1944, £32 (£18), increasing cred. blce. brot. in from £218 to £250.

HYDRO-ELECTRIC SECURITIES (Montreal).—Net income 1944 $528 408 ($494 038). Break-up val. of com. $6.38 ($5.10).

NORTHERN STATES POWER (Minn., U.S.)—Pref. rcpt. 1944 shows operatg. rev. $49 059 924 ($46 577 411). Net income $6 362 867 ($6 492 004).

ELECTRIC SUPPLY CORPORATION, LTD.—Rev. 1944 £193 283 (£178 025), less wkg. costs, tax and depreen. £132 049 (£119 207), leavg. net pft. £61 234 (£58 818). Pref. div. £15 000 (same), ord div. 10% £43 126 (same), fwd. £40 968 (£37 860).

Company Meetings

NORTHMET POWER CO.—The annual meeting was held in London on March 27, Mr. G. W. Spencer Hawes, presiding in the absence of Lord Ashfield, the chairman. The latter, in his speech, read by the secretary, said that at December 31, 1938, consumers numbered 263 750, as compared with 338 245 consumers to-day; an increase of 28 per cent. The number of units supplied to them had risen from 706 059 000 in 1938 to a record total of 1 054 667 000 in 1944—an increase of 348 608 000, or nearly 50 per cent. compared with 1938. In this same period the gross revenue rose from £3 342 000 in 1938 to £5 113 000 in 1944. The capital expenditure of the North Metropolitan Power Station Co. during the year, mainly in connection with the extensions of the generating stations, amounted to £217 145. After deducting the cost of plant written off, the total capital expenditure of the Station Company at December 31 last was £5 445 347.

BOURNEMOUTH AND POOLE ELECTRICITY SUPPLY CO., LTD.—In the course of his address at the annual meeting held in London on March 27, Sir Robert Renwick, Bt., the chairman, said that to meet consumers' demands, the units purchased for the year 1944 totalled 136 millions. This compared with 80.4 million units purchased in the year 1939, which showed an increase of 69 per cent. As compared with 1943 the units purchased showed a rise of approximately 19 per cent. The revenue from sale of current at £733 093 compared with £510 122 for 1939, but expenditure for the past year of £529 482 had to be compared with a comparable figure of £324 759 for 1939. In spite of the cost of current having increased by over 100 per cent. during the war years, consumers were still enjoying pre-war prices for their supplies. One of the reasons for this was that, in spite of the rise in rates of labour and price of materials, the company had been able, by good management, to keep down distribution costs. The number of consumers was now 68 534 as compared with 65 380 in 1939.

The U.K.P.I.

In the chairman's statement, which accompanied the one hundred and fourth annual report and balance sheet of the United Kingdom Temperance and General Provident Institution, Sir Ernest J. P. Benn, Bt., said the vastly swollen National Debt now amounted to 45 per cent. of the total value of private property in this country, and more than a third of it was callable within a year. This could not be considered a healthy condition, and emphasised the urgency of a halt in the orgy of spending and the piling up of public commitments. The unrivalled stability of Britain had always depended upon the successful balancing of the Budget, and that dependence would be of even greater importance in the days to come. A post-war aim of first importance would be to perpetuate the saving habit developed with such gratifying success in the last few years. Saving was essential in war-time, but to refrain from or defer spending and consumption must always be an essential part of the process of progress. It would be necessary to find new savers to replace any who from force of circumstances were obliged to encash Saving Certificates and other Government obligations, and in addition to rebuild capital assets of all descriptions lost or damaged by war. In this connection Life Assurance had a great part to play and might be regarded not only as a personal necessity but also as a national service. There was a great deal to be said for cheap money—meaning thereby good money at a low rate of interest—but there was also much that needed saying on the other side of the argument. Thrift, as a social service, was entitled to a just reward. Too much attention could be given to large public financial transactions and too little thought to the millions of individuals and the hundreds of thousands of small traders whose need was for money with good purchasing power.

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.*

BOWERS AND BARR, LTD., Gt. Yarmouth, electricians.—Feb. 26, two charges to Barclays Bank Ltd. each securing all moneys due or to become due to the Bank; respectively charged on messuage and appurtenances at Hall Plain, and warehouse at Row 71, both Gt. Yarmouth. *£2 254. Oct. 3, 1941.

NORTH METROPOLITAN POWER STATION CO., LTD., London, N.—Mar. 14. £1 500 000 3½% sec. deb. stock secured by a Trust Deed dated Mar. 13, 1945; gen. charge (ranking (subject to Trust Deeds dated Feb. 25, 1927, and Aug. 19, 1930), pari passu with Trust Deeds dated Feb. 16, 1937, Nov. 11, 1938, and June 26, 1939); also Mar. 14, additional security supplemental to Trust Deeds dated Aug. 19, 1930, etc., charged on certain lands and bldgs., etc., at Enfield, Waltham Holy Cross, Sewardstone and Hoddesdon Marsh, etc. (subject to Trust Deed dated Feb. 25, 1927). *£4 811 481. Apr. 14, 1943.

Satisfaction

BYLOCK ELECTRIC, LTD., Enfield, electrical engineers. Sat'n. Mar. 12, of mort. reg. Nov. 6, 1937.

Companies Winding Up

CUBA SUBMARINE TELEGRAPH CO., LTD.—At a meeting of this company at Electra House, Victoria Embankment, London, W.C.2, on March 26, 1945, a resolution was duly passed that the company be wound up voluntarily and that Sir Alan Rae Smith of 5, London Wall Buildings, London, E.C.2, be appointed Liquidator.

CHIPPING NORTON ELECTRIC SUPPLY CO., LTD.—At a meeting of the company held at 24-30 Gillingham Street, London, S.W.1, on April 3, 1945, a resolution was passed that the company be wound up voluntarily and that Mr. Leslie A. Pearl, 109, Jermyn Street, London, S.W.1, be appointed Liquidator.

Notice of Dividend

MILLER, George Thomas, 4, Harewood Close, Northolt, Middlesex, engineer, lately carrying on business under the style of Odeon Radio, at 335, Northolt Road, South Harrow, and 10, New Parade, Hayes, Middlesex. Radio dealer. First and final dividend of 6s. 3½d. per £, payable April 20 1945, at office of Trustee, 185-188, High Holborn, London, W.C.1.

Coming Events

Friday, April 20 (To-day).

I.E.E., MEASUREMENTS SECTION.—London, W.C.2. "An Electrical Moisture Meter." L. Hartshorn. *5.30 p.m.*——N.W. CENTRE, RADIO GROUP.—Manchester. "Frequency Modulation," K. R. Sturley. *6 p.m.*—I.E.E., BRISTOL STUDENTS' SECTION.—Bath. "Protection of A.C. Circuits and Plant," J. Fitzpatrick. *7.15 p.m.*

INSTITUTION OF ELECTRONICS.—Royal Society of Arts, London, W.C.2. Lecture. "Dynamics of Electron Beams," Dr. D. Gabor. *5.30 p.m.*

Saturday, April 21.

I.E.E., N.E. STUDENTS' SECTION.—Visit to the Washington Chemical Co.

A.M.E. AND M.E., LONDON BRANCH.—39, Victoria Street, S.W.1. Joint meeting with Kent Sub-Branch. *4.30 p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—Connaught Rooms, Great Queen Street, Kingsway, W.C. Annual luncheon. *1 for 1.30 p.m.*

Monday, April 23.

I.E.E.—London, W.C.2. Informal meeting. Discussion. "Electrical Aids to Public Speaking," P. G. A. H. Voigt. *5.30 p.m.*——MERSEY AND N. WALES CENTRE.—Liverpool. Short papers. "Some Notes on Coal Mining," E. W. Ashby. "Speed Control of D.C. Motors with the Grid Controlled Mercury Arc Rectifier," A. R. Davies, and "Costing of Engineering Work," D. J. Pearce. *5.30 p.m.*——I.E.E., WESTERN CENTRE. INSTALLATIONS GROUP.—Cardiff. "Modern Electric Lift Practice," L. S. Atkinson.——S. MID. STUDENTS' SECTION.—Birmingham. "An Introduction to Circuit Diagrams," A. J. Lundo. *7 p.m.*

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel. "Research in the Electrical Industry," H. Warren. *6 p.m.*

Wednesday, April 25.

I.E.E., RADIO SECTION.—London, W.C.2. Lecture, "The Fundamental Principles of Frequency Modulation," Dr. B. Van der Pol. *5.30 p.m.*——LONDON STUDENTS' SECTION.—Visit to The Gramaphone Co., Ltd., Hayes. *2.30 p.m.*——EAST- MID. SUB-CENTRE, Loughborough. Joint meeting with the Radio Group. "Energy Conversion in Electronic Devices," D. Gabor. *2.30 p.m.*——SCOTTISH CENTRE.—Edinburgh. Annual meeting. "The Electrical Aspect of Farm Mechanisation," C. A. Cameron Brown. *6 p.m.*

Thursday, April 26.

I.E.E.—London, W.C.2. Thirty-sixth Kelvin Lecture, "Electric Currents in the Atmosphere," Sir Edward V. Appleton, F.R.S. *5.30 p.m.*——CARDIFF STUDENTS' SECTION. Joint meeting with the Electrical Association for Women. Discussion, Electricity in the Post-War Home.

Friday, April 27.

I.E.E., N.E. STUDENTS' SECTION.—Newcastle-on-Tyne. Annual meeting. *6.30 p.m.*—— SCOTTISH STUDENTS' SECTION.—Edinburgh. "Oscillations in Mechanical and Electrical Systems," J. Willis. GLASGOW.—Joint meeting with the Students' Section of the Institution of Mechanical Engineers.

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