THE
ELECTRICIAN

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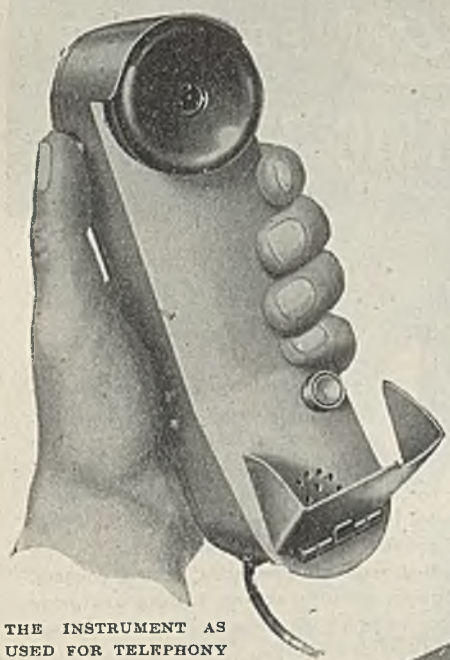

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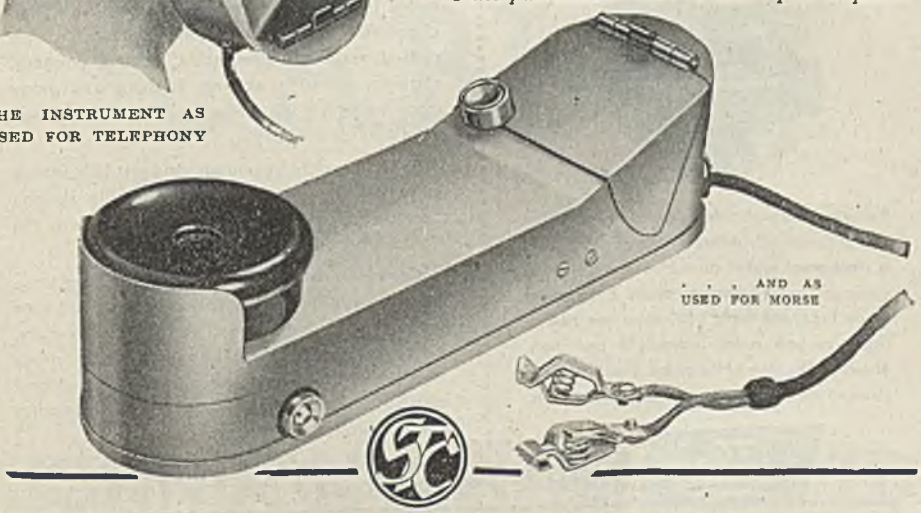

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THE ELECTRICIAN

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CHIEF CONTENTS OF THIS ISSUE

The Grid

ANSWERS to the many questions which have occurred to the industry during the last few years as to what extent the war has affected the operation of the grid, will be found in the reports for the years 1940 to 1943 which were released on Wednesday, and in which the Central Electricity Board makes it abundantly clear that the reason why the maximum generating capacity of the country is so near the figure of the peak load, is one for which the Minister of Production must be held reponsible.

This is borne out by the fact that among the difficulties which the Board encountered in carrying out power station extensions was that concerned with the shortage of labour and materials, the attitude of the Ministry of Production being that the necessary priorities could not be granted for plant extensions in that they were not considered to be of primary importance to the war effort. The Board, however, sensing the potential increased demand of industry as a result of war production, continued to press its point until in 1941, the Board was told that it would not be held responsible for any shortage of electricity supply which might arise from withholding the necessary priorities. Again, in 1942 the Board put forward a further substantial programme for new plant, of which only about a third was allowed by the Ministry of Production, and during 1943 another programme for completion by the autumn of 1948, though approved was subject to manufacture being withheld until further consent was given.

By this time, however, the effect of withholding permission to replace old plant and build new stations was beginning to overtax the capacity of the grid stations, and the possible electricity overload which has confronted the industry this winter is due to the restrictions which the Government thought fit to put upon the extensions advocated by the Board. While the Board has been relieved by the Government of responsibility in the matter, the general public, unless they read p. 3 of the 1941 report, will lay the blame upon the doorstep of the Board, and electricity supply may in consequence be subjected to much adverse criticism it does not deserve.

During 1940 and 1941 the war machine of the country was speeding up production in preparation for D-day, and though the negative attitude of the Ministry of Production with respect to power plant extensions may be understandable up to a point, the supply industry is now paying the price. Whether or not starving the selected stations of the extensions which good engineering held to be necessary was the best policy to follow, we

leave history to judge, bearing in mind the fact that even by the winter of 1947 there may still be connected to the grid some 2 000 000 kW of plant over 20 years old, with 347 000 kW of it over 25 years of age; a further 281 000 kW will reach the latter age in the following year.

Growth of Peak Load

COUPLED with the demands upon our man-power and material resources for war production, has been the year by year increase in the peak load for power, in that in the calendar year of 1942, the figure reached was 7 489 000 kW, in 1943 it was 7 970 000 kW, in 1944, 8 367 000 kW and in January last 8 706 000 kW. In addition, the longer working hours in war factories resulted in the demand being more constant throughout the day and the load factor on the grid system which was about 36 per cent. in 1938 rose in 1942 to some 50 per cent., necessitating thereby the longer daily use of plant which because of its age would in other circumstances have been operated for relatively short periods. This in its turn reduced the time available for maintenance, and, coupled with the variability of the coal delivered to the stations, output capacity and boiler efficiency were reduced—when in more normal circumstances it would have been reasonable to expect substantial improvement in such figures.

War-time Expansion

IN spite of the difficulties in convincing the Government of the danger of the peak load figure reaching that of the maximum generating capacity, however, considerable expansion was made, for by the end of 1943, some 670 miles of transmission lines, many of them specially erected to meet war requirements, were added to the grid system; an addition of 37 was made to the number of switching and transforming stations; the number of selected stations was increased by 5 to 142, including three new units; the aggregate installed capacity being 10 984 656 kW. From an engineering point of view the system of inter-connection provided by the grid proved a valuable contribution to the national war effort, in that it not only enabled supplies to be made available for rapidly expanding demands of munition and other factories, but when those demands exceeded the capacity of the generating stations in the areas in which they were located, the transfer of power from the pooled generating resources in those areas in which demand had dropped off was facilitated by the flexibility of the system. Again, since the grid enjoyed comparative immunity from serious dislocation by war damage, it proved of immeasurable advantage in those areas where supply was interrupted through damage by enemy action to local stations.

University Vacation Training

THE Vacation Work Committee of the Imperial College Union of London University has during the last two years held a conference of industrial representatives in order that views may be exchanged, the requirements of students better catered for, and the needs of industry better appreciated. The last conference was held in December and among those who spoke was Dr. P. DUNSHEATH, who gave his views on industry's requirements in personality. Contact with a number of Imperial College students who have from time to time been employed under the Vacation Training Scheme, shows that in most cases their reactions are the same. Namely, that the short time they are engaged in industry permits them to appreciate not so much the opportunity of applying their knowledge to the processes carried out at any particular works, as the necessity for correct handling of the works personnel. Talking to these students more often than not shows that their understanding of economics is weak, while their views generally suggest that their contacts with the executives of the firms should be more frequent, and then made to serve as opportunities for explaining to the students the more complicated forms of administration.

Undergraduates in Industry

THE universities, in Dr. DUNSHEATH'S opinion, at present consider an undergraduate too much as a box to be filled with good things, nicely tied up and labelled ready for handing to industry, whereas the student should, too, be made aware of the fact that industrial life is likely to be perpetually irritating to any who cannot make allowances for such things as age and experience. Youth is commendably eager and the undergraduate filled with the latest college

theory is often apt to believe that he knows more than his older neighbour. Vacation training has done something to adjust matters but with the average student regarding a Degree as his ultimate goal, he cannot afford to accept such training as often as he should without encroaching too much upon his time for study. Six weeks works training in the autumn and three in December are better than nothing, it is admitted, but there should be in addition, some college instruction, which in the words of Dr. DUNSHEATH, will show that, though great knowledge is a help, it is no guarantee of success; more important is the way in which that knowledge is applied to everyday human relationships.

Industry and Research

THE address which Sir ARTHUR FLEMING delivered at the annual luncheon of the E.R.A. on February 9, showed that the association under his presidency is not likely to lose sight of the fact that production in war-time is vastly different from that obtaining in a world of peace, in that in war, developments are made without regard to cost, whereas in peace cost is a vital factor. Sir HARRY RAILING, who also spoke, was equally realistic. Both speakers were emphatic in the need for expanding the facilities of the association, commensurate with the ever-growing requirements of the industry, and while both speakers had something to say of past achievements it was with the future that most of their remarks were concerned. The threat of possible controls encroaching upon industrial development would, it was suggested, be best met by the industry becoming so efficient that its usefulness to the community could not be bettered by any other system, and in the establishment of that condition research could play a major part.

The E.R.A. Brochure

THE annual report of the E.R.A. made known the intention of the association to put into the form of a brochure a history of its work for the information of those who, occupying positions of responsibility, may not already be sufficiently acquainted with the nature and importance of its functions, and the publication is now available. Accustomed as we have become to war-time paper, printing and binding, the booklet—handsome even by peace-time example—is a production which does credit to the high standards set by the association in all else it does. Without the use and financial advantages of an organisation like the E.R.A., British manufacturers would long since have been obliged to adopt methods of test and technical standards developed in the United States and on the Continent, whereas as it is, British representatives are now able to take a leading part in establishing international standards; an advantage which will have a considerable influence upon our export trade.

Domestic Electricity

READERS of the "Daily Telegraph" on February 8 were treated to the views of Sir LEONARD HILL on the future of electricity supply, and though Sir LEONARD may be excused for being so ill-informed on electrical matters, less understandable is his apparent lack of appreciation of the fact that all fuels, coal, coke, oil, gas and electricity are in short supply. Fortunately, the challenge thrown down by Sir LEONARD, was on Monday taken up by Mr. CLARENCE PARKER, chairman of the E.D.A., who, with simple facts, blunted every argument advanced in favour of the gas industry.

Post-war Service

TO the facts given by Mr. PARKER, may be added those given in the reports of the Central Electricity Board wherein, too, may be found support of Mr. PARKER'S statement that the shortage of generating capacity is the result of the nation's war effort, and not in any way due to inability of the industry to meet any peace-time demand. Sir LEONARD concluded his remarks to the effect that local authorities would be well advised to consider the whole problem most carefully before deciding that temporary houses to be erected in their areas should be all-electric, to which we can only reply that if the local authorities in question fail to respect the growing public demand for electricity service, they will be failing in their public duty. Any doubt in the growth of that public demand is answered by the fact that increased domestic consumption is one of the contributory factors in bringing about the possible war-time electricity overload, which prompted Sir LEONARD to ventilate his views.

The Grid in War-Time

Electricity for Munition Production—C.E.B. Reports for 1940-43

THE recent relaxation in the restrictions placed upon the publication of statistical details has permitted the Central Electricity Board to release its annual reports for the years 1940 to 1943 inclusive, and since these present a picture of the operation of the grid system during the war period as a whole, we deal with their contents below as if they were one report. This, it is felt, will enable readers to more readily absorb the mass of detail given, though for reasons of space much which we would have preferred to have included is unavoidably omitted; the reports themselves, however, are available at the Stationery Office, price 1s. each.

During the four years, covered by the reports, considerable expansion took place and at the end of 1943 the grid system comprised 3 585 miles of 132 kV lines, 1 514 at 66 kV and lower voltages, and 344 substations with an aggregate transforming capacity of 13 058 750 kVA. The number of selected stations was increased by five and the capacity of all such stations was raised by 2 326 656 kW, the number of stations at the end of 1943 being 142, with an aggregate installed capacity of 10 984 656 kW. The first section of the Little Barford station, as explained in THE ELECTRICIAN of January 19, became operative in 1941, the station at Barrow-in-Furness was "selected" in the following year, and three new stations, two of which were constructed specially to meet war requirements, were commissioned in 1943.

Rise in Output

Except during the fuel economy campaign in the winter of 1942-43, the aggregate output, which was a little over 26 400 000 000 kWh in 1939, rose to some 37 000 000 000 in 1943, over 40 per cent. increase. Of electricity supplied by distributing undertakers throughout the country (excluding North Scotland) in the latter year, 98.65 per cent. was produced at stations generating for the Board.

The reports disclose some of the difficulties encountered in carrying out extension programmes, in respect both of grid lines and associated sub-stations, and of generating capacity in selected stations; the attitude of the Government's Production Executive being that priorities could not be granted for extensions which could only be justified by peace-time requirements. As early as 1941, the Board, impressed with the danger of a national shortage of plant, urged upon the Government the seriousness of the position which was likely to arise if, for reasons of war policy, the necessary priorities were not granted but the Board was informed that it would not be held responsible for any shortage.

Again, in 1942, the Board put forward a substantial programme of new plant for the autumn of 1945, but the Minister of Production allowed only about one-third of its extent.

Time-Expired Plant

During 1943, the Board put forward a programme of new generating plant, some of which would be required to be in service by the autumn of 1947 and the whole by the autumn of 1948. The greater part of that programme was approved on the understanding that orders for the main items of plant could be placed but that, pending the cessation of hostilities with Germany, no work of manufacture should be undertaken until further consent was given. In framing that programme, the Board had in mind the replacement of some 2 000 000 kW of time-expired plant which would be over 20 years old by the winter of 1947 but decided that, in view of the interconnections provided by the grid, full replacement of that plant could be deferred until it was 25 years old.

From the outbreak of hostilities it became necessary for the Board to depart substantially from its peace-time policy of concentrating generation in the most economical stations and to keep a larger amount of generating plant than usual in constant readines to secure, as far as possible, continuity of supply in emergency. Black-out restrictions and longer working hours resulted in the load factor, which was about 36 per cent. in 1938, rising to some 50 per cent. in 1942; in 1943, however, there was a decline to about 48 per cent. in that year. A further effect of the war on grid operation was a transference of the peak demand, which in pre-war days was normally in the evening and limited to about one hour per day during the fortnight immediately preceding Christmas, to a period extending with little variation throughout the morning during three or four winter months.

The use for long hours of plant which would normally have been used only for short peak periods, the shortage of labour available for maintenance work, and the inferior and variable quality of coal had the combined effect of reducing the average thermal efficiency of stations operating under the Board's direction during 1941 and 1942 by some 3 per cent. below that

recorded in 1939, involving substantial annual increases in the quantities of coal consumed. During 1943, however, owing to improved war conditions and to new generating plant being brought into operation, a saving in coal consumption of over 400 000 tons was effected as compared with the quantity which would have been consumed on the 1942 level of thermal efficiency, though the efficiency figure attained was still 1 per cent. below that of 1939. Added to maintenance difficulties a progressive increase in breakdown brought about a serious reduction in the amount of plant available for service. During the winter of 1942/43 the aggregate amount of plant out of commission due to overhaul, breakdown and other causes averaged 1 250 000 kW, and in the winter of 1943/44 1 857 000 kW, being respectively 13 per cent. and 18.6 per cent. of the aggregate selected capacity of all stations as compared with a pre-war average percentage of about 6.

The annual accounts covering the first four years of the war show that the gross receipts from sales of energy rose from £37 899 128 in 1939 to £68 299 560 in 1943, the increase being accounted for partly by the big expansion in the volume of trading and partly by the substantial rise which had taken place in coal costs. Apart from the added financial burdens attributable to war-time operation and other causes, the Board, in common with all other authorised undertakers, experienced a general and progressive rise in their revenue expenses. These factors were sharply reflected in the revenue account for 1940 which showed a balance lower by £558 436 than that for 1939. The estimated results of trading at the end of the following year were insufficient to cover working expenses and capital charges. It proved possible, however, to reach a settlement during the year in a number of cases relating to earlier years, in respect of which conservatively estimated amounts had been included in the accounts for those years. In consequence, the revenue balance showed an increase of £837 028, while the balance of the net revenue and appropriation account was raised by £430 472 to £2 983 820. During 1942 and 1943, the improved load factor brought about by the war, and the continued expansion of munitions output, more than offset the adverse war factors so that the revenue brought to account in each of those years was sufficient to meet all outgoings, including interest and amortisation, and increase the credit balances on net revenue and appropriation account by amounts of £873 953 and £1 325 479, respectively. At the end of 1943, the balance was £5 183 252 as compared with £2 433 716 at the end of 1939. During the four years, the capital expenditure on the grid undertaking was increased by nearly £6 000 000.

To the Board's primary function of carrying on the grid undertaking was added during 1940, the duty of administering the Electricity (Civil Defence) Fund, which was established to defray expenditure on a national pool of spare equipment for war emergency purposes, and on measures for securing the due functioning of the public electricity supply systems during the war. The fund, limited to a maximum of £6 000 000, is provided as to one half by Exchequer grants and as to the other half by money raised by the Board on the security of a levy on the supply industry. At the end of 1943, the Board had exercised their borrowing powers to the amount of £2 368 993.

EXTENSIONS FOR WHICH ARRANGEMENTS WERE MADE BY THE CENTRAL ELECTRICITY BOARD DURING PERIOD JANUARY 1, 1939, TO DECEMBER 31, 1943.

Scheme.	Station.	Owners.	No. of Generators and Capacity (kW.).	No. of Boilers and Capacity (lbs./hour).
Central Scotland.	Kilmarnock ...	Ayrshire Elect. Board ...	1 × 30 000	3 × 150 000
	Clyde's Mill ...	Clyde Valley E.P. Co. ...	3 × 30 000	12 × 100 000
	Bonnybridge ...	Scottish Central E.P. Co. ...	2 × 20 000	4 × 120 000
North-East England	Darlington ...	Darlington Corp.	2 × 20 000	4 × 120 000
	Dunston ...	North-Eastern E.S. Co. ...	—	1 × 156 000
	Kepier ...		2 × 50 000	3 × 375 000
	North Tees ...		—	2 × 180 000
	Sunderland ...	Sunderland Corp.	2 × 20 000	3 × 121 000
North-West England and North Wales.	Whitebirk ...	Blackburn Corp.	1 × 30 000 1 × 40 000	6 × 150 000
	Willowholme ...	Carlisle Corp.	2 × 30 000 1 × 750†	5 × 150 000
	Kearsley ...	Lancashire E.P. Co.	1 × 50 000 1 × 1 600†	4 × 173 000
	Padiham ...		—	2 × 56 000
	Lancaster ...	Lancaster Corp.	1 × 20 000 1 × 800†	1 × 205 000
			1 × 20 000 1 × 800†	1 × 200 000*
	Clarence Dock ...	Liverpool Corp.	1 × 50 000 * 1 × 1 500†	1 × 250 000* 2 × 350 000

(*continued p.* 138.)

Scheme.	Station.	Owners.	Details of Extensions. No. of Generators and Capacity (kW.).	Details of Extensions. No. of Boilers and Capacity (lbs./hour).
North-West England and North Wales (*continued*)	Stuart Street ...	Manchester Corp.	1×60 000 1×30 000 1× 750† 1×25 000 1× 1 500†	2×400 000 4×130 000
	Ribble	Preston Corp.	4×31 500	4×187 500 4×190 000
	Hartshead	Stalybridge, Hyde, Mossley and Dukinfield T. and E. Board.	1×30 000 1× 1 250†	3×150 000
	Stockport	Stockport Corp.	1×30 000	1×300 000
	Trafford	Stretford and District E. Board	1×30 000	2×150 000
	Warrington	Warrington Corp.	2×20 000 1×20 000*	3×200 000 1×200 000*
Mid-East England...	Valley Road	Bradford Corp.	1×30 000 2×22 500	3×180 000
	Huddersfield ...	Huddersfield Corp.	1×20 000	2×120 000
	Hull	Hull Corp.	1×30 000	2×190 000
	Kirkstall	Leeds Corp.	2×30 000	2×250 000
	Lincoln	Lincoln Corp.	2×20 000	4×120 000
	Prince of Wales ...	Rotherham Corp.	1×30 000	1×200 000
	Blackburn Mdws. ...	Sheffield Corp.	—	2×190 000
	Neepsend		1×50 000	3×190 000
	Ferrybridge	Yorkshire E.P. Co.	1×45 000	4×150 000
	Mexborough ...		2×30 000	4×180 000
	Thornhill		1×45 000	4×180 000
Central England ...	Hams Hall	Birmingham Corp.	2×50 000 2× 3 500†	4×320 000
	Burton-upon-Trent...	Burton-upon-Trent Corp. ...	2×15 000	4× 80 000
	Spondon	Derby. and Notts E.P. Co. ...	1×30 000	4×200 000
	Freemen's Meadow	Leicester Corp.	1×31 500	2×175 000
	Avon	Leics. and Warwick. E.P. Co....	2×15 000	4× 80 000
	North Wilford ...	Nottingham Corp.	2×30 000	4×175 000
	Meaford	N.W. Mid. J. E. A.	3×30 000	5×240 000
	Stourport	Shrop., Worcs. and Staffs. E.P. Co.	1×60 000 5 000(*b*)	1×525 000
	Ocker Hill	W. Mid. J. E. A.	2×30 000	5×150 000
	Hylton Road ...	Worcester Corp.	2×15 000	3×150 000
South-East and East England.	Little Barford ...	Beds, Cambs. and Hunts. E. Co.	2×30 000	1×300 000
	Brighton	Brighton Corp.	1×50 000	2×350 000
	Earley	Central Electricity Board ...	1×40 000* 1×40 000	3×200 000* 2×200 000
	Fulham	Fulham B. C.	2×60 000	6×315 000
	Cliff Quay	Ipswich Corp.	2×45 000	3×365 000
	Kingston	Kingston Corp.	2×30 000 1× 3 000*	3×260 000
	Battersea	London Power Co., Ltd. ...	—	1×550 000
	Willesden		1×30 000	4×110 000
	Peterborough ...	Peterborough Corp.	—	1×100 000
	Watford	Watford Corp.	1 500(*b*)	—
	West Ham	West Ham Corp.	1×30 000	2×180 000
	Woolwich	Woolwich B.C.	1×30 000 1× 750	2×165 000
South-West England and South Wales.	Portishead	Bristol Corp.	1×50 000 1× 2 000†	2×250 000
	Cardiff	Cardiff Corp.	— 1×30 000	2×180 000(*a*) 2×180 000
	Castle Meads ...	Gloucester Corp.	1×20 000* 1×20 000	2×100 000* 3×100 000
	Llanelly	Llanelly and District E.S. Co., Ltd.	1×12 500	2× 60 000
	Plymouth	Plymouth Corp.	1×20 000 1× 500†	2×100 000
	Upper Boat	South Wales E.P. Co. ...	—	1×364 000
	Llynfi		1×30 000*	1×182 000*
	Tir John North ...	Swansea Corp.	2×30 000 2×37 500	2×300 000 4×230 000
	Moredon	Swindon Corp.	1×20 000	2×120 000
	Newton Abbot ...	Torquay Corp.	2×15 000	4×100 000
		TOTAL	2 923 700	37 419 000
	(*a*) Amending a previous direction for 2×150 000 lbs/hr.			−300 000
	Net additional plant for which arrangements were made		2 923 700	37 119 000

* Arrangements were made for this plant at the request of the Government as an insurance against War damage.
† Auxiliary sets.
(*b*) Increase in capacity of an existing set.

Crop Drying by Electricity

Successful Grain Drying Installation in Worcestershire

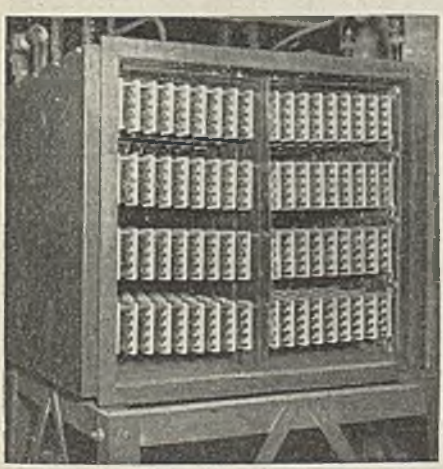
SUCCESSFUL conversion of a coke-fired grain dryer to electric heating has been completed at the farm of Mr. O. J. Paige, Worcestershire, the heating unit having been supplied by the General Electric Co. to the specification of the Shrops., Worcs. and Staffs E.P. Co. The coke-fired furnace was dispensed with and a battery of electric heaters was introduced in such a position that the air is sucked by the paddle - bladed fan through the heater bank and trunking into the drying chamber.

The heaters were supplied ready mounted in a section of trunking for insertion in the existing trunking, the unit also being provided with a terminal box for the incoming electrical connections.

The heaters consist of a bank with a total loading of 171 kW, arranged for 400 V, three-phase, 4-wire a.c. supply. The loading is divided into two main sections, one of 99 kW, and the other of 72 kW, and each section consists of three units of 33 kW and 24 kW, respectively. These are arranged so that whatever section of the load is in use, even heating is obtained through the cross-section of the trunking.

The 99 kW section provides the basic load and is controlled manually by 50 A 3-triple-pole contactors. The amount of the basic load can be selected to conform to heating requirements for varying conditions. The 72 kW section serves to provide the variable load for automatic temperature control, and is operated through a contactor by means of a three-step thermostat. The latter is situated in the heating chamber adjacent to its junction with the main trunking of the dryer, as this position was found to be the most satisfactory in maintaining the air temperature in the trunking at a constant value.

General view of dryer, showing winnowing equipment and dry grain discharge to bags



Electric heater with guard removed

As a precaution against damage to the heater, inter-connections are provided between the heater contactor panels and the motor gear so as to ensure that the heaters cannot be switched on without the fan being in operation. As a further safeguard the heater battery is provided with a device to isolate it should the air supply fail.

The grain dryer is entirely electrically-operated; in addition to the electric heating, the fan which provides the air for both the heating and cooling sections is driven through Vee ropes by a 15 H.P. protected type squirrel cage motor controlled by a star-delta starter.

During the 1944 harvest, approximately 260 tons of grain were dried, some of which had a moisture content as high as 30 per cent., as against an average of about 20 per cent. Automatic temperature control removed the risks of over-heating, and reduced the supervision required. Labour was also saved by the elimination of stoking. The absence of fumes in the

building was particularly marked. On some occasions the plant was used for long hours without a stop, and its ease of operation enabled it to be handled by one man, instead of the normal two when the old method was used.

Although the cost of drying per ton is higher than with raw fuel, the accurate temperature control, and consequent ability to run nearer to the critical temperature, combined with the cleanliness and the saving in time and labour of the electrical method, have convinced Mr. Paige of its superiority.

The units per ton consumed varied from 60 to 303, the latter figure being for very wet grain which was put through the dryer twice, and had 16 per cent. of moisture removed as against an average of 4 to 6 per cent. Average consumption per ton was 129 units for an average removal of 7.05 per cent. of moisture. The units per ton per 1 per cent. of moisture removed varied between 7.4 and 36, the average being 18.3. When the grain is wet the efficiency of drying is higher, probably due to the moisture laden air being heavier and absorbing more heat. Drier grain allows some heat to be blown away.

Thanks are due to Mr. O. J. Paige of Greenacres, Hob Hill, Alvechurch, Worcestershire, for his co-operation in preparing this article and for his permission to print it.

The Redditch staff of the Shrops., Worcs. and Staffs E.P. Co. carried out the complete installation of the heaters, switchgear and wiring, with the co-operation of the G.E.C., of Birmingham. Acknowledgment is made also to the assistance given by Mr. J. E. Newman, technical consultant to Messrs. Kennedy and Kempe, who manufactured the original plant.

Other electric grain dryers are now being manufactured by the G.E.C. to the orders of Edmundsons Electricity Corporation.

The figures for the consumption of current per ton of grain and the amount of grain dried, as mentioned in the previous paragraphs, covered the period up to the end of the harvest. Since that time a further fifty tons has been dried from wet ricks in small quantities, from 14 cwt. quantities up to 6 ton quantities, the majority being from 1-2 tons. This naturally increases the cost figure by a little over that obtained for the 260 tons. For these small lots, the average percentage of moisture removed was 6.9 with an average of 138 units used per ton. This gives 20 units used per ton per 1 per cent. of moisture removed. Another reason for the slightly higher consumption was the fact that the ambient temperature of the air was considerably lower in the drying room than in the earlier period when the bulk of the crop was dried.

Book Reviews

A Treatise on Applied Hydraulics. 3rd Edition.—By H. Addison. (London: Chapman and Hall). Pp. 592 + index. 22s. net.

This third edition is considerably bigger than those preceding it and among the subjects which have received renewed attention may be mentioned frictional loss in closed and open conduits; pressure and thrust and immersed solids; water hammer in pipes; pressure distribution on pump and turbine blades, and its relation to cavitation and suction lift. The book was first published in 1934 and it has found considerable popularity among power station engineers; the third edition therefore, revised and enlarged, will be welcomed.

"On" Some Irresponsible Jottings—Scientific and Otherwise. By "H. W." (London: A.E.I. News). Pp. 164. 5s. net.

By the use of the initials H.W. the author of this book has hidden his identity only from those who are unfamiliar with his writings in the A.E.I. News, The Electrician, and elsewhere, but we see no reason why we should say more than that his name is well known throughout the industry. The book which he has produced is a collection of articles which have appeared from time to time in the A.E.I. News and "the excuse for re-publishing them as a collection is that the writer has been persuaded that a larger circle of workers might find in their perusal some enjoyable relaxation from their labours." The title is based on the fact that the articles are written "on" various subjects ranging from umbrellas to fluorescent lamps, from eggs to atoms, all of which make very amusing and on occasion, very instructive reading. In these days of war news, post-war reports and other heavy literature the book makes a very pleasant companion with which to pass away an hour or two.

BOOKS RECEIVED

Journal of the I.E.E. Vol. 91 (London: Spon.), December. Part I (General), No. 48. 5s. net; Part II (Power Engineering), 7s. 6d.; Part III (Radio and Communication Engineering) No. 16, 6s. net (including index).

Industry and Research

Annual Meeting and Luncheon of the E.R.A.

THE annual report of the British Electrical and Allied Industries Research Association which was reviewed last week, was presented at the annual meeting of the association on February 9, when in addition to the business of the meeting, Mr. E. B. Wedmore, who has been in retirement since the beginning of the year, was elected an honorary member.

The meeting was followed by a luncheon when the president, Sir Arthur P. M. Fleming, presided.

Sir Harry Railing in proposing the toast of the E.R.A. said that though the industry had been engaged in research in a co-operative way for over 30 years, only during the last two years had the country awakened to its possibilities, and having done so, it now presumed to preach. The public should by now have realised, however, of the long established infiltration of research into industry and he strongly resented the implication that industry had not done its part.

An Approaching Birthday

Sir Arthur Fleming, in reply, said that twenty-seven years ago a committee comprising members of the B.E.A.M.A. and the I.E.E. was set up to carry out co-operative electrical research. Arising from this activity, the E.R.A. was formed. The association was now within a year of its twenty-fifth birthday, and the time seemed appropriate to take stock of the industry and of the part which research had played in its progress.

In this connection the industry should be considered as a whole, because failure on the part of the manufacturing side to maintain the development of economically-produced plant and equipment was detrimental to the supply industry; and conversely, inefficient and unreliable supply reacted to the detriment of the manufacturing side.

At the beginning of the century, the electrical industry comprised a number of manufacturing concerns sorely beset by foreign competition and maintaining a suicidal price-cutting policy between themselves—conditions which precluded any possibility of healthy development. On the supply side there were large numbers of relatively small generating and distributing plants, some d.c., some a.c., frequencies ranged from 25 to 133 cycles, and there was a wide variety of voltages making standardisation and efficient manufacture extremely difficult. Communication was by telegraph and, sparingly used, telephone. Domestic illumination was expensive, and where electricity was used public illumination was by arc light.

By the time the E.R.A. was set up the industry was getting into its stride. Turbine-driven units of sizes up to about 25 000 kVA were taking the place of reciprocating engine prime movers; generating costs were being reduced; lighting became more efficient through the introduction of the metal-filament lamp; power was being used increasingly in factories.

Within a few years broadcasting was established and this led to expansion in the production of thermionic valves and radio transmitting and receiving apparatus. The introduction of the grid led to the inter-connection of systems providing enormous aggregations of power. Transmission voltages had risen from 20 000 to 132 000, generating units to upwards of 100 000 kW, and transformer units to about the same capacity. Great strides had been made in the application of electricity to medicine and surgery, notably in connection with X-rays.

What part had the E.R.A. played in these activities? In the first place it had drawn together technical experts from hitherto competing firms to co-operate in the solution of research problems common to the industry. It had co-operated extensively with the N.P.L., the B.S.I., and the various branches of the industry represented by such bodies as the B.E.A.M.A., the C.M.A., the I.M.E.A., and the E.L.M.A. The E.R.A. had established with membership from these bodies, a very large number of committees composing the leading technical experts of all branches of the industry, thereby augmenting enormously the strength of its own permanent staff.

The association was unique in that throughout its existence it had had but one director, Mr. E. B. Wedmore. Under his leadership the income of the association had risen from about £3 000 a year to upward of 30 times that amount.

Example of Public Service

And what of the future? The industry was the most perfect example of a public service, for it provided the means whereby natural resources of power such as coal, water, wind, oil, etc., and possibly, subatomic energy, were converted into a form in which they could be used in varying degrees by all members of the community. The applications of power affected all our domestic amenities—lighting, heating, therapeutics, communication, transport,

amusements. Electric power was essential to all industries, to say nothing of vital uses in aircraft, etc. Apart from these obvious services to the community, the industry had other obligations. It must continue to contribute to the solution of that great social-economic problem, employment. Its contribution heretofore had been no puny achievement since within 25 years, employment in the industry had grown by some 300 per cent. Measured by invested capital its growth had been 250 per cent., and by units sold 900 per cent. But that was by no means all. It had been responsible for the development and growth of many ancillary industries, for example, those concerned with the variety of insulating materials, ranging from the mining of mica to the most modern developments in plastics.

Other important ancillary industries were those producing magnetic sheet materials and alloy steels for heavy duty in prime movers and generating plant. It was not an over-statement to say that for every additional worker the electrical industry engaged, several other workers were indirectly employed. In this same respect it should be noted that electrical development required the employment to an increasing extent of the scientific personnel —the chemist, physicist, physical-chemist, metallurgist, geologist, to mention only a few.

Technical Personnel

In the translation of new scientific discovery into industrial application, however, a difficulty presented itself, namely, the lack of men having adequate scientific knowledge coupled with commercial and industrial experience and aptitude. It was here that the E.R.A. could fulfil a most important function by providing numbers of suitably trained men who could be seconded temporarily or permanently to those industrial firms lacking such personnel. These would give practical effect to the results of research. In this connection it should be borne in mind that young scientists—and there were many to-day who had done notable research for the war effort—had been trained in the light of natural physical laws that were immutable and we were now expecting them to take part in a business world where there were no such basic laws, and where conditions might change overnight. There were relatively few who were adaptable to those very diverse sets of conditions. The E.R.A., where science and industry met, afforded a very useful training ground for such personnel.

To support export trade was obligatory to service because the country could not exist without exports—whether it be goods or workers. As a result of war necessity many of our overseas customers had to some extent become competitors. Our main hope in the export field would be from products of such a highly developed technical character that they were beyond the capacity of newly industrialised countries.

Safeguard Against State Interference

There were not lacking signs that in the future there might be political tendencies to impose controls which would hamper industry, to restrict profit-making, and to regard industry as a national asset in a narrow conventional way, and thus reduce incentive and initiative. Surely the best safeguard against such interference was to make the industry as a whole so efficient that its usefulness to the community could not be bettered by the introduction of any other system.

In the war period the industry had done magnificently in adapting itself to new and strange products, in developing and devising new and marvellous applications, and we had gained enormously in technical and manufacturing experience. But all this had necessarily been accomplished without regard to cost. In peace-time we should have to learn how to adjust ourselves to entirely different conditions in which cost was a vital factor. We should have to shake off the narcotic influence of E.P.T. and the feeling that " anyhow the Government pays." We must also not be deluded by a period of great activity during the time of reconstruction since this would merely be the time given to us wherein to equip ourselves for the struggle for existence that would then be ahead. That was the appropriate time for taking stock of the position.

The most vital need in the industry was, therefore, self-evident, and the importance of expanding the facilities of the E.R.A. commensurate with the ever-expanding needs of the industry could not be overemphasised. Not only was it essential that the association be enlarged and equipped to carry out on an adequate scale the solution of the increasing day to day problems, but it was even more important that it should expand its activities in connection with long-term researches, since it was from the results of these that new industrial applications would arise.

Guildford.—A rebate on the March quarter accounts of fifty per cent. of the fixed charge of all consumers taking current on the all-in rate for domestic, office, shop and business premises, is recommended by the Electricity Committee.

War-Scarred Eastbourne

Bouncing Bomb Hurtled Through Power Station

WHILE not so much in the public eye as some of the other south-east coast towns, Eastbourne suffered more severely than did her neighbours from attacks by raiding aircraft.

In 97 raids aircraft dropped 671 h.e. bombs, 76 unexploded bombs, 28 oil bombs and several thousands of incendiaries, including five of the phosphorus type. In addition, 15 flying bombs fell on or exploded over the town and 3 fell just outside, causing damage to buildings. There were 500 houses destroyed and 11 000 damaged. In the rural area served by the Eastbourne electricity undertaking 374 h.e. bombs and 2 382 incendiaries, as well as 230 anti-personnel bombs, fell on villages and residential districts. Hailsham had 110 h.e. bombs and 1 225 incendiaries, Pevensey 93 h.e., 630 incendiaries and 115 anti-personnel bombs, Westham 57 h.e. and 75 incendiaries, and Polegate 20 h.e., 5 incendiaries and 115 anti-personnel bombs.

By the courtesy of Mr. N. Boydell, the borough electrical engineer and manager, we are able to tell for the first time the story of how the electricity supply was maintained.

Distinguished by the only two factory chimneys in the town and four cooling towers, the power station became a major target for the Luftwaffe, but only once was a direct hit scored with a heavy bomb. There were many near misses which affected the works, the roof and cooling towers being most frequently damaged, and many times the alternators, motors, pumping motors and other machines were running under tarpaulin erections to keep out the rain. Hurled from a distance, a heavy bomb fragment landed on the bedplate of a generating set, but did no harm. Even now there are bomb splinters embedded in the woodwork of the cooling towers.

Damage to Cooling Towers

In August, 1942, a heavy bomb, dropped by a low-flying daylight raider, destroyed a boiler and other plant and caused extensive structural damage. Bouncing between the cooling towers and the main control room, the bomb smashed through a cooling tower, flew over the coal dump, hurtled through the wall of the pump house and the wall of the boiler house, and exploded behind No. 4 boiler, which was moved bodily from its foundations and damaged beyond repair. The economiser behind the boiler was blown to pieces; the whole of the pipe work was wrecked, and a piece of the main steam gauge was found half a mile away. The economiser behind No. 3 boiler was damaged and had to be completely rebuilt as did also the fans and chimney common to the two boilers. That portion of the boiler house and the pump house were so badly damaged that they had to be reconstructed. Despite this damage, the supply of electricity from the station continued without interruption. Fortunately the boiler that was put out of action was spare and was not working. No. 3 boiler, however, was under steam, and the fire had to be drawn.

Bomb damage in boiler house at Eastbourne power station

Other buildings of the undertaking also received considerable damage, and, in consequence, the offices, central stores and workshops were moved twice.

Incidents affecting the distribution system ran into hundreds. H.t. feeders and l.t. distributors were frequently damaged. One bomb scored a direct hit on a point where several h.t. feeders met, but the supply was restored within an hour by alternative supplies from adjoining areas. Sub-station roofs and doors have been blown off many times, and although the plant in them has been damaged to a greater or lesser degree, only once has the gear in a sub-station had to be completely

written off. In that case there was a direct hit. An h.e. bomb bounced directly over a major sub-station and wrecked some houses beyond, but did very little damage to the sub-station itself. In the rural area, overhead lines, poles and other gear suffered considerably. There was a direct hit on an H pole carrying a transformer point. In another instance a fault in a 11 kV cable was traced to a neat hole drilled in the cable just below the pole box by a machine gun bullet. A heavy terminal l.t. pole was uprooted by a bomb and flung a considerable distance without apparent damage.

The evacuation of most of the residents of Eastbourne reduced the output of the electricity undertaking by almost 50 per cent. and caused many administrative difficulties, particularly in regard to meter readings and the preparation of accounts. Many householders failed to give notice of their evacuation, and their whereabouts and date of removal were not known. In those days Eastbourne was but a shadow of its former self.

At the outbreak of war, there were 22 000 consumers and the sales averaged almost 40 000 000 units, with a maximum demand of over 18 000 kV. The figures for 1942-3 showed that the sales had dropped to 21 000 000 units and maximum demand to 8 695 kW, and the revenue had fallen from £241 045 in 1939, to £162 530. Therefore the undertaking had to face not only loss of revenue, but also greatly increased operating costs due to the rising cost of coal and wages.

Returning Inhabitants

From the domestic point of view the gradual rehabilitation of the town is bringing an improvement in the financial and general commercial position of the undertaking. Considerable increase in output and revenue is anticipated for the current year, and it is hoped that despite the greatly increased cost, this may result, after an interval of four years, in a net profit, and a resumption of the former long record of prosperity which the undertaking enjoyed. The domestic use of electricity in Eastbourne was amongst the most extensive in the country. The sales of electricity to domestic consumers represented 63 per cent. of the total output, as against the national average of 25 per cent. The units sold per domestic consumer averaged 1 448, as compared with 620 for the whole country: and the cooker saturation averaged 30 per cent., compared with the national average of about 15 per cent. Water heaters and radiators were also extensively used. Now the people are returning, the undertaking is busier than ever, dealing with re-connections and domestic requirements generally.

Mr. Boydell told a representative of THE ELECTRICIAN that no praise was too high for the staff who had carried on the generating station not only in the face of direct danger from enemy bombing, machine gun and cannon fire, but also in the face of even greater potential danger from high power plant dislocated as the result of enemy action. The distribution staff on whom the bulk of war damage repair work fell also fully deserved the highest praise.

Wind Power

ON a recent visit to Stornoway, a representative of THE ELECTRICIAN found many of the islanders developing wind power plants on their own account, with equipment supplied by Scottish Electromills Ltd., of Glasgow, and the Lucas organisation of Birmingham.

Typical wind-driven generating set in the Outer Hebrides

This experience is of interest in that when the North of Scotland Hydro-Electric Board was conceived, specific mention was made of the possible development of wind power in areas where water power appeared unsuitable, while the Secretary of State for Scotland is, we understand, himself the owner of a windmill generating plant.

A considerable number of windmill generators are installed in North and South Uist and now the islands of Harris and Lewis are being similarly interested. There are, too, many windmill sets in Orkney.

The Electromill sets most generally in use are operated by a twin-bladed propeller which drives a dynamo, mounted on a wooden or steel mast.

The plant is designed to give 30 V, 50 A with a 30 m.p.h. wind.

The Lucas plant consists of a 12V dynamo, with twin blade propeller. The batteries comprise 2-6 V, 130 Ah units.

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. L. A. Hooke has been appointed managing director of Amalgamated Wireless (Australasia), Sydney. He has been associated with the company since its incorporation in 1913.

Mr. Arthur Philip Smith has been appointed a director of British Ropes, Ltd.

Major Lloyd George, Minister of Fuel and Power, has appointed **Prof. J. M. Mackintosh** of London University, as a member of the Fuel and Power Advisory Council.

The new position of head of the electrical and engineering department of the Denbighshire Technical College, Wrexham, is to be occupied by **Mr. T. W. Rowlands,** with a salary of £500, rising to £550 a year.

The Institution of Mechanical Engineers has awarded the Hele Shaw medal and prize for 1945 to **Mr. George German,** a student at Preston Technical College, employed by the English Electric Co., Ltd.

Sir Felix J. C. Pole has recently undergone an operation to an eye, which necessitated his remaining in hospital.

Mr. James Wright, meter superintendent at Blackburn, has retired after 40 years' service. The Electricity Committee has placed on record appreciation of his work.

We are informed that **Miss Caroline Haslett,** who has been on a visit to Sweden to lecture for the British Council, has now returned to this country.

Mr. W. Roe, Cork city district engineer of the E.S.B. Dublin, has been appointed to the post of E.S.B. engineer in charge of the scheme for the rural electrification of Eire.

Mr. W. H. Sollis, Wavertree, Liverpool, retired electrical engineer left £20 724 (net £18 535).

Mr. Arthur Richard Hoare, chairman Isle of Thanet Electric Supply and Kalgoorlie Electric Power and Lighting Corporation, left £23 279 (net £23 168).

We are given to understand that though the Commissioners announced his retirement from the secretaryship as from January 15, the services of **Mr. T. G. French** are still available to the Commissioners in a consultative capacity.

Mr. William R. Murray, burgh electrical engineer of Stirling, has retired after 25 years' service. In appreciation of his valuable work for the town, his fellow officials presented Mr. Murray with a valueable gift.

In reply to a request by the military authorities for the services of **Mr. C. R. Westlake,** the general manager and electrical engineer, who was wanted in connection with the supervision and direction of electricity and gas supplies on the Continent, the Finchley Borough Council have replied that they cannot agree to his being released again.

Sir Louis Sterling, formerly chairman and managing director of A. C. Cossor, Ltd., radio manufacturers, has launched an action against that company to recover damages for alleged wrongful dismissal. The action, which is expected to come into Court at an early date, is defended by the company.

A memorial service for Mr. Frederick Robert Stephen Balfour, a director of Cable and Wireless, Ltd., was held at St. Michael's, Cornhill, on February 7. Prebendary George Saywell officiated and Archbishop Lord Lang gave the address. Among those present were Lord Inverforth and Lord Pender (Cable and Wireless (Holding) Ltd.); Sir Edward Wilshaw (chairman, Cable and Wireless, Ltd.); Mr. J. J. Denison-Pender, Mr. L. J. King (Marconi's Wireless Telegraph Company, Ltd.),Captain F. G. A. Vallancey, Mr. C. E. Tavener, Mr. A. K. Graham and Mr. E. K. Jenkins (Cable and Wireless (Holding) Ltd.).

Over 6 000 years of service has been given by 225 employees of Herbert Terry and Sons, Ltd., and at a recent gathering in the works welfare hall, 25 workers with forty or more years' service received gold watches, illuminated and framed certificates, and savings stamps, and over 200 employees with twenty-five and more years of service, were the recipients of illuminated and framed certificates. The presentations were made by the directors, Alderman Charles Terry, Messrs. A. Victor Terry, C. Douglas Terry, Norman V. Terry and Pilot Officer Philip Terry, all of whom paid tribute to the employees.

One of the Fire Guard teams of the English Electric Co.'s Bradford works, won the Men's Fire Guard Drill event in the national finals of the Industrial Fire Brigade, Fire Guard and Civil Defence competitions, held in London, last December. The team now holds three cups, that for the North-East Region (No. 2) being presented by Sir Stafford Cripps, while the large cup won in the national finals was presented by Mr. A. V. Alexander, First Lord of the Admiralty. The members were congratulated by **Sir George H. Nelson,** chairman and managing

director of the English Electric Co. Ltd., who presented each with a replica of the National " Finals " Cup.

Obituary

Mr. Thomas Edward Ritchie, chief illuminating engineering of the General Electric Co. Ltd., for 18 years. Born in Manchester in 1872, he was elected to the I.E.E. in 1900. He joined the G.E.C. in 1923 and retired in the summer of 1941. He lectured on the subject of electrical illumination throughout the country and contributed many articles to the Press.

Mr. T. E. Ritchie

Mr. William Walker Lackie, one of the first Technical Commissioners under the Electricity (Supply) Act, on February 10, aged 75 years. Educated at Aberdeen Grammar School, University College, Dundee, and Glasgow University, Mr. Lackie served with Mavor and Coulson from 1888 to 1892. He was then appointed mains superintendent under the Glasgow Corporation; in 1897 he was made chief assistant to the electrical engineer and from 1902 to 1920 he held the position of chief engineer and manager of the Glasgow electricity department. In 1920 Mr. Lackie was appointed one of the Technical Commissioners, following the passing of the Electricity (Supply) Act, 1919. He retired in 1934. The honour of C.B.E. was conferred upon him in 1919. Mr. Lackie made various contributions to the proceedings of the I.E.E., the Institute of Engineers and Shipbuilders in Scotland, the I.M.E.A., and the Glasgow University Engineering Society.

Mr. Charles K. Everitt, on February 6, aged 78 years. He was chairman of Edgar Allen and Co., Ltd., and introduced to Sheffield the high-frequency crucible process of making fine tool steels.

Mr. Alan J. Popert, technical engineer of Hove electricity department, on February 6, aged 52 years. He received his technical education at London University. For many years he was with Metropolitan-Vickers Electrical Co., Ltd., and, as their erection engineer installed the generators at the Corporation's Davigdor Road station. Upon the completion of the contract in 1925 he joined the staff of the electricity department.

Correspondence

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

Lighting Fittings

[To The Editor]

Sir,—Under the Limitation of Supplies (Misc.) No. 25 Order, 1945, S.R. & O. 1945, No. 62, operating from February 1, 1945, supplies of goods under Class 9(b) " Lighting Fittings " are no longer restricted.

It is understood, however, that the Board of Trade may, in due course, issue Orders requiring manufacturers of goods, hitherto controlled under Class 9(b), to submit periodical returns showing the number of persons employed and value of goods supplied (a) by Export, (b) to the Home Market and (c) to Government Departments. New manufacturers will also be required to notify the Board of Trade when they begin manufacturing such goods.

The Electric Light Fittings Association desire to point out that in spite of the freedom now accorded to manufacturers to supply these fittings without restrictions, many of the established fittings manufacturers are still very fully occupied on work of high priority in relation to the war effort, thus production of the types of fittings in question can, generally speaking, only be effected by easy stages and in the limited pockets of capacity that may arise from time to time without detriment to more essential contracts.

For this reason, the distributing side of the trade and the public must not expect immediate deliveries of these fittings on a peace-time basis; they must be tolerant, bearing in mind that freedom to manufacture all goods of this nature is contingent upon there being no interference whatsoever with war production.

Furthermore, there is no doubt that production for export must receive important priority and that, in the national interests, manufacturers generally will, when available production capacity permits, be expected to pay major attention to the building up of the nation's export trade.

The foregoing does not, of course, apply to industrial type fittings on which production must, for obvious reasons, continue to be devoted to work of national importance.—Yours faithfully,

Felix A. Rogers,
Director.

The Electric Light Fittings Association.

Motor Control Gear

Present-Day Practice and Possible Development

A PAPER by Mr. D. Rudd on "The Development of Motor Control Gear" was read at the meeting of the I.E.E. Installations Section on February 8.

The paper was a review, in general terms, of present-day practice in the design of industrial motor control-gear. Its scope was limited to what might be described as standard industrial equipment, and the subject was approached from the standpoint of the user of such equipment. In the first part the principles on which modern design has been established were reviewed, and in the later sections some of the factors that are likely to effect the future development were discussed. The author stated the case for the utmost simplicity in design and for greater latitude in the value of starting-current peaks that might be allowed. Possible development in contact materials was discussed, and reference was made to the possibility of achieving some measure of standardisation.

Discussion

Mr. J. G. Knowles said it was the extent of the problem and not the will to tackle it which made progress in standardisation appear slow. Commenting on the suggestion that the cost of making a multi-step starter fully automatic prevented this being fully developed, he said there were several designs on the market of small multi-step starters which did not require "automatic contactors" on each step. With regard to laminated brushes, these did not soften so easily in hot atmospheres if the copper was alloyed with a little silver. Oil immersion resistances were very undesirable.

Mr. J. R. Smith, referring to built-in motors and control-gear, asked whether there was any future for a composite unit of motor and starter for individual drive up to, say, 10 H.P. Whilst appreciating the necessity for an overload setting of 25 per cent., there was room for an improved type of lag which would permit a lower overload setting of, say, 10 per cent., which was more in keeping with the overload capacity of the present-day motor. As to the suggestion that the trend of future design would be towards air-cooled resistors, it should be remembered that industry preferred totally enclosed dust-proof gear.

Mr. C. H. Last (Metropolitan-Vickers Electrical Co., Ltd.) maintained that control gear had not been developed from circuit-breaker practice as suggested, and, referring to the variety of types of control gear complained of, he contended that the manufacturer was forced by circumstances in this matter and it was hardly possible to contemplate a serious reduction. He mentioned the wide range of enclosures provided for in B.S.S. 587. In the same way, contacts were largely contingent on the service conditions. As to protection, there should be fuse protection with a fuse rating of something of the order of three times the full load current of the machine. Single-phase protection was not justified except, perhaps, on large machines which ran continuously in unattended situations. The use of reverse current braking, due to unskilled operators during the war, had been troublesome.

Mr. W. F. Baker (General Electric Co., Ltd.) expressed keen disappointment that electronic motor control had been deliberately neglected by the author, because this was one of the major developments in which all control gear engineers were extremely interested. The operation of d.c. motors from a.c. lines by means of suitable rectifiers, had opened up an entirely new field which engineers in America had been quick to explore. All the advantages of d.c. variable speed drive were obtainable, together with certain other desirable and unique features. Embedded thermostats controlling direct trips in the starter provided the most satisfactory solution to the problem of overheating, and should become a universal feature in the design of motors if provision for withdrawable thermostats was always made. He asked for the author's recommendations regarding over-current protection for power station auxiliary motors where tripping might have very serious consequences. This was a case where tripping should be delayed until the last second. Indeed, there was a good argument for dispensing with over-current trips altogether. Replying to the comment in the paper that starter design should be based on the principle of restricted rupturing capacity, he said surely the real criterion was that the starter should be capable of breaking the standstill current.

Mr. S. H. Parsonage (Compound Electro-Metals, Ltd.) said the performance of tungsten-copper material for contacts was much better than that of copper alone and for butt contacts was more economical than silver-tungsten. The difference in performance was practically negligible. This, however, did not apply to air-break contactors which were in a different field

and presented a different problem. Developments suggested that these contacts would eventually be in the form of extruded material, not unlike the present copper contacts, which were simply cut from the section, and he believed that in future small switchgear, particularly for machine tools, would incorporate a large number of these contacts.

Mr. E. H. Martin (B.T-H. Co., Ltd.) said that in the case of machines with commutators, there was a definite limit to the current which could be permitted to flow without damage to the commutator and brush gear. This naturally called for a type of overload protection which would take the motor off the line under certain overload conditions, depending almost entirely on the current. The squirrel cage induction motor would stand up to very heavy overloads for relatively long periods, and the solenoid type of relay had characteristics which did not match up with those of the motor at all. The result had been the development of the thermal relay both in this country and the United States and most squirrel cage motors depended on this for protection. The thermal characteristics of the relay should match up, to some extent, with the thermal characteristics of the motor.

Mr. G. A. Cox (Watford Electric and Manufacturing Co., Ltd.) said there had also been on the market for almost 40 years a starter with rubbing contacts, which worked very satisfactorily. From the point of view of the user, he asked whether it was desirable to have the starter and resistance incorporated in one container or as separate items. In the case of large equipments it would be a disadvantage to have the whole of the equipment boxed up in one cubicle.

Mr. L. B. S. Golds (Edmundsons Electricity Corporation) said that to get over the single-phase problem, the principle of unbalanced current had been adopted in a device developed by his company. Three thermal elements were used co-axially in line with every satisfaction. In devising this relay there was the thought that apart from their own use of it, manufacturers would be helped by it to retain our position in the export market.

Dr. E. H. Norgrove (George Ellison, Ltd.) said as to the suggestion that starter design in the future must be based on the principle of restricted rupturing capacity, he asked "Why?" He did not feel enthusiastic about the system of tripping out motors by means of thermostats in the windings and iron circuit. The arrangement became cumbersome and difficult to maintain. The author's remarks on single-phase troubles were entirely at variance with his own experience. Seventy per cent. of breakdowns had been due not to single-phase running, but to bearings, and the bulk of the rest to the motor maker's insistence on building motors as highly effective air filters. Switch-fuses should not be used at all for motor starting. Whilst built-in control gear in machine tools appeared to be fashionable, he regarded it as a form of laziness.

Mr. R. Shinnie spoke of the use of bakelite mouldings in control gear and troubles that had occurred, and expressed the view that these had been due more to the works electrician than to the design. Although the author expressed the view that air-break starters were coming into vogue, it was a fact that in many cases they had been superseded by oil-immersed starters for heavy duty work, such as milling machines to which the air-break starter did not always stand up.

Mr. A. Morgan said he required a switch which would not wear out, would resist abuse and did not require any maintenance, and he believed it could be done. The mercury switch appeared to be the best means of accomplishing that end.

The Blue Book

THE 63rd edition of "The Blue Book," the Electrical and Engineering Trades Directory, is the fifth war-time publication of this unrivalled guide to the organisation of the electrical and engineering industries.

Restrictions and paper shortage are still reflected in the size of the production, and it is not essentially different from last year's slimmer issue. As far as humanly possible, revision and correction, necessitated by constant changes, have been carried out, and the book's main purpose, the rapid provision of carefully arranged information, is still well served.

In the preface, the new edition of "The Blue Book" is introduced with some of the considerations that should be greatly exercising the minds of electrical engineers and business men while the vague outlines of the post-war world take firmer shape. There can be no doubt, it is stated, that the electrical industry will find itself in a more highly regulated age, and it will share with other industries the heavy burden of providing the finance which is to yield a more abundant standard of life for the people of these islands. The technological needs of the coal industry, the extension of main line electrification of railways, the overdue standardisation of voltages and systems, and our export trade are among the matters touched upon, and the cramping effect of bureaucratic control is stressed.

"The Blue Book" is published by Ernest Benn, Ltd., 30s. net.

Electricity Supply

Croydon.—Provision of supply to bungalows on the Long Heath estate is to be made at a cost of £7 190, and for lighting at £850.

Poplar (London).—The Electricity Committee is to lay a sub-main to the premises of Messrs. Pinchin, Johnson and Co., Ltd., at a cost of £360.

York.—Sanction to borrow £22 942 for extensions at Kingsway and Huntington sub-stations and for equipment, is being sought by the Electricity Committee.

Sheffield.—The Electricity Committee has obtained sanction to borrow £6 938 for the development of the primary distribution system.

West Cumberland.—The Local Authorities Joint Advisory Committee is taking steps to secure uniformity and a reduction in electricity charges.

Glasgow.—The Gas Committee has arranged for the Electrical Engineer to renew electrical switches in the coal handling plant at Dawsholm gasworks at an estimated cost of £130.

Chester.—The Electricity Committee is to provide supply to farmers in the parish of Rushton at a cost of £1 230 for transformer, switchgear and electrical lines.

Lichfield.—The T.C. proposes to carry out extensions in order to afford a supply of electricity to works premises at Dove House Fields. The cost is estimated at £3 500.

Leeds.—The Electricity Committee's estimates for the financial year ending March 31, give 652 000 000 as the number of units generated, as compared with 440 000 000 in 1939. In the same period the coal bill has risen from £242 000 in 1939 to £650 000.

Brighton.—The Public Utilities Committee report that many people are returning to the district, frequently to occupy houses where no alternative service to electricity exists, with a consequent demand for electrical apparatus which cannot be met from existing stocks. The Committee is to seek sanction to borrow £5 000 for the purchase of essential domestic apparatus.

News in Brief

Wireless for Sanatorium.—The Middlesex Health Committee is to provide new wireless equipment at Clare Hall sanatorium at a cost of £840.

New Housing Equipment.—The South Shields T.C. intends installing electric cookers and wash boilers in new houses.

Hospital Extension. — The Manchester Electricity Committee is to enlarge the laboratory and provide an internal telephone system at Crumpsall Hospital at a cost of £1 330.

Rate Relief Contributions. — The Warrington Finance Committee has requested the Electricity Committee to contribute £10 000 to the relief of rates for the current year and a minimum of £10 000 for 1945-6, the precise sum to be settled later.

Birkenhead Power Station Site.—The Electricity Committee has been considering the selection of a suitable site for the new power station and has decided to state a case for the acceptance of the offer of a site by Lever Bros. Ltd., at the southern end of their estate at Bromborough.

London Students' Dance.—Owing to the fact that the Lysbeth Hall, Soho Square, will not be available on March 10, it has been necessary to bring forward the date of the I.E.E. London Students' Section dance to March 3. The price of admission remains as before, namely, 12s. double, and 6s. 6d. single tickets, inclusive of refreshments.

Swimming Bath Installation. — The Workington Health Committee has considered the question of equipping the swimming baths with an electrically operated storage heating system, and has asked for estimates for electrical heating as compared with the present method.

TWENTY-FIVE YEARS AGO

FROM THE ELECTRICIAN *of February 13, 1920: The syndicate responsible for the utilisation of the water power of Dartmoor streams, which has been dropped for this year, proposes to erect a copper refinery near Newton Abbot. In addition to generating electricity for the copper refinery it is considered that power can be generated so cheaply that it will be possible to supply current in bulk to all the towns in South Devon, as well as to the industries which may be attracted to the neighbourhood.*

Polythene

Its Application in the Electrical Industry

IN July, 1930, I.C.I. decided to start a new programme of fundamental research on the effect of extremely high pressures on certain chemical reactions. The range of pressures selected for study were of the order of 15 000—300 000 lbs. per sq. in. Chemical studies began in 1932, but it was not until the beginning of 1933 that anything novel was observed. Then, as a result of experiments involving ethylene, a trace of a white solid was found in a reaction vessel. This was polythene, a polymer of ethylene which may be described as a solid comprising a large number of ethylene units linked together, 500 or more, which, under the combination of extreme pressure, temperature and a catalyst are made to combine. By 1935 the technique of handling these high pressures was improved, larger and more efficient apparatus became available, and a systematic study of the phenomenon was made.

At first, attempts to repeat initial experiments met with inexplicable explosions in the reaction vessels, but after the reason for these explosions was found and the process brought under control, progress was rapid. In 1936 the first beginnings were made towards devising a continuous process of manufacture; by 1937 continuous running on a small pilot plant had been achieved and by 1938 it was possible to start up a proper pilot unit embodying the basic ideas for full scale production.

Early Practical Experiments

A study of the properties of the plastic produced showed that it had outstanding electrical characteristics, toughness and flexibility, coupled with lightness and extreme water resistance. Its future in the electrical field at any rate was promising, and during 1938 close contact was made with the Telegraph Construction and Maintenance Co. An experimental length of submarine cable was made at the end of 1938 and a mile length in 1939, much to the interest of the British Post Office authorities. It was quickly seen that polythene was not only most promising for telephone and telegraph cables, but also for high frequency work, especially in the field of television.

By 1938 progress had been sufficient to decide I.C.I. to design and erect the first full scale manufacturing unit involving a high pressure reactor 600 times the size of the original experimentnal vessel. Work began on the erection of the plant early in 1939 and the unit went into production on September 1, the day of the German invasion of Poland.

Under-Water Cable Insulation

By the beginning of the year 1939, wartime use of polythene was under development with the Admiralty. This was for the insulation of certain special under-water cables. The Army was also interested in new types of communication cable embodying polythene, and the second unit of the first polythene plant came into operation on June 1.

Construction of a much larger plant began in August, 1940, and this was in production early in 1942.

Early in 1940 I.C.I. shipped polythene to the Du Pont Company in the U.S.A. for processing, and a cable was made by the Western Electric Co. and was laid on a section of the Bell Telephone Co.'s trunk telephone line between Washington and Baltimore. Early U.S. experiments had not been entirely happy, and in 1941 the decision was taken to standardise on polythene. Accordingly an American delegation visited the I.C.I. plants in search of information, but it was not until 1943 that polythene was made on a full productive scale in the U.S.A.

COVENTRY ELECTRIC CLUB

The Coventry Electric Club held its monthly meeting at the Electricity Showrooms on February 6. About 80 members were present, and a lecture was given by Mr. E. T. Norris on "Radio Frequency Heating."

He said that whilst a number of industrial applications had already been established, there were probably many others which would mature as industrial production engineers, metallurgists and chemists became aware of possibilities of radio frequency heating. There were two major applications, namely: (a) The superficial heating of metals; and (b) the homogeneous heating of materials which were virtually electrical insulators. There was a *prima facie* case for its consideration where other methods seemed unsuitable or unsatisfactory and where the characteristic peculiar to radio frequency heating of generating the heat within the material in an accurately controllable manner appeared attractive. Individual detailed examination was then necessary to establish whether or not the new performance was economically justified.

Electricity Distribution in London

Review of the Position Given Before A.S.E.E. Meeting

IN a paper on " Distribution of Electricity in London," read before the Association of Supervising Electrical Engineers on February 10, Mr. E. H. Jesty gave a brief review of the legislation enacted on the subject, noting past and present tendencies and hinting at future ones, and then went on to comment on certain " high-lights " of technical development and to suggest the need of planning for larger areas.

Referring to the " Outline of Proposals," issued by the Government in 1937, suggesting three possible methods of effecting re-grouping, the author said he regarded as nearest to practical politics, centralised control of grouped undertakings by an advisory body giving decisions on matters common to all members, but leaving the identity and operation of each more or less separate. The municipalities were strongly opposed to any loss of identity and these could be preserved for public relations purposes, leaving questions of technical development and commercial policy to be co-ordinated by the decisions of the central direction. In view of the large scale economies to be effected by centralised purchase of cable and stores it was possible that some form of re-grouping into larger areas might be effected before 1971 —the date for the exercise of the purchase rights of the L.C.C., which were transferred by an Order of 1925 to the L.J.E.A.

Supplies were still being given at a bewildering variety of voltages, and it was felt that a bold policy of voltage standardisation was of supreme importance to future development. Eloquent arguments had been advanced for a system of three-phase 4-wire distribution at 400 V between phases, and 230 V between phases and neutral.

The London district abounded in pockets of industrial and heavily loaded areas having very different characteristics, but this did not weaken the argument for a greater measure of agreement between the voltages and systems. Legislative and administrative changes must be accompanied by technical plans which would give London an electricity distribution comparable with its main drainage.

In conclusion, the author referred to the way in which London's electricity distribution stood up to its ordeal by aerial bombardment, and said the soundness of the lay-out often facilitated the restoration of supply by alternative routes, and the quality of the material and workmanship which went into the building of the systems was amply demonstrated.

Rehabilitation of Agriculture

IN an address on the relationship of agriculture to the engineering industry delivered before the Engineering Industries' Association, in London, on February 7, Mr. A. P. Young (British Thomson-Houston Co., Ltd.), said a research attitude of mind in agriculture must be developed. The money spent on research must be increased many times. With a turnover of £600 000 000 per annum it was not unreasonable for the industry ultimately to spend £3 000 000 per year on research.

The industry could, in his judgment, take a decisive step forward and at the same time establish a principle of co-operative action in the research field, which might well be applied to other industries, by deciding to pay into a common research fund a very small part of its annual turnover. A halfpenny in the £ would do. This would hardly be noticed by the individual farmer; but at the present rate of turnover this small payment would provide annually for research, no less than £1 250 000.

A big job of work faced us after the war in the sphere of electricity supply. Distribution needed to be effectively linked with generation; and he looked forward to the time when it might be possible, through perfecting the grid system to establish the sales of electricity throughout the British Isles on the principle of the penny postage stamp—one of the most revolutionary changes ever made in our postal system. At a remote farmstead in Ontario, Canada, were to be found all the modern electrical appliances which were a boon to the housewife. The power of Niagara Falls had been harnessed to the needs of that farm and electricity was the handmaiden. We must do likewise. Not only in our villages but on our farms. Electrical mechanisation should become the most potent new idea which would aid the farm group, and the local farming community centred on the village, to improve its service function and thus move forward to better and happier times for all. Cheap electricity must be the foundation of this forward move; and when this came they could rely on the engineering and electrical manufacturing industries doing their part in making available mechanical and electrical apparatus of the right quality, sold at the right price to meet their expanding needs. The engineering and electrical manufacturing industries must co-operate whole-heartedly with the agricultural industry in this common task.

Industrial Information

E.D.A. Bulletin.—The current issue contains reports of E.D.A.'s Silver Jubilee dinner, the opening of the exhibition of all-electric kitchens at the Building Centre, Maddox Street, W.1, other matters of interest, and news from the areas.

W.R.C. Electric Irons.—The Central Price Regulation Committee has approved the following prices for the W.R.C. electric iron complete with flex' and adaptor:—Manufacturer's selling price, 13s. 6d.; wholesale, 16s. 6d.; retail, 22s. These prices are exclusive of purchase tax.

Berry Electric Fire.—The Central Price Regulation Committee has approved a retail selling price of 63s. exclusive of purchase tax for the pattern No. 626 2 kW electric fire on the lines of the Dormy model (pattern No. 616), complete with flex' manufactured by Berry's Electric Ltd.

Production and Engineering.—Among the features of the current issue is the third of a series of articles on motion study in which examples of its benefits in the manufacture of light electrical equipment are illustrated and described. Other articles deal with the avoidance of waste labour, designing for production, and milling light alloys.

Kitchen Equipment.—In order to facilitate the layout and planning of kitchens in post-war houses, a British standard specification, B.S. 1195, giving recommendations for the space dimensions for kitchen fitments, has been issued. The unit dimensions on which the space dimensions are based are a width of 21 ins., a depth of 21 ins. and a working height of 36 ins. Copies of the standard are available from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s.

Fuel Efficiency.—The news sheet issued by the Ministry of Fuel and Power (Fuel Efficiency Committee) for February gives instances where the utilisation of waste heat has resulted in considerable saving in coal. Reference is also made to Fuel Efficiency Bulletin No. 36, which has been prepared to assist users of creosote-pitch mixture (coal tar fuel 200) to obtain the best efficiency from their plants. It gives technical data regarding the fuel and shows the main difference in application between it and " pool " fuel oil.

New Manufacturers' Association.—The formation of an association named the Electrical Sign Manufacturers' Association (short title E.S.M.A.), to take the place of the electrical section of the Master Sign Makers' Association is announced with founder members as follows:—Claude-General Neon Lights Ltd., Elders Walker and Co., Ltd., Electrolumination Ltd., Franco-British Electrical Co., Ltd., Ionlite Ltd., Nash and Hull Ltd., Oldham Sign Services Ltd., L. V. Pannel, Pearce Signs Ltd., Sign Accessories Co., Ltd., Sign Construction Co., Ltd. The offices of the association are at 36, Kingsway, London, W.C.2. (Telephone: Holborn 0502) and communications should be addressed to the secretary, Mr. W. E. Babb.

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.

Manchester Public Health Committee, February 19.—Supply, delivery and erection of three motor-driven hydro extractors at Langho Colony. Specifications from the City Architect, Town Hall, Manchester; deposit, £1 1s.

Leeds Education Committee, February 20.— Electrical repairs and maintenance work in connection with school buildings for the three months ending June 30. Forms of tender from the Director of Education, Education Offices, Leeds.

Tynemouth T.C., February 24.—Supply of electric lamps for the year ending March 31, 1946. Schedules and forms of tender from the Borough Surveyor, 19/20, Howard Street, North Shields.

Ashford (Kent) U.D.C, February 26.—Supply and installation of a 300 000 cu. ft. per day carburetted water gas plant with automatic operation, together with electric coke-skip hoist. Particulars from the Manager of the Gasworks, Ashford, Kent.

Manchester T. C., March 1.—Supply, delivery and erection of four outdoor-type sub-station kiosks and switchgear. (Spec. No. 815). Particulars from Mr. R. A. S. Thwaites, Electricity Department, Town Hall, Manchester; deposit, £1 1s.

Shipley U.D.C., March 2.—Supply and delivery of paper insulated cables for twelve months from April 1, 1945. Specification from Mr. Nigel L. Duncan, Electricity Works, Dockfield, Shipley, Yorks.

Westhoughton U.D.C., March 7.—Supply of electric lamps for the year ending March 31, 1946. Particulars from Mr. F. H. Walker, Town Hall, Westhoughton.

Company News

DAVIES AND METCALFE LTD.—Fin. div. 8% (same), mkg. 11% (same).

R. B. PULLIN AND CO., LTD.—Fin. div. 12½% (15%), mkg. 17½% 11 mos. to Sept. 30 (20% for 12 mos.).

MATHER AND PLATT, LTD.—Fin. div. on ord. 6% (same), mkg. 10%, less tax, for 1944 (same). Net pft. £172 294 (£168 388).

BRISTOL TRAMWAYS AND CARRIAGE CO., LTD.—Fin. div. on ord. 5%, mkg. 10%, less tax, for 1944. Net pft. £191 930 (£198 905).

CANADA NORTHERN POWER.—Gross earngs. to Nov. 30 $4 149 310 ($4 236 929). Operatg. exes. and taxes $1 966 518 ($2 075 809). Net earngs. $2 182 792 ($2 161 121).

YORKTOWN (CAMBERLEY) AND DISTRICT GAS AND ELECTRICITY.—Pft. on rev. acct. 1944 was £32 970 (£37 755). Fin div. on consd. ord. £2 15s.%, payable Mar. 17, mkg. £5 10s.%. Fwd. £5 217 (£3 821).

SOUTHERN CANADA POWER.—Gross earnings to Nov. 30 $3 300 990 ($3 260 095). Operatg. and maintnce. exes. $1 154 654 ($1 017 585), taxes $739 089 ($817 470), int., divs. and depreen. $1 426 265 ($1 425 040). Deficit $19 018 (surplus $17 607).

YORKSHIRE ELECTRIC POWER CO.—Net rev. for 1944, £816 805 (£783 089) after providg. £458 287 (£389 953) for tax. Deb. int. and redemptn. takes £70 403 (£69 653), leavg. net pft. £772 307 (£738 231), to which is added interest and div. received £25 905 (£24 795), mkg. £842 710 (£807 884).

SHAWINIGAN WATER AND POWER.—Rev. from power sales $22 081 965 ($23 088 890) and other rev. $1 191 424 ($1 242 822), givg. gross rev. $23 273 390 ($24 331 712). Operatg. pft. of $10 773 888 ($13 509 382). Net income was $2 324 286 ($2 367 385). After chargg. divs. $1 960 425 (same) earned surplus is $3 843 675 ($3 505 536).

J. AND E. HALL, LTD.—Trdg. pft. to Sept. 30 £325 849 (£399 982), plus transf. fees £9 (same), pft. on investmt. conver. nil (£500), mkg. £325 858 (£400 491). To admin. exes., etc., £189 119 (£157 031), int. acct. (bloc.) £4 742 (£62), war dmg. £2 067 (£3 362), dirs.' fees £5 000 (same), E.P.T. £27 000 (£140 000), loss on sale and res. agst. investmts. £3 225 (nil), leavg. net pft. before inc. tax £94 705 (£95 036), plus £63 104 (£49 068) brot. in. As prov. inc. tax £50 000 (£55 000), pref. div. £3 600 (same), ord. div. 10% (same), £22 400. fwd. £81 809.

ISLE OF THANET ELECTRIC SUPPLY CO., LTD.—Co. states that if the local authorities carry through their intention to purchase its electricity undertakg. the purchase price will include a sum equal to the aggregate of all amts. by which the gross pfts. durg. the war yrs. have bn. less than the co's. sh. of the pfts. as scheduled in the Margate, Broadstairs and District Electricity Act, 1937.

Company Meeting

POWER SECURITIES CORPORATION LTD.—The annual meeting was held in London, on February 14. In the statement circulated with the report and accounts the chairman, Mr. William Shearer, said the electrical construction department had been fully occupied. Considerable extensions to power stations in this country had been in progress and many miles of cables and transmission lines had been laid and erected. In the post-war period, not only a continuance of wise leadership, but the utmost application and the most strenuous endeavours on the part of all engaged in industry and commerce would be required to restore to health and vigour the battered and shattered economic life of the country. To this end "regimentation" must cease and liberty to adventure and create must prevail.

Metal Prices

	Monday, February 12. Price.	Inc.	Dec.
Copper—			
Best Selected (nom.) per ton	£60 10 0	—	—
Electro Wirebars ... „	£62 0 0	—	—
H.C. Wires, basis ... per lb.	9⅝d.	—	—
Sheet ... ... „	10⅞d.	—	—
Phosphor Bronze—			
Wire(Telephone)basis per lb.	1s. 0⅛d.	—	—
Brass (60/40)—			
Rod, basis ... ... per lb.	—	—	—
Sheet „ ... ... „	—	—	—
Wire „ ... ... „	10⅞d.	—	—
Iron and Steel—			
Pig Iron (E. Coast Hematite No. 1)... per ton	£6 18 6	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ... „	£27 10 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in. ... „	£20 0 0	—	—
Galvanised Steel Wire No. 8 S.W.G. ... „	£26 0 0	—	—
Lead Pig—			
English ... ... per ton	£26 10 0	—	—
Foreign or Colonial „	£25 0 0	—	—
Tin—			
Ingot (minimum of 99.9% purity) ... per ton	£303 10 0	—	—
Wire, basis... ... per lb.	3s. 10d.	—	—
Aluminium Ingots ... per ton	£110 0 0	—	—
Spelter... ... ... „	£25 15 0	—	—
Mercury (spot) Warehouse ... ...per bottle	£69 15 0	—	—

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

Commercial Information

County Court Judgments

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

DOME, A. (male), 55, Thornby Road, Clapton (Trading as Electric Refrigerating Co.), electrical contractor. £141 19s. 3d. Nov. 20.

HARFORD, P. A. (male), 34, Phyllis Crescent, Ely, Cardiff, electrical engineer. £25 3s. 1d. Nov. 28.

Satisfactions

GLOBELITE BATTERIES LTD., London, S.W. —Sat'n. Jan. 1, £1 500, deb. reg. May 20, 1943.

NEWPORT ELECTRICAL CO., LTD. (Mon.). —Sat'n. Jan. 24, £400, reg. Jan. 18, 1930.

Applications for Discharge

WELLS, Frederick William, 41, Hawkswood Avenue, Kirkstall, Leeds, and carrying on business at 64, Town Street, Horsforth and 37, Commercial Road, Kirkstall, Leeds, radio dealer. Date of hearing, Feb. 28, 1945, 10.30 a.m., County Court House, Albion Place, Leeds.

MOON, Clifford, 24, Market Street, Heanor, Derby, radio dealer. Date of hearing, March 7, 1945, 10 a.m., the Court House, 20, St. Peter's Churchyard, Derby.

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.*

J. AND J. COUCH LTD., St. Ives (Cornwall), wireless and elec. engrs.—Jan. 15, mort., to Midland Bank Ltd., securing all moneys due or to become due to the Bank; charged on ppty. in Chapel Street, St. Ives.

SILICA GEL, LTD., London, W.C.—Jan. 22, mort., to Midland Bank Ltd., securing all moneys due or to become due to the Bank; charged on contract moneys. *£1 776. Nov. 29, 1944.

Coming Events

Friday, February 16. (To-day.)

I.E.E., MEASUREMENTS SECTION.—London, W.C.2. "The Economic Utilisation of Modern Permanent Magnets," D. J. Desmond. *5.30 p.m.* —I.E.E., N.E. STUDENTS' SECTION, Newcastle-on-Tyne. Senior chairman's address, J. A. Harle. *6.30 p.m.*

I.E.E., BRISTOL STUDENTS' SECTION.—Bath. "Paper Insulated and High Voltage Cables," J. W. Miles.

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, S.W.1. "War-time Engineering in Agriculture," H. W. Arkell. *6.30 p.m.* —SHEFFIELD SECTION, West Street. Discussion, "Fabrication by Welding," R. W. T. Norton. *7 p.m.*

ELECTRICAL TRADES' COMMERCIAL TRAVELLERS' ASSOCIATION.—Connaught Rooms, London, W.C.2. Luncheon. *1 p.m.*

Saturday, February 17.

I.E.E., LONDON STUDENTS' SECTION.—Visit to Furzehill Laboratories, Boreham Wood, Herts. *2.45 p.m.*

I.E.E., W. WALES SUB-CENTRE.—Swansea. "Electrostatic Precipitation of Dust from Boiler-Plant Flue Gases," J. Bruce.

Monday, February 19.

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, "Brains Trust." *6 p.m.*

I.E.E., MERSEY AND N. WALES CENTRE.—Liverpool. "Remote Switching by Superimposed Currents," J. L. Carr. *5.30 p.m.*

Tuesday, February 20.

I.E.E., RADIO SECTION.—London, W.C.2. Discussion, "Aspects of Post-War Valve Standardisation," opened by A. H. Cooper. *5.30 p.m.*

LUTON ELECTRICAL SOCIETY.—Town Hall. "Pulverised Fuel for Electric Power Stations," R. A. W. Connor. *7.30 p.m.*

Wednesday, February 21.

I.E.E., E. MID. SUB-CENTRE.—Demonstration Theatre, City of Nottingham Gas Department. "The Design and Performance of Domestic Electric Appliances." W. N. C. Clinch. *2.30 p.m.*

COMMERCIAL ELECTRIC REFRIGERATION ASSOCIATION.—Connaught Rooms, London, W.C.2. Annual luncheon. Principal guest, Rt. Hon. A. V. Alexander. *12.45 for 1.15 p.m.*

Thursday, February 22.

I.E.E., DEVON AND CORNWALL SUB-CENTRE.—Globe Hotel, Newton Abbot. "Reinforced Concrete Transmission Line Supports," E. C. Neate and W. F. Bowling. *3 p.m.*

Friday, February 23.

I.E.E., N.W. CENTRE, RADIO GROUP.—Manchester. "Television Broadcasting Practice in America, 1927/44," D. G. Fink and D. G. Espley. *6 p.m.*—I.E.E., N.E. STUDENTS, Old Assembly Rooms, Newcastle-on-Tyne. Annual dance.

Saturday, February 24.

I.E.E., LONDON STUDENTS' SECTION.—Visit to the London Hydraulic Power Co., Grosvenor Road, S.W.1. *2.30 p.m.*—I.E.E., N.W. STUDENTS' SECTION, visit to Trafford Power Station.—I.E.E., N. MID. STUDENTS' SECTION, Great Northern Victoria Hotel, Bradford. Discussion, "Frequency Modulation." *2.30 p.m.*

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