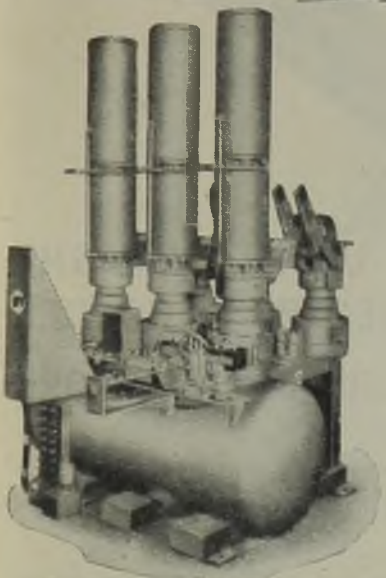
ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXVI. No. 3508 FEBRUARY 16, 1945 9d. WEEKLY

'ENGLISH ELECTRIC'

Air-Blast SWITCHGEAR



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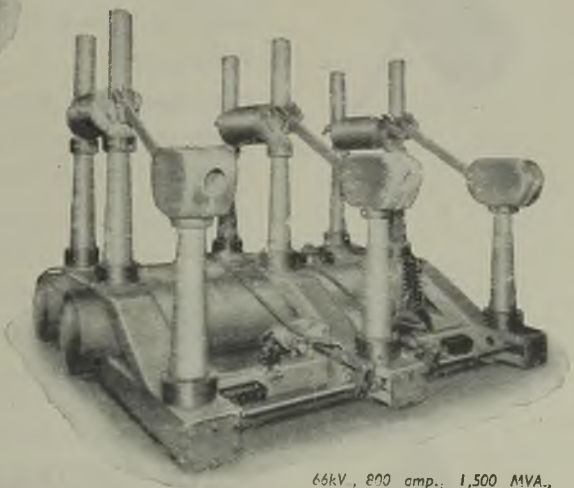

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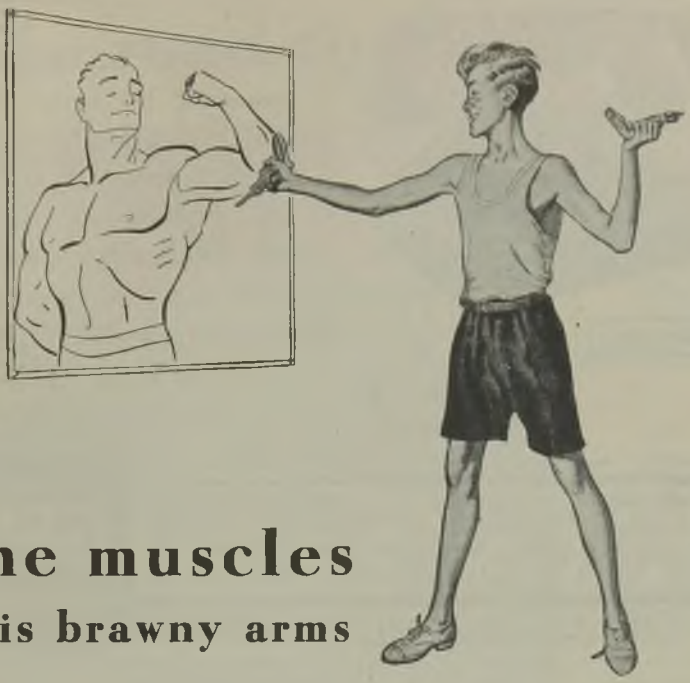

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ELECTRICAL REVIEW

February 16, 1945

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

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Power Plant Shortage

Central Board Absolved from Blame

DURING these war years our readers have been kept informed, so far as national safety allowed, of the hazards under which the supply of electricity has been kept going. Latterly it has become permissible to describe and illustrate damage to power stations through enemy bombing. Vivid as are such indications of severity of operating conditions, a truer perspective of the position as a whole is obtained by recalling their almost negligible effect on output. More troubles have resulted from defence measures and incomparably more from the use of coal of varying unsuitability (not, as yet, from actual coal shortage) and from lack of adequate labour for maintenance.

Such factors, however, do not lie at the root of the trouble. Even before this winter's cold spell added about 800,000 kW to the morning peak and—in order to avoid widespread curtailment of electricity supplies—necessitated subjecting some consumers to the discomfort of being temporarily cut off, the impression had been gaining ground of a serious deficiency in available generating-plant capacity. This impression is confirmed by perusal of the annual reports of the Central Electricity Board for 1940 to 1943, particulars of which are given in this issue.

Ministry of Supply Decides

It is highly important that the public should realise the causes of the inadequacy, if it is to retain its confidence in the reliability of electricity supply—a confidence that depends largely upon the foresight shown by the authority responsible for co-ordinating generation and devising programmes of plant extensions. The reports show that the Board did its duty in persistently urging on the Government the serious consequences which might ensue from refusals of manufacturing priorities and that it was specifically absolved from responsibility for any such consequences. The Ministry of Production, which alone is competent to judge between the claims of the various war services on the limited resources of labour and materials, acting with the full knowledge of the difficulties that its attitude might create after the cessation of hostilities, decided that the risk had to be taken.

Modifications in Methods

The national policy of subordinating all else to winning the war had, of course, been observed by the Board itself in the modifications which it introduced in operating practice with a view to insuring against any locality being deprived of electricity and against any delay in affording supplies to munition factories. This being so, its ability to make ends more than meet financially and to secure an average power-station thermal efficiency near the pre-war figure may be regarded almost as an uncovenanted bonus.

After the war there will still be many conflicting claims on the national resources of material and labour for the manufacture of diverse classes of goods. The requisite output of these will be obtained only if, first of all, electricity supply plant is adequate to provide all the power required

for industry and also for feeding and warming the homes of those who work in the factories. It will be no longer a matter of calling upon the electricity supply industry for a supreme effort during a relatively limited period. The supreme effort has been made and it has led to progressive deterioration of plant, an appreciable proportion of which is already obsolescent and calls for replacement. It follows, therefore, that—subject to the overriding claim of the armed forces—priority should be given to the construction of generating plant.

Scientific Linkage

THE relevance of investigations in our branch of science to those in another having little obvious connection with it receives apt illustration in the E.R.A. report for last year, reviewed in this issue. The behaviour of insulating materials under high mechanical stress at working temperatures had not previously received the attention its importance warranted, and the subject is far removed from the creep of steels at high temperatures, which has been a dominant factor in limiting the temperature of steam in electric power stations. Nevertheless ideas similar to those that are proving successful in the latter case are being applied to dielectrics with promise of good results.

Either or Both ?

IN their joint memorandum entitled " Temporary Accommodation " the Ministries of Health and Works stipulated that in temporary dwellings the cookers and washboilers should be served by the same supply and that all houses on one site must have either gas or electricity *for these purposes*; individual variations could not be allowed. As we pointed out at the time, all this is most indefinite. Some housing authorities have interpreted it as meaning that only gas or electricity could be provided to the houses: this view is the sensible one. Why make conditions regarding the cookers and washboilers if there is to be a free hand with regard to lighting and refrigerators? It was stated in a letter from the local gas company to York City Council last week that an amended circular on the subject was to be issued. We have not seen this yet but are most anxious to know how the Departments straighten out their ambiguity.

Perthshire Water Power

THE three new stations projected by the North of Scotland Hydro-Electric Board (referred to on another page) will probably, on the data given and allowing a margin of spare capacity, operate at a load factor not exceeding 30 per cent. Assuming the small associated scheme at Gairloch to involve a greater proportionate capital expenditure per kW, the maximum figure for the Garry-Tummel project may be taken at £40 per kW. Overall costs, at 6 per cent. on capital, should be less than 0·25d. per kWh, equivalent to 8 per cent. for a modern steam station costing £30 per kW, leaving coal to be paid for in addition.

Rubber Prospects

DISCUSSIONS on the probable post-war rubber situation are of the first importance to the electrical industry which has had to do without or employ substitutes to a great extent during the war. In 1943 imports of rubber amounted to nearly 78,000 tons, against 203,000 tons in 1940. The British, Dutch and American groups in Washington dealing with the subject have stated that the production of natural rubber in the Pacific area will probably be at the rate of 1½ million tons annually within three or four years of the eviction of the Japanese and world demand is not expected to exceed this figure. This raises the problem of synthetic rubber, mainly American.

Production of Synthetic

THE world output of synthetic rubber is said to be in the neighbourhood of 1⅓ million tons. A reversion to the use of natural rubber would thus apparently render this superfluous to requirements. It seems unlikely that the cost of production generally can be reduced to the price of the natural product, although some plants are claimed to have got down to a more or less " economic " figure. Just before the war rubber (Para fine) was selling at about 7½d. per lb. A probable post-war figure which has been quoted is 1s. per lb. American consumers will probably prefer to revert to natural rubber, but it is very unlikely that the United States Government will be prepared to close and write off the synthetic plants. The best suggestion so far has been that the plants should be kept dormant but in a state of preparedness against possible emergencies.

Works Transport

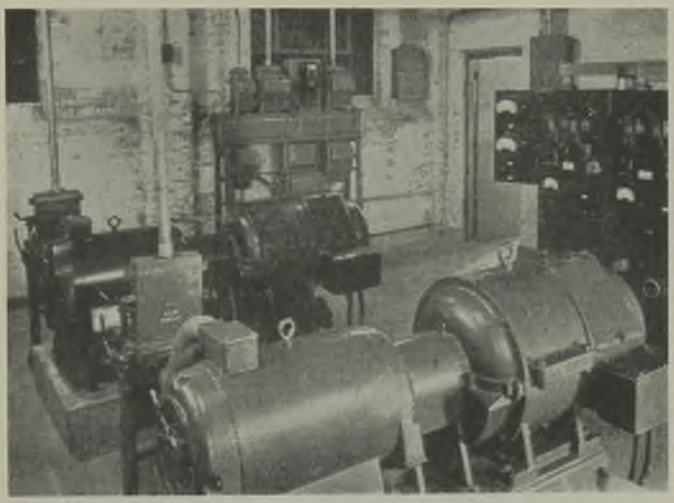
Battery Vehicles in a Large Factory

DURING a recent visit to a large factory employed in the manufacture of explosive material we saw how efficiently the use of electric trucks and tractors has overcome the many difficulties associated with the transport of explosives in their various stages of production between widely dispersed process buildings and departments. The three types of vehicles in service, namely, one- and two-ton platform trucks, and a two-ton tractor, are shown in the illustration at the top of the page. All are B.E.V. vehicles supplied by Wingrove & Rogers, Ltd., and they are of similar design and construction, except for size. The two-ton truck has a load platform measuring 8 ft. long and 3 ft. 6 in. wide, while the top surface of the platform is 2 ft. above ground level.

The construction throughout is massive and the bodies are built up on channel-iron frameworks with sheet-steel walls and platforms, etc. The vehicles are all reversible and the driving step, which is about 6 in. above ground level, is at one end immediately "behind" the control equipment, and the battery container which is carried on the platform. Tiller steering is employed and the steering transmission is to both of the wheels at the "back-wheel" driving end. All four wheels are rubber tyred. Two flashtight headlamps and a similar rear lamp are carried by each vehicle.

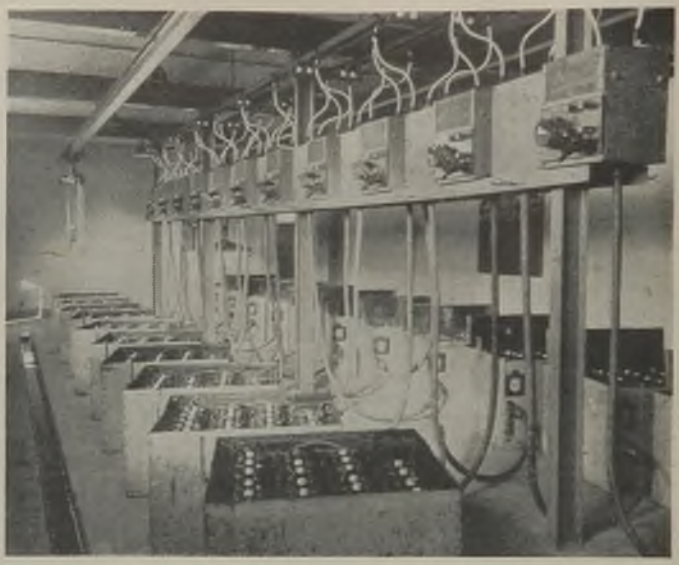
The battery in each case is an "Exide" ironclad 22-cell equipment with a capacity of 240 Ah at the five-hour rate of discharge. The battery container is of heavy-steel and welded construction, with a suitable lift-off cover and handling lugs, and it is fitted with an ampere-hour meter and a 150-A charging socket. A padlock prevents inadvertent withdrawal of the plug.

The electrical arrangements are similar on all three types of trucks, except for the size of the motor and its associated control equipment. The one-ton truck has a 1·7-HP motor, the two-ton truck a 5-HP driving equipment, and the two-ton tractor a 4-HP motor. The motor in each case is of J. H. Holmes make, and is carried under the vehicle body just in front of the "back" axle, with its nose suspended on torque reaction springs. It is of flameproof construction and is a 40-V DC series traction-type unit with a short-period overload capacity of 300 per cent. Ball bearings are



The charging supply machines are two 750-A, 60-V DC m.g. sets; main DC distribution is by simple open-type switchboard

fitted. The motor speed in the case of the 5-HP unit is 875 RPM and transmission is through a single-reduction worm gearing and a differential gearing to impart to the vehicle an average high speed of 5½ miles per hour on a level run. The whole of the transmission equipment operates in an oil retaining case.



The central rack accommodates 22 charging-resistance units with t.r.s. trailing cable connections to the batteries beneath

The motor is served by a reversing drum-type controller which gives three speeds in each direction with series-parallel control. The controller resistance is mounted under the chassis. The controller alone is hand operated for normal working, but there is an emergency foot-pedal operated brake fitted on the transmission drum between the motor and the differential gear on the back axle. This foot brake is automatically " on " when the " dead man's " foot pedal is " up," *i.e.*, when the driver is not in the normal operating position. There is a link between the foot pedal and a switch in the controller which completes the contactor circuit, so that current is supplied to the motor only when the foot pedal is depressed, *i.e.*, when the link-operated switch is " on." In overall control of the motor circuit is a s.p. hand resetting overload circuit-breaker.

Small charging racks serve individual cells and lamp batteries ; running mains and distilled water are available

Most of the vehicles are employed on general-service exterior work, and for the care and maintenance of these there are throughout the factory four combined garages and charging stations, each serving thirty vehicles. Each charging station proper has two rooms, one housing the machinery supplying the charging current and the other the batteries while on charge, with the necessary handling and distribution equipment. The charging supply machines are two motor-generator sets, each consisting of a 67½-HP s.r. motor, with direct stator switching and rotor-resistance control, directly coupled to a 750-A, 60-V DC generator. A simple open-type, air-break Statter

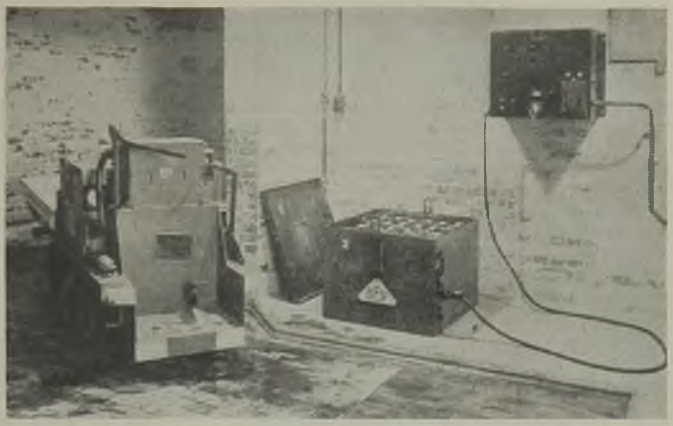
switchboard in the machine room serves for the main DC distribution, and this is equipped with 1,000-A air-break incoming switches fitted with overload and reverse-current protection devices.

The outgoing circuits are controlled by knife switches; there are directly connected to stout copper busbars which are continued through the partition wall to the charging room where the two bars for each circuit are suspended from the concrete roof and run almost throughout the length of the room immediately above a central main battery charging rack mounted on the building stanchions. The rack accommodates 22 charging-resistance units, each of which is complete with a d.p. knife switch and an ammeter. In each case the circuit to the battery beneath is completed *via* heavy two-core t.r.s. trailing cable and a 150-A Reyrolle concentric plug and socket, the socket portion of which is integral with the battery container and has already been referred to. During charging the batteries stand on a central platform, about two feet above floor level, which will accommodate two lines of eleven batteries each.

The batteries are charged on the constant-potential method, the generators being regulated to provide a voltage of 57 at the busbars. Charging takes place in each case at a rate (current) depending on the relative voltages of the battery and the busbar, and as the charge progresses and the battery voltage rises the charging current correspondingly decreases. This method of operation permits a battery to be charged in seven hours, instead of the usual ten, without risk of excessive temperature increases.

Accurate battery records are kept of every charge and discharge, and boosting charges are given to individual cells, if and when necessary, by means of a wall-mounted small rectifier charging panel at one end of the charging room. Two smaller charging racks serve, respectively, the batteries of flashtight portable hand lamps and the Ceag "Jellac" type batteries of flame-proof lighting fittings used for secondary lighting in certain explosives-handling buildings. Running mains water is available for washing cells and distilled water for "topping up" is provided by a steam-heated still. The building is heated by high-level steam pipes fitted round the interior surfaces of the walls.

Over each line of batteries in the charging room is a one-ton hand-operated hoist and runway for lifting the batteries to and from the trucks and the battery charging platform, while at the entrance to the garage is a Tecalemit air-hydraulic hoist which serves for raising the vehicles for examination and greasing purposes. This 3½-ton hoist is served by a single-stage air compressor which provides air for operating the hydraulic lift proper at 150 lb. per sq. in. The compressor is driven by a 3-HP motor served by a direct-on push-button controlled starter.



"Clean floor" interior work necessitates special charging arrangements

In one section of the factory one-ton trucks are used for materials handling on internal "clean floors" only, so that special charging arrangements have had to be provided for the vehicles of the batteries. Charging takes place in an annexe to the "clean floor" building where the layout is simple and wall-mounted Westinghouse rectifier units serve the batteries, with connecting and mounting arrangements similar to those in the main charging stations.

Smithsonian Institution

THE illustrated volume of over 600 pages which constitutes the annual report of the Smithsonian Institution in Washington, U.S.A., contains brief records of such of its diverse wartime activities as may be mentioned. The international exchange service of governmental and scientific publications involved the handling of 573,460 packages during the year ended June, 1943, although the war prevented shipments to many foreign countries. The library, which contains 907,645 items, continued to be used almost entirely for war purposes. The purpose of the articles in the general appendix (of 500 pages) to the report is to furnish short accounts of discovery in particular branches of science.

Overhead Lines

Operating Experiences in Yorkshire

THE operation and maintenance as well as testing of overhead power lines and associated outdoor substation equipment on AC systems are commented upon in a paper by MESSRS. R. C. HATTON and J. MCCOMBE (Yorkshire Electric Power Co.) submitted to the Transmission Section of the Institution of Electrical Engineers on Wednesday.

The authors detail experience gained in their area of 3,000 sq. miles, comprising both transmission and distribution networks operating at 66, 33 and 11 kV down to 400/230 V with overhead line routes ranging up to 1,500 ft. above sea level. They indicate suitable intervals for maintenance work and emphasise the fundamental importance of providing adequate transport and communication facilities, of carefully selecting well-trained staff to be situated at strategic points, of centralising the control of all operations and of enforcing the strict observance of a suitable code of safety regulations.

Protection Against Lightning

Means are described of counteracting faults, which have been carefully recorded and analysed, the predominance of failures due to lightning being emphasised. Some 47 per cent. of the total overhead-line faults in the ten-year period ended in 1943 were caused by lightning. Unless overhead earthing wires are correctly placed at the requisite height above the conductors their protective utility will be negligible. Most types of power line need two overhead earthing wires to afford complete protection, which complicates construction and greatly increases the number of supports required and the cost of erection. The authors doubt whether on the whole such additional cost is warranted.

There seems to be little hope of reducing the incidence of line faults due to wind. Snow and ice have caused roughly 16 per cent. of the total faults on overhead lines; they have occurred principally on routes at altitudes of over 800 ft. above sea level. The authors believe that the disposition and spacing of conductors as well as the span length have an important bearing on circuit outages due to snow and ice, but no scientific information on the subject was available until a few years ago.

During the ten-year period ended in 1938 some 1,692 transformers were installed of capacities ranging up to 1,000 kVA. It is noteworthy that 70 per cent. of the transformer faults were caused by flashover above the oil level during lightning periods. In some of the earlier 11-kV transformers, both for indoor and outdoor use, the clearances of from 2 to 5 inches between live metal and the tank or cover were insufficient for connection to overhead line systems. In view of the danger of explosion inside the tanks, the clearances were enlarged by means of long-shank bushings and good results have since been obtained. It was thought that the greater clearance might result in added insulation failures, so a duplex lightning arrestor with twin spark gaps was developed.

The number of inter-turn failures in transformers has been high (14 per cent.) but it is believed that lightning contributed to the puncturing of the insulation, which subsequently failed.

Reducing Maintenance Costs

The authors' recommendations for minimising maintenance costs include the avoidance of exposed high ground when choosing overhead line routes; otherwise span lengths must be kept short. Overhead lines of 66 kV and over should not be taken into areas of polluted atmosphere; they should be terminated and the distributors extended outward to meet the transmission line. The extra cost involved may well be more than counterbalanced by the saving on insulator washing, which is a costly and inconvenient item of maintenance.

Copper conductors are recommended for all lines up to and including 66 kV at altitudes not exceeding 800 ft. above sea level with spans of less than 500 ft. Horizontal spacing is preferable wherever practicable. Galvanising is considered by the authors to be well worth while as the cost of painting transmission line supports is very high and it is often inconvenient to switch the lines out for painting.

Routine inspection and testing are usually essential in the case of insulating materials used on high-voltage lines, although too much attention can be given to them. It is often found to be good practice to renew doubtful conductor and insulators rather than continue to spend money on maintaining them.

Instrument Making and Horology

THE next school year of the Northampton Polytechnic Junior Technical School for Instrument Making and Horology commences on April 9th, at premises in Fishpool Street, St. Albans, to which the school has been evacuated. Admission is free but is conditional upon pupils passing the entrance examination which is being held on March 12th at St. Albans and at the Polytechnic in London.

The Grid and the War

Central Board's Reports for 1940-43

FOLLOWING the recent censorship relaxations the annual reports and accounts of the Central Electricity Board for 1940 to 1943 have now been released for publication (Whitehead Morris, Ltd., 1s. each). During the four years some 670 miles of lines (many of them erected especially to meet war requirements) were added to the grid so that at the end of 1943 the aggregate mileage had reached 5,099, of which 3,585 was operated at 132 kV. The number of switching and transforming stations was increased by 37 to a total of 344 with a capacity of 13,058,750 kVA.

By the addition of Little Barford Station[1] and three new stations[2] and by the selection of the Buccleuch station of Barrow-in-Furness Corporation, the number of selected stations became 142, containing 10,984,656 kW of generating plant. There were also 40 non-selected stations under the control of the Board. The output from public supply systems rose from 26,400 million kWh in 1939 to 37,000 million in 1943 and of the latter amount 98·65 per cent. was produced at stations generating for the Board. Of the 558 distributing undertakings in the country (excluding North Scotland), 224 were supplied directly by the Board and 307 indirectly *via* other undertakings.

Reasons for Plant Shortage

The Reports disclose how the extensive programmes of the Board both for the grid and its substations and also for generating plant capacity have been hampered by shortage of labour and materials and by the policy of the Government's Production Executive not to grant priorities unless necessary for war purposes. As early as 1941, the Board impressed upon the Government the danger of a national shortage of generating plant in the immediate post-war years and was informed by the Production Executive that it would not be held responsible for non-availability of plant in the first year or two after the termination of hostilities as a result of absence of such priorities.

In the following year a substantial programme of new plant for the autumn of 1945 was submitted, but only about one-third was allowed by the Ministry of Production. During 1943, the Board put forward a programme to meet the situation if the war ended in the autumn of 1944, some of which would be required for service in 1947 and the whole by the autumn of 1948; the greater part of the programme was approved on the understanding that while the undertakings concerned might place orders, pending the cessation of hostilities against Germany, manufacture should not begin without further consent. In that programme it was assumed that the useful age of 2,000,000 kW of plant could be safely extended from twenty to twenty-five years. The extended age will be reached by 347,000 kW before the end of 1947 and by 281,000 kW before the end of 1948.

Great Rise in Load Factor

Several factors have affected grid operation, such as a departure from the policy of concentrating generation in the most economical stations and the keeping of more generating plant in readiness to secure continuity of supply in emergency. Also black-out and longer working hours have resulted in a more constant demand throughout the day, so that the pre-war load factor on the grid system of 36 per cent. rose to 50 per cent. in 1942 and was 48 per cent. in 1943. Continuance of summer time in the winter and the black-out caused the peak, which had normally lasted for about an hour during evenings a fortnight before Christmas, to be transferred to the mornings, when it was extended over several hours during three or four winter months.[3] Moreover, summer demands were about three-quarters of those in the winters, adding to the difficulties of routine overhauling.

Mr. Harold Hobson, Chairman of the Board

The need to run for many hours plant that normally would have been used only to meet short peaks reduced considerably the period available for maintenance and insufficient labour was available for this work. Also the inferior and variable quality of coal reduced the effective capacity and efficiency of boilers. The combined result was to lower the average thermal efficiency of stations in 1941 and 1942 by some 3 per cent. below the 1939 figure, thus substantially increasing the quantity of coal consumed. During 1943,

(1) Beds., Cambs. & Hunts. Electricity Co., *Electrical Review*, Jan. 19th, 1945.

(2) Castle Meads (Gloucester Corporation), *Electrical Review*, Feb. 9th; Earley (C.E.B.); Lynfi (S.Wales E.P.Co.)

(3) Aggregate maximum demands on generating stations in recent calendar years have been as follows:—1942 (Jan.), 7,489,000 kW; 1943 (Dec.), 7,970,000 kW; 1944 (Dec.), 8,367,000; 1945, to date (Jan.), 8,706,000 kW.

however, partly as the effect of new generating plant, 400,000 tons was saved compared with the previous year as under equivalent conditions, though thermal efficiency was still 1 per cent. below the 1939 level.

A progressive increase in plant breakdowns seriously reduced the capacity of plant available for service. In the winter of 1942–1943, the proportion out of commission due to overhaul, breakdown and other causes was about 13 per cent. of the aggregate output capacity as compared with a pre-war average of about 6 per cent. In 1943, the percentage had risen to 18·6, equivalent to 1,857,000 kW.

From time to time there has been grave anxiety in regard to coal stocks, especially towards the end of 1943, when consumption appreciably exceeded the deliveries and threatened a need for a general curtailment of supplies of electricity. The Report points out that extensions to generating plant after the war must, in regard to their location, be influenced by national coal policy. In the absence of a Government pronouncement, no long-term plan for the development of the grid can be formulated. In order to minimise delay, however, the Board is considering alternative plans, including the construction of transmission lines and equipment for operation at higher than present voltages.

Technical Achievements

Among research and technical achievements probably the most remarkable is that, despite a substantial increase in the number of faults on the grid due chiefly to defence measures, the percentage of faults correctly cleared reached 93·7 per cent. in 1943—the highest standard yet obtained anywhere, we believe. Another notable development has been the installation of air-blast circuit breakers for 66 and 132 kV. Nitrogen-filled, nitrogen-pressure and oil-filled cables for 132 kV in appreciable mileage lengths are functioning successfully. Cadmium copper and steel-cored copper conductors, as war-time substitutes for aluminium, are in extensive and satisfactory use. Although Petersen coils alleviated the effects of earth faults on 33-kV sections of the grid, further installations were suspended on account of shortage of materials and labour. Reduction in noise of capacity-compensating reactors, surge filters and studies in associated phenomena, one-unit, rod-type and glass insulators and transformer steels were further subjects investigated under field conditions.

An important judicial decision was obtained in regard to wayleaves. Under Section 11 of the Electricity Supply Act, an undertaking may retain a line in position after the termination of an agreement until notice of objection has been served by the owner or occupier of the land. In the relevant action it was contended that the Board had become trespassers because within twenty-one days after the expiry of the agreement it had neither removed the line nor obtained a compulsory wayleave for its retention. The Board was held not to be trespassers. The Court's decision was that notice of objection could not be served until after the termination of the agreement, that on receipt of such notice an undertaking should follow with all reasonable dispatch the procedure laid down by Section 22 of the Electricity Supply Act, 1919, for obtaining a wayleave and that, pending the decision of the Minister of Transport, the undertaking was entitled under Section 11 of the 1922 Act to retain the line in position.

Revenue and Expenditure

The Board's accounts show that gross receipts from sales of energy rose from nearly £38 million in 1939 to a little over £68 million in 1943, partly owing to the rise in coal prices. Increased expenses resulted in the revenue balance being some £558,000 lower in 1940 than in 1939. In the following year the revenue balance was increased by £837,000 in consequence of settlements relating to accounts for earlier years, while the balance of the net revenue and appropriation account was raised by £430,000 to £2,984,000. In both 1942 and 1943 improved load factors and expansion of munitions output enabled revenue to meet all outgoings, including interest and amortisation, and increase the credit balances on net revenue and appropriation account by approximately £874,000 and £1,325,000, respectively. During the four years capital expenditure on the grid was increased by nearly £6 million.

As regards the Electricity (Civil Defence) Fund, which was established to defray expenditure on a national pool of spare equipment for war emergencies and on measures for securing due functioning of public electricity supply system, the Board at the end of 1943 had exercised its borrowing powers to the amount of £2,369,000. This fund, limited to a maximum of £6 million, is provided half by Exchequer grants and half by money raised by the Board on the security of a levy on the electricity supply industry.

Portuguese Development Plan

ACCORDING to a message from Lisbon to the Bank of London and South America, the Portuguese National Assembly has approved proposals for developing the production and distribution of electricity for all purposes. Both hydro-electric and thermal stations seem to be contemplated. For the generating plant credits are offered at Banco de Portugal rate of discount together with exemption from import duty covering also construction materials. Concessions will be at the disposal of the State and in no case will their duration exceed 75 years. On expiry the installations will revert to the State.

Wartime Extensions

Power Plant Arrangements 1939-43

THE Central Electricity Board has sent us a list of generating plant and boilers for which it made arrangements with authorised electricity undertakers during the five years from January 1st, 1939, to December 31st, 1943.

Included in these arrangements are the Clarence Dock, Liverpool, extension which was described in the *Electrical Review* of January 12th, and the new stations at Little Barford and Gloucester with which we have recently dealt and those at Earley and Llynfi, which will be the subject of future articles.

It will be seen that the total capacity of generating plant arranged for was just under 3,000,000 kW. Particulars of post-war extensions provided for by the Board were given in our issue of November 24th last (p. 731).

Scheme Area and Station	Owners	Generators kW.	Boilers lb. per hr.
Central Scotland—			
Kilmarnock	Ayrshire Bd.	1–30,000	3–150,000
Clyde's Mill	Clyde ValleyCo.	3–30,000	12–100,000
Bonnybridge	Scottish Central Co.	2–20,000	4–120,000
N.E. England—			
Darlington	Darlington	2–20,000	4–120,000
Dunston		—	1–156,000
Kepier	North-Eastern Co.		
North Tees		2–50,000	3–375,000
			2–180,000
Sunderland	Sunderland	2–20,000	3–121,000
N.W. England & N. Wales—			
Whitebirk	Blackburn	1–30,000	6–150,000
		1–40,000	
Willowholme	Carlisle	2–30,000	5–150,000
		1–750	
Kearsley	Lancashire E.P. Co.	1–50,000	4–173,000
Padiham		1– 1,600	
		—	2– 56,000
Lancaster	Lancaster	2–20,000	1–205,000
		2–800	1–200,000
Clarence Dk	Liverpool	1–50,000	1–250,000
		1–1,500	2–350,000
Stuart St.	Manchester	1–60,000	
		1–30,000	2–400,000
		1–750	4–130,000
		1–25,000	
		1–1,500	
Ribble	Preston	4–31,500	4–187,500
			4–190,000
Hartshead	Stalybridge, etc., Board	1–30,000	3–150,000
		1 1,250	
Stockport	Stockport	1–30,000	1–300,000
Trafford	Stretford Bd.	1–30,000	2–150,000
Warrington	Warrington	3–20,000	4–200,000
Mid East England—			
Valley Rd.	Bradford	1–30,000	3–180,000
		2–22,500	
Huddersfield	Huddersfield	1–20,000	2–120,000
Hull	Hull	1–30,000	2–190,000
Kirkstall	Leeds	2–30,000	2–250,000
Lincoln	Lincoln	2–20,000	4–120,000
Prince of Wales	Rotherham	1–30,000	1–200,000
Blackburn Mdws.	Sheffield	—	2–190,000
Neepsend		1–50,000	3–190,000
Ferrybridge		1–45,000	4–150,000
Mexboro'	Yorkshire E.P. Co.		
		2–30,000	4–180,000
Thornhill		1–45,000	4–180,000

Scheme Area and Station	Owners	Generators kW.	Boilers lb. per hr.
Central England—			
Hams Hall	Birmingham	2–50,000	4–320,000
		2– 3,500	
Burton	Burton	2–15,000	4– 80,000
Spondon	Derby & Notts Co.	1–30,000	4–200,000
Freemen's Meadow	Leicester	1–31,500	2–175,000
Avon	Leicester and Warwick Co.	2–15,000	4– 80,000
N. Wilford	Nottingham	2–30,000	4 175,000
Meaford	N.W.M. J.E.A.	3–30,000	5–240,000
Stourport	S.W. & S. Co.	1 60,000	1–525,000
		5,000(*b*)	
Ocker Hill	W.M. J.E.A.	2–30,000	5–150,000
Hylton Rd.	Worcester	2–15,000	3–150,000
S.E. & E. England—			
Little Barford	Beds., Cambs. and Hunts Co.	2–30,000	1–300,000
Brighton	Brighton	1–50,000	2–350,000
Earley	C.E.B.	2–40,000	5–200,000
Fulham	Fulham	2–60,000	6–315,000
Cliff Quay	Ipswich	2–45,000	3–365,000
Kingston	Kingston	2–30,000	3–260,000
		1– 3,000	
Battersea	London P. Co.	—	1–550,000
Willesden		1–30,000	4–110,000
Peterboro'	Peterborough	—	1–100,000
Watford	Watford	1,500 (*b*)	—
West Ham	West Ham	1–30,000	2–180,000
Woolwich	Woolwich	1–30,000	2–165,000
		1–750	
S.W. England & S. Wales—			
Portishead	Bristol	1–50,000	2–250,000
		1– 2,000	
Cardiff	Cardiff	—	2–180,000(*a*)
		1–30,000	2–180,000
Castle Meads	Gloucester	2–20,000	5–100,000
Llanelly	Llanelly Co.	1–12,500	2–60,000
Plymouth	Plymouth	1–20,000	2–100,000
		1–500	
UpperBoat	S.W. E.P. Co.	—	1–364,000
		1–30,000	1–182,000
Llynfi		2–30,000	2–300,000
Tir John			
North	Swansea	2 37,500	4–230,000
Moredon	Swindon	1–20,000	2–120,000
Newton Abbot	Torquay	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

(*b*) Increase in capacity of an existing set.

Views on the News

Reflections on Current Topics

AGAINST the advice of its Housing Committee the Edinburgh Corporation has decided that its temporary houses shall have gas cookers, wash boilers and refrigerators instead of being all-electric. The houses are still to have electric lighting (they must have of course) and so it will be necessary to lay both electricity and gas services which one member justly termed wasteful. Another member remarked that it was safe to say that 70 per cent. of the householders in Edinburgh preferred gas to electricity for cooking. I always wonder how people arrive at these very definite percentages. If the statement is correct it would seem that Scotland's capital is out of step with most of its other towns.

* * *

York has not yet made up its mind on this subject. The Housing Committee there had recommended that electricity should be used throughout the city's temporary houses, but at a meeting of the City Council last week it was decided to instruct the Committee " to consider the matter on an equitable basis." The decision followed a letter from the local gas company which stated that the Ministry of Health was issuing an amended circular on the subject. I am pleased to see that Alderman Mrs. E. A. Crichton backed up the proposal that the houses should be all-electric—truly an admirable Crichton.

* * *

In a long letter to the *Daily Telegraph* last week Sir Leonard Hill suggested that local authorities were taking a serious step in deciding to make their post-war temporary houses all-electric. The chief reason he gave was that the electricity supply industry might not be able to meet the load.

Replying to the letter Mr. Clarence Parker, chairman of E.D.A., pointed out that the present shortage was the result of the nation's war programme and he assured " the public and those local authorities whose decisions Sir Leonard Hill seeks to anticipate and perhaps influence " that his fears were entirely without foundation. The numbers of gas and electric cookers in use quoted by Sir Leonard were, I was pleased to see, put in their right perspective by Mr. Parker who showed that in 1939 the number of electric cookers was increasing at the rate of nearly 1,000 a day.

* * *

Somewhat exaggerated ideas (encouraged by the cinema) of the equipment of the American home are held in this country. Of course, many excellent appliances and arrangements have been produced and some of these are described by Kay Riley in the January *Transatlantic*. But the sting, contrary to the usual custom, is in the foreword headed " Warning to the Reader."

Miss Riley says:—" You are about to walk into an American home gleaming with tile, chromium and mirrors; filled with electric gadgets that do everything for the housewife. . . . Before you start on your tour of inspection I must tell you one important thing about this fabulous house: *it doesn't exist*. If Mrs. Smith (the average American housewife) had an unlimited income and if she made a tour of our experimental laboratories and picked up a sample of every new invention, it is just possible that she might be able to assemble such an H. G. Wellsian dream-house. Some of us have some of these gadgets. But for 99 per cent. of us, most of this kitchen-magic belongs to the future." This needed saying.

* * *

As a sort of footnote to the foregoing I quote a statement by Mr. J. H. Squires, Jr., of the Westinghouse Electric & Manufacturing Co., that 95 per cent. of the 32 million homes in the United States are "electrically obsolete," by which he means that they have only sufficient wiring to accommodate the " basic minimum of present electrical needs." Why should we hang our heads when the American home is mentioned?

* * *

A good story reaches me from Mr. A. G. Connell, the Halifax borough electrical engineer. He recently acted as question master of a " brains trust " arranged for the benefit of local troops. Somebody asked whether electricity originated at the positive or negative pole. The questioner explained that during his training in the Corps of Signals he was told the negative pole, but upon being posted to his unit he was instructed that the reverse was the case. Some argument ensued but the matter was put beyond doubt by the posting of a notice by the O.C. stating that in future in that unit electricity would originate at the positive pole.

* * *

From the United States comes the news that some of the leading steel manufacturers are experimenting with the production of extremely fine stainless steel thread which, it is suggested, will be suitable for the weaving of ladies' hosiery. Will a British manufacturer be first to evolve a small home welder for repairing the new form of stocking? I suppose that a seam welder is the type required.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Crane Hoist Motors

IN his article in your issue of February 2nd, Mr. R. S. Bennett does not substantiate his arguments in favour of compound-wound motors in any of his curves. These only show the characteristics of the two types of motors between light and full load and different results are obtained when a crane is lowering, say, full load. In this case, as soon as the controller is moved over to the first notch when lowering, the solenoid brake will lift and a compound or series motor will race away. This speed may well be beyond the safe " banding " limit of the motor and will be determined not by the shunt limiting winding but by the balancing of the various mechanical losses against the energy released by the load falling under gravity. The final speed then on this and the earlier notches of the controller will be determined by the type of gearing and general efficiency of the crane.

In these circumstances the speed would only be finally checked to any degree by moving the controller rapidly to the " full-on " notch and at the same time cutting out the series turns of the motor, so that it can regenerate to some extent on to the mains at about the shunt limiting maximum. The only way to check the speed when lowering full load would be by a mechanical brake of some form such as centrifugal, Weston type, or foot brake.

As many armatures are damaged by excessive speeds when hoisting a light hook, the best plan would be to provide a shunt limiting winding in the hoist direction but to cut this out in the lowering direction, using a controller which provides dynamic breaking by the potentiometer method, which, without any additional apparatus, provides perfect control of the speeds in lowering any load from " creeping " up to a safe maximum.

EXPERIENCE.

THE matters discussed in Mr. R. S. Bennett's article have received a great deal of attention over nearly half a century and the conclusion is not that stated in his last paragraph. Various views are held: the type of crane, type and rating of motor, hoisting speed compared with maximum distance lifted, all have their influence in preventing a rigid outlook. Moreover, there are so many conditions of which some must be present to permit of overspeed during hoisting: (lowering speeds are always restricted to a safe value on a well designed modern crane). The hoisting distance must be great compared with the rated speed, the block light compared with full load, the gearing very free, the motor unsaturated.

The last two conditions seem to be improving with the passage of time. Modern gearing with its total enclosure and oil turbulence is not so free as the old-fashioned open drives, and the modern motor tends to greater saturation. The article mentions that many hoists are over-motored; this is quite true but of equal importance and influence is the very general use of 60-minute rated motors, needlessly. There are few crane duties which require this rating for the hoist motor; 30-minute is adequate for all except duty-cycle jobs which should receive individual attention. Owing to less saturation the 60-minute motor tends to overspeed more readily than the 30-minute and many cranes would be well equipped with 15-minute rated hoist motors. If 60-minute rated motors are specified by a user, perhaps for standardisation, a good solution is to use one of the standard sizes and windings but geared and powered at its 30-minute rating.

It is not possible to do justice to this subject in brief, but one conclusion to be mentioned in opposition to Mr. Bennett's article is that as most crane hoist motors are still series wound and deservedly popular there is no need for the change which he recommends. Also armatures damaged by overspeed occur mostly on old cranes with plain-reversing control and no load brake and it is hard to find a genuine case of this damage taking place during hoisting; consequently the second conclusion can be drawn that the series motor has so many advantages that it should continue in favour, and the odd cases of overspeed during hoisting should be dealt with by one of such well-known methods as a permanent divertor or overspeed governor, the latter providing either electrical or mechanical limitation.

The curves in the article would be understood more easily if they were all drawn upon a percentage basis, as Fig. 1.

Glasgow. RICHARD A. WEST.

Educational Opportunities

FROM the correspondence under the above heading, disillusions regarding the value of the Higher National Certificate and Graduate qualifications seem widespread.

When I left school, prospective employers found it convenient to require a " School Certificate " or " Matriculation," without always being aware of the class of study involved. It now appears that, as we progress in engineering, the qualification of the Higher National Certificate is required by future employers or heads of departments, many of

whom have had little technical education and are, again, unaware of the syllabus covered or the technical nature of study.

It does not seem worth while to attend evening classes three times each week for five or six years with your employer's approval, only to be told at the end "We have no technical work for you, therefore we cannot pay you more; neither will we allow you to leave because the Essential Work Orders put you in our power." The last is, of course, a war measure, but in any case these young men should have fair play.

HIGHER NATIONAL.

I.E.E. Graduates' Position

WHEN I contemplated applying for a transfer to associate membership I was quickly and definitely told by my chief that my position was such that he could not support my application. Since then, in the Foreword to the *I.E.E. Journal* for March, 1943, an appeal has been made to senior members of the Institution to encourage the younger men who have attained graduate status. From the recent correspondence, it would appear that this appeal has fallen on barren ground.

Still, I do not suppose that your other graduate correspondents are in the position of having to take some of their instructions from a clerk, who, in the absence of the departmental superintendent, is to all intents and purposes considered by the management as the person in charge of the department.

In common with your other correspondents I would definitely advise intending candidates to think twice before starting on five to seven years hard work in their spare time, especially as the reward in many cases is so elusive.

STILL ANOTHER GRADUATE.

Universal Domestic Tariff

WITH reference to Mr. J. L. Ferns' letter in your issue of February 9th, my first paragraph was intended to convey that I thought the average cost of ½d. per kWh for 1,200 kWh per quarter much too low and that, as a consequence, alterations to figures in the formula would have to be made. It appears to me that at least 60 per cent. increase would be needed and such an increase might adversely affect the promotional value. This would be the case if the price of the kWh between 120 and 480 was made relatively high. I am not afraid of high demands; in fact I should welcome them except for the fact that the m.d. charge looms large in bulk supply tariffs. My experience has taught me that the highest weekly load factors occur at the time of heaviest loads. I am in complete agreement with Mr. Ferns that the kW of m.d. of a domestic consumer constitutes only a fraction of his capital liabilities, but I see no logical reason for reducing the price to an individual consumer for an increase in load only. One of the difficulties, if Mr. Ferns' proposals were adopted, would be explaining to a manufacturer how it came about that he was given a bonus for increasing the load in his house but penalised for a similar increase at his factory.

Like Mr. Ferns, I respect the efforts of John Hopkinson and other stalwarts, but these stalwarts sometimes have a habit of sticking to old ideas, which were sound at one time, but cannot be applied universally today. If Mr. Ferns can convert to his way of thinking those who still believe in making a charge in proportion to the demand of a domestic consumer, then I will lift my hat to him and withdraw my remark about grandfather.

B. CROWSLEY, A.M.I.E.E.

Welwyn Garden City.

Electric v. Gas Vegetable Boilers

RECENTLY in connection with the equipment of a modern canteen, it was found necessary to make inquiries for vegetable boilers. Whilst there is available gas-heated apparatus of the most up-to-date, well finished and appropriate type, manufacturers do not appear to be able to offer electrically-heated boilers which can compete with these in any respect. This was confirmed by one manufacturer, who was prepared to admit that in this particular field gas had them beaten.

If this is the case, it would appear to be about time that the matter was taken in hand seriously, as there does not seem to be any technical reason why satisfactory and reliable electrically-heated apparatus for the purpose mentioned should not be rapidly developed, even if the industry has to copy the best features of the gas-heated prototype.

PROGRESS.

[Our correspondent is a director of an important industrial concern. We do not believe that the position is quite so bad as he implies and will gladly pass on, or publish, replies from interested manufacturers.—Editors, *Electrical Review*.]

Science in Peace

AN open conference on "Science in Peace" organised by the Association of Scientific Workers is being held this week-end at the Caxton Hall, Westminster, S.W.1. The first session to-morrow (Saturday) at 2.15 p.m. will be devoted to "Science and Production"; the chairman will be Prof. P. M. S. Blackett, and the speakers will include Dr. J. L. B. Cooper (engineering) and Mr. A. Dooley (fuel and power). The subject for the Sunday morning session (10 a.m.) is "The Future Development of Science." Sir Robert Watson-Watt will be the chairman and the speakers will include Prof. P. M. S. Blackett, Prof. J. D. Bernal, Dr. Forbes W. Robertson, Dr. S. Lilley and Mr. E. Carter. In the afternoon (2.30 p.m.) Prof. H. Levy will preside and the subject will be "Science in Everyday Life."

Electrical Research

E.R.A.'s Plans for Future Work

MORE applications than ever before were received for the annual luncheon of the British Electrical and Allied Industries Research Association at the Savoy Hotel on Friday last week following the annual general meeting at which MR. E. B. WEDMORE (who recently retired from the position of director and secretary) was elected an honorary member.

SIR HARRY RAILING (President, I.E.E.) remarked that it was fitting that he should propose the toast of "The E.R.A." because the Association could not exist without the support of the I.E.E.; nor could the I.E.E. continue to flourish without the achievements of the E.R.A. They all welcomed the efforts being made to stimulate the interest of the older industries in research, but he could not help occasionally smiling when their various "advisers" (inside and outside the Government, which seemed to be just awakening to the value of research) endeavoured to preach to the electrical industry, which rather resented the implication that it had not played its part in either fundamental or individual research. While in the older industries it might still be a case of infiltration, some of the younger industries often themselves stimulated research. The achievements of the E.R.A. proved that it had been well led in the past, but there were several large question marks across the page of the future. The three essentials were, first, that the whole organisation must be imbued with the spirit of public service; secondly, it must have a first-class and contented staff; and, thirdly, sufficient means must be available. He had not the slightest doubt that funds would be forthcoming; recent directoral changes had been made in preparation for post-war development and money must be saved for the building project.

Sir Arthur Fleming, President of E.R.A.

SIR ARTHUR FLEMING (who succeeds Viscount Falmouth as president of the E.R.A.) responded with an outline of the state of the electrical industry at the time the E.R.A. was established. Co-operation in manufacture had begun to displace unrestrained competition and the rising standard of technical competence caused the export business to begin to thrive. It would have been very well worth while if it had done nothing more than draw together technical experts from previously competing firms to co-operate in the solution of research problems common to the industry.

After referring to a few of the technical achievements that had been dealt with in the more than 1,000 reports issued to members, Sir Arthur described the Association as unique in that throughout its existence it had had but one director, Mr. E. B. Wedmore, who came to it equipped with a fine academic record and very varied industrial experience. Under his leadership income had risen from about £3,000 a year to more than thirty times that amount. In the uphill fight to gain the confidence of previously keenly competitive interests, Mr. Wedmore had by his tact and wisdom built up an organisation that was an integral part of the industry.

As to the future, the industry was perhaps the most perfect example of a public service, for it provided the means whereby natural resources of power were converted into a form in which they could be used in varying degrees by all members of the community. Electric power was essential to all our industries. 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 has been 250 per cent. and by kWh sold 900 per cent. It had been responsible for the development and growth of many ancillary industries; for example, the electrical industry was the biggest user of plastics and had been responsible for much of the scientific research which had led to the development of that industry. It was not an over-statement to say that for every additional worker the electrical industry engaged, several other workers were indirectly employed. In that same respect it should be noted that electrical development required the employment to an increasing extent of scientific personnel.

As a result of war necessity many 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.

In the future there might be political tendencies to impose controls which would hamper industry and restrict profit-making, and to regard industry as a national asset in a narrow conventional way, thus reducing incentive and initiative. With the present economic system it was essential that there should be such a margin between the cost of

production and selling price as would provide a reasonable return on invested capital and thus ensure the attraction of further capital when required for expansion; and also provide sufficient funds for research and development to ensure enduring prosperity. The best safeguard against such interference as hampering controls 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.

Mobilisation of Resources

In peace-time the industry would have to learn how to adjust itself to entirely different conditions in which cost was a vital factor. It would have to shake off the narcotic influence of E.P.T. and the feeling that "anyhow the Government pays." It must also not be deluded by a period of great activity during the time of reconstruction, since that would merely be the time to equip for the struggle for existence ahead. It might be necessary to have as complete a mobilisation of manufacturing resources for peace as for war.

Not only was it essential that the Association be enlarged and equipped to solve on an adequate scale the increasing day-to-day problems, but it was even more important that it should expand its long-term researches, since it was from those that new industrial applications would arise.

In the translation of new scientific discovery into industrial applications a great difficulty presented itself in the lack of men having adequate scientific knowledge coupled with commercial and industrial experience and aptitude. It was there 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 men would be able to give practical effect to the results of research.

CAPT. J. M. DONALDSON (chairman of the E.R.A. Council) proposed the vote of thanks to the president.

Annual Report

THERE are references in most sections of the annual report for 1943-44 to the war's interference with, or retardation of, investigational programmes. But there is a feeling of satisfaction that a peacetime organisation should have proved itself to be so readily and successfully adaptable to the wartime requirements. It is reasonable to expect that the E.R.A. will eventually emerge with added strength from the ordeal.

It is a striking commentary on the volume of work performed that the Perivale laboratories, which were established on what was then quite a liberal scale, should in ten years have become inadequate. Control has been secured over some 47 acres at Leatherhead, at a cost of £25,000, and Mr. H. J. Rowse, F.R.I.B.A., has commenced to design new laboratories. Meanwhile, notwithstanding further hutment extensions at Perivale, it has been necessary to hold in abeyance at least half a year's full activity for which financial provision had already been made, and overcrowding at the head office in London has caused considerable concern.

In a foreword to the report Capt. J. M. Donaldson, chairman of Council, points out that not only will further capital have to be provided in addition to reserves to enable the building project to be financed, but that considerably larger annual expenditive will also be incurred upon the re-establishment of peacetime activities. It may thus be necessary to broaden, or perhaps deepen, the financial basis of the Association.

It is reasonable to expect that Service Departments will continue to utilise E.R.A.'s facilities. It is increasingly evident that the limiting factor will be shortage of adequately trained personnel; this can only be properly relieved by still more extensive pooling of problems of common interest, for which the E.R.A. organisation is peculiarly well adapted.

An Informative Brochure

It is considered that "many influential personages" holding responsible positions in the electrical industry are not fully informed about the nature and extent of the use that is made of the E.R.A. by the industry. To remedy this a 62-page illustrated brochure (ERA/R.619) has been produced describing what the Association is and what it does, including outlines of typical researches in ten different branches of the industry. The value of co-operative effort is stressed and the scale of working indicated by the present annual expenditure of £105,000 (the first years' expenditure was £10,500) which would have been materially larger had it not been for the wartime diversion of activities and staff.

There has been some further expansion of war contracts; much of the work, which must remain secret, represents a permanent contribution to industry and in due course will no doubt be made generally available in appropriate manner. Special attention has been paid to investigations related to the further commercial development of gas-blast circuit-breakers. One new patent application has been made and the renewal and maintenance of others have not been neglected.

The electric control apparatus section has been very active and, urged by wartime factory needs, has prepared a further important series of reports on industrial explosion hazards. Each of seven reports relates to a different gas and rapid progress

has been maintained in experiments with a third series of atmospheres commonly encountered in industry. The Safety in Mines Research Board has also reported on the performance of safe-gap bakelite flanges in methane-air atmospheres.

Recognition of the importance of determining the rate of creep of various steels at elevated temperatures has caused expansion of the scale of investigation at the National Physical Laboratory and some success has followed the application of similar ideas to the study of the even more complex group of insulating materials when subjected to continuous great mechanical stress at working temperatures. The latter subject had been practically unexplored until tackled by the E.R.A., some of whose reports on insulation materials are to be used as the basis of specifications by the British Standards Institution.

Magnetic Materials

Magnetic investigations at the Cavendish Laboratory, Cambridge, under the direction of Professor Sir Lawrence Bragg, now include an attack on electrical sheet steel. Measurements have been made for the first time with single crystals. The extension of the method to the separation of hysteresis and eddy-current components of the loss is not expected to present much difficulty. Work is also in hand on new alloys of different compositions from those at present in commercial use. There has been further success at Cambridge in the solution of permanent magnet problems and endeavoures are being made to utilise the electron-microscope for that purpose.

In connection with Professor Sucksmith's work at Sheffield satisfactory apparatus has been evolved for measuring the magnetic and magnetostrictive properties of a specimen without removing it from the apparatus. At Bristol saturation intensity-temperature curves for the same alloy are being correlated with BH data obtained in weak fields with a view to clarifying the processes causing maximum hysteresis.

Lightning Surges

Several reports on transformer calculations are nearly ready. Another on the current distribution in overhead power lines, towers and earthing wires induced by lightning strokes has an important bearing on back-flashover, the cause of which has been imperfectly understood because of lack of knowledge about the manner in which lightning current subdivides in its passage through the various earthed parts of the system. Russian investigators have stated that a method is not available for making the requisite calculation correctly, but the E.R.A. report (S/T.47) describes a method of calculation that is free from the technical objections to which the older methods have been subject.

An associated report (S/T.49) shows how to determine the probable number of lightning strokes to any given transmission line as well as the manner in which they are likely to be distributed between towers, phase wires and earth wires according to the known dimensions of the particular line concerned.

Rural Work

The co-ordination of all research into the utilisation of electricity for agriculture and horticulture is almost complete; a field station is to be established in association with Reading University and a working liaison has been effected with the North of Scotland Hydro-electric Board. There has been some modification of methods of heating and control of gravel culture (Dr. R. H. Stoughton) at Reading.

Electrical pre-heating of tomato-house soil in Nottinghamshire has confirmed the practical and economic success of the method, but further operating experience of more installations is to be obtained before a report is issued. Soil sterilisation by means of immersion heaters has been satisfactory; certain confirmatory tests are being made. A critical resumé of information about the employment of electric lamps for the irradiation of growing plants is being prepared in anticipation of the resumption of this work.

A new sub-committee is considering small generating plant for farms and other isolated premises not within practicable reach of public distribution systems, starting with the analysis of prevailing winds and the devising of means of testing wind-driven plant.

Room Heating Experiments

A report is expected soon on floor heating to provide a background of warmth continuously with off-peak loading, including cables buried directly in the solid concrete floor of an experimental room. The heat distribution over the surface and throughout a single-floor structure has already been determined.

A final report is in an advanced state of preparation on the reflectivity and other thermal properties of wall coverings and their relative effects on the rate of attainment of comfort in an initially cold room which is not continuously heated. It has been established that a highly reflecting surface (metallised wallpaper or metal paint) applied to a ordinary brick and plastic wall is as effective in producing comfort quickly as a layer of material of high thermal resistance, such as good proprietary wall-boards, which are themselves rendered more effective by being given a reflective coating; but the increased efficiency of heating is more notable in the case of the less effective insulating materials. Under certain conditions a saving of fuel of as much as 50 per cent. may result from the judicious use of such wall coverings in domestic living rooms.

NEW BOOKS

Analysis of Metals. Power Station Plant.

Metallurgical Analysis by means of the Spekker Absorptiometer. By F. W. Haywood, Ph.D., F.I.C., and A. A. R. Wood. Pp. 128; figs 31. Adam Hilger, Ltd., 98, St. Pancras Way, Camden Road, London, N.W.1. Price 18s.

Colorimetric analysis is well known and is greatly used in metallurgical and other branches of chemistry. Certain chemical reactions, on the taking place of which a distinctly coloured substance is formed, can be measured with great accuracy by comparing the " amount " of colour with that of a similar reaction in which known weights of the reactants in question are used. Where comparisons are made by colour matching with the eye, an instrument known as a colorimeter is used, but as the authors of this book point out, when a photo-electric cell is used in making the comparison, the term colorimeter becomes a misnomer and the name absorptiometer has been substituted.

The Spekker absorptiometer is a Hilger instrument, which is sufficient to say that it is a high-precision piece of apparatus. It consists essentially of a lamp in a metal lamphouse, on one side of which the light passes successively through a colour filter, a variable calibrated aperture and a lens. Parallelised light from the lens passes through a glass cell containing the liquid and thence on to an indicating photo-cell. On the other side of the lamphouse, the light passes through a water cell, a filter of the same colour as that on the opposite side, and thence through a variable aperture on to the compensating cell. The two cells being balanced, the liquid under analysis is introduced into the indicating cell light path. Readings are made by the null point method on the galvanometer provided.

Some determinations, such as that of manganese in a manganese alloy, can be made by a direct reading, the colour-absorption being proportional to the concentration of the element sought. In many analyses it is necessary to take more than one reading to obtain a figure which is strictly proportional to the concentration of the element sought. The authors explain in ample detail the operation of the instrument, and give data regarding the determination of cobalt, copper, manganese, etc., in ferrous alloys, and of various elements in copper, aluminium and magnesium alloys.

Dr. Haywood is chief metallurgist to Wild-Barfield Electric Furnaces, Ltd., and Mr. Wood is his assistant. Both authors are to be congratulated on dealing with the subject in a way which clarifies the use of an excellent piece of apparatus which is already proving of important value in metallurgical analysis.—T.T.B.

Electric Power Stations.—Volume II. By T. H. Carr. Second edition, revised and enlarged. Pp. 549; figs. 456. Chapman & Hall, Ltd., 37-39, Essex Street, London, W.C.2. Price 32s.

Vol. I was reviewed in our issue of May 9th, 1941. The present volume, which has been considerably enlarged since the first edition in 1941, covers condensing plant, feed heating and water treatment, alternators and electrical equipment, oil, station auxiliaries, commissioning and testing, organisation and costs, and fire fighting and A.R.P. precautions. The various subjects are considered in sufficient detail to give the non-expert a good grasp of the fundamentals involved and, as in the case of Vol. I, an excellent bibliography is given at the end of each chapter, so that the reader can further study any complex detail.

In the chapter dealing with condensing plant the author uses the term " vacuum " extensively. This is a relative term and must be referred to barometric pressure before it has a precise meaning, and it then becomes absolute pressure, which is complete in itself and has a precise meaning. It would probably lead to clearer exposition if an adequate explanation of this was given at the start and thereafter consistently use the term of absolute pressure instead of vacuum. The author states that the steam friction pressure drop across the condenser tubes should not exceed 0·2 in. Hg. This figure seems to be about twice as great as should be achieved with modern practice provided that the tubes are reasonably clean.

In the chapter on station costs many examples are given of actual costs relating to pre-war extensions. A knowledge of present-day prices makes one wish the costs given could still be obtained. The war has brought a relatively large increase in cost, a considerable portion of which may be expected to be permanent. To accord with present-day levels the examples given would need about 60 per cent. adding to them. Possibly by the time a further edition is published prices may have been stabilised somewhat and then values could be incorporated in the book that would form a more reliable guide to costs.

In addition, there has been a great increase in the price of coal. This cost is really the fundamental cost and has a great influence on all the decisions of a power station designer. While it seems reasonable to expect some reduction on present-day coal cost, it seems practically certain that the post-war price of coal will remain at a much higher value than pre-war and, therefore, the value of power station thermal efficiency will be correspondingly increased. This makes the author's two volumes all the more valuable an addition to power station literature. As an indication of the care devoted to references the bibliography in Vol. II alone gives references to over 170 publications dealing with the various subjects covered.—J. N. W.

Books Received

Rebuilding Britain—A Twenty-Year Plan. By Sir Ernest Simon. (256 pp., 16 illustrations.) Victor Gollancz, Ltd., 14, Henrietta Street, W.C.2. Price 6s.

High Frequency Transmission Lines. By Willis Jackson. Pp. 152; figs. 46. Methuen & Co., Ltd., 36, Essex Street, London, W.C.2. Price 6s.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT Hirst Hall, Wembley, the social centre of the group of factories in that district owned by the General Electric Co., Ltd., the Hon. Mrs. Gamage recently unveiled a bronze plaque of the late Lord Hirst to commemorate the great personal interest he always took in the activities

The Hon. Mrs. Gamage unveiling the plaque of the late Lord Hirst

at the Hall and in the social welfare of G.E.C. employees. The plaque was a gift from Lord Hirst's daughter and son-in-law (the Hon. Mrs. Gamage and Mr. Leslie Gamage), and its unveiling coincided with the date of his death two years ago. Brief but fitting eulogy was made at the ceremony of the man who founded and developed the present world-wide G.E.C. organisation. Among those present were Sir Harry Railing, Mr. Leslie Gamage, Mr. G. Chelioti, Dr. C. C. Paterson and Mr. F. Winstanley, directors of the company.

Mr. R. T. G. French, who has just retired from the position of secretary to the Electricity Commission, is being retained for the time being in a consultative capacity.

Mr. L. A. E. Fosbrooke, assistant station superintendent at the Blackburn Meadows Station, has been recommended by the Sheffield Electricity Committee for the position of station superintendent rendered vacant by the retirement of **Mr. H. C. Wilson** after forty-one years service.

Mr. E. D. Johnson, works manager of the Indian Cable Co., Ltd., tells us in an airgraph just received that the company's eighteenth annual sports were held in fierce tropical sunshine on January 13th. The new recreation ground near the factory at Tatanagar, Bihar, was packed for the occasion, and the spectators included members of the Allied Forces. Later the prizes, among them the "Cableco" championship cup and the British Electric Co. cup, both won by P. Ramalingham, were presented to the winners by Mrs. E. D. Johnson.

Mr. H. C. Siddeley, M.I.E.E., manager of the engineering department of H. W. Roberts & Co., Buenos Aires, is arriving in England shortly, for the purpose of renewing agencies, etc., for his company, covering Argentina and Uruguay. Communications should be addressed c/o H. W. Roberts & Co., Orient House, Granby Row, Manchester, 1.

Miss Caroline Haslett, C.B.E., director of the Electrical Association for Women, has recently returned from a visit to Finland.

Leeds Corporation Finance and Parliamentary Committee is recommending the appointment of a deputy city electrical engineer at a salary of £1,100 rising to £1,300.

Mr. W. Roe, Cork City district engineer of the Irish Electricity Supply Board, has been appointed engineer in charge of the Board's rural electrification scheme.

Mr. A. G. Hawkins has been appointed manager of the north-western area of the home branch organisation of the General Electric Co., Ltd. Mr. Hawkins assisted the late Mr. J. H. Farthing in the management of the district for the past eight years, but he has also had a varied experience in the G.E.C. for over thirty years. After graduating with honours at Cambridge he joined the company in 1912 as secretary to the late Lord Hirst, and shortly afterwards he was transferred to the Cardiff branch where he was engaged when war broke out in 1914. He then served in France with the 36th (Ulster) Division, was twice mentioned in dispatches and was awarded the Belgian Croix de Guerre and the M.B.E. In 1919 he was appointed assistant manager of Glasgow branch and left there in 1925 to take charge of the company's interests in India as general manager of the General Electric Co. (India), Ltd. He remained in India for over ten years and during this time the company's branches in India and Burma underwent a considerable expansion for which he was largely responsible.

Mr. A. G. Hawkins

Mr. J. W. Smith, chief inspector of works for the Liverpool Corporation Electric Power and Lighting Committee, has been promoted to the position of works superintendent.

The mission headed by **Lord Reith** which is visiting the Dominions and India to discuss the future organisation of Commonwealth telecommunications services has returned from New Zealand to Australia. Discussions were held at

Wellington last Friday with Mr. Peter Fraser (Prime Minister) and Mr. Walter Nash.

Dover Corporation Electricity Committee has agreed to designate the electrical engineer, **Mr. R. G. Widgery,** as electrical engineer and manager.

Obituary

Mr. K. L. Wood.—We regret to report that Mr. Kenneth Lindsay Wood, M.I.E.E., former engineer-in-chief of Cable & Wireless, Ltd., died on February 4th at the age of sixty-one.

The late Mr. K. L. Wood

Mr. Wood was educated at Christ's Hospital and entered the service of the Eastern Telegraph Co., Ltd. (which later became part of the Cable & Wireless organisation) as a probationer in 1899, serving at Suez, Aden and Porthcurno (Cornwall). In 1910 he was transferred to the laboratory at the company's head office and in 1929 was appointed assistant electrician-in-chief. He became joint deputy engineer-in-chief later in the same year and five years after succeeded to the position of engineer-in-chief from which he retired in 1939. During the war he had been engaged in signal work at the Air Ministry.

During the last war Mr. Wood served in the Royal Engineers. He attended the Cairo International Telecommunications Conference in 1938. A paper on "Empire Telegraph Communications" which he presented to the Institution of Electrical Engineers in 1938 was republished in book form by Cable & Wireless, Ltd.

A former colleague pays a tribute to Mr. Wood's influence on submarine telegraphy technique, particularly his share in the work which culminated in direct working between London and India, Australia, South Africa and other distant points through, in one case, as many as fourteen cables in series.

Mr. C. G. Jackson.—We learn with regret of the death on February 3rd, at the age of thirty-nine years, of Mr. Cyril Gordon Jackson, who held the post of production engineer for Southern United Telephone Cables, Ltd., at Dagenham Dock, having joined the company in 1932. Mr. Jackson obtained his B.Sc.(Eng.) degree at London University and was a member of the Institution of Electrical Engineers. Before joining Southern United Telephone Cables he was for some years with Standard Telephones & Cables, Ltd., being engaged on telecommunication work.

Mr. A. J. Popert.—The death occurred last week at the Hove General Hospital of Mr. Alan J. Popert, of the Hove Corporation Electricity Department. Mr. Popert, who was a Londoner, received his technical education at London University. He was for many years with the Metropolitan-Vickers Electrical Co., Ltd., and as an erection engineer installed the first rotaries and motor generators at the Hove Corporation's Davigdor Road station. Upon the completion of the contract, in 1925, he joined the staff of the Electricity Department and had since been responsible under the engineer and manager for the installation, and maintenance of all h.v. and l.v. switchgear and transformers in the Corporation's substations. In his early days he was in the R.N.V.R., was mobilised in 1914 and throughout the first world war saw considerable service at sea. He was fifty-two.

Mr. W. W. Lackie.—It is with regret that we record the death at his home at Walton-on-Thames, on February 10th, of Mr. William Walker Lackie, one of the original Electricity Commissioners. Mr. Lackie was born at Montrose, Angus, in 1869 and was educated at the academy there and at University College, Dundee, and Glasgow University. From 1887 to 1891 he was with Mavor & Coulson, Ltd., Glasgow, and then joined the Glasgow Corporation Electricity Department as mains superintendent. Later he was successively assistant chief engineer (1895-1903) and chief engineer and manager (1903-1920). In 1920 he was appointed an Electricity Commissioner and held that position until his retirement in 1934.

Mr. Lackie was a member of the Institutions of Civil and Electrical Engineers and a past-president of the Institution of Engineers and Shipbuilders in Scotland. In 1919 he was awarded the C.B.E.

Mr. T. E. Ritchie.—We regret to record the death of Mr. Thomas Edward Ritchie, A.M.I.E.E., on January 16th. Mr. Ritchie was born in Manchester in 1872. He was elected to the I.E.E. in 1900. He joined the General Electric Co., Ltd., in 1923 and, until he retired in the summer of 1941, held the position of chief illuminating engineer to the company.

The late Mr. T. E. Ritchie

During these eighteen years he gave many lectures on the subject of electrical illumination throughout the country and contributed a number of articles to the Press.

Mr. A. Ionides.—The death occurred last week of Mr. Alexander G. Ionides, B.A., M.I.E.E., who for many years acted as consulting engineer to Rolls-Royce, Ltd., and Vauxhall Motors, Ltd. Mr. Ionides was educated at Harrow and Cambridge and in the earlier part of his career was associated with the Brush Electrical Engineering Co. and the Fowler Waring Cables Co. and he was manager of the electrolytic refinery of the Pembrey Copper Works. During the last war (and for a time in the present war) he served in the Experimental Department of the Admiralty, largely in connection with radio, and he invented a form of submarine detector.

Spanish Electrified Railway

With the opening of the second part of the Madrid-Avila electrified railway, traffic to North and North-Western Spain can now be drawn by electric locos over the 4,000-ft. Guadarrama Pass. The pass had previously slowed up steam-driven trains considerably.—*Reuter.*

COMMERCE and INDUSTRY

Standard Meter Dimensions. Lighting Fittings Position.

South Shields and I.M.E.A.

THE Town Clerk of South Shields has reported to the Town Council that proceedings against the I.M.E.A. arising out of an alleged invalid resolution passed at an extraordinary meeting of the Association last April, have been stayed pending another meeting of the Association. In the meantime the Association has agreed not to take any action regarding the memorandum upon electricity distribution reorganisation stated to have been approved at the meeting last April, and to refrain from pressing the Minister of Fuel and Power to make any decision on the matter dealt with in the memorandum.

Kitchen Equipment

In order to facilitate the layout and planning of kitchens in post-war houses B.S.1195 has just been issued, giving recommendations for the space dimensions for kitchen equipment. The unit dimensions on which the space dimensions are based are a width of 21 in., a depth of 21 in. and a working height of 36 in. Standard dimensions for a wide range of kitchen fittings in both metal and wood, based on the recommended unit size, are also included. They cover cabinets either with drawers or shelves and cupboards, etc. The requirements laid down relate to overall dimensions and the storage accommodation. It is hoped to prepare a quality standard to cover the constructional requirements at a later date. Copies are available from British Standards Institution, 28, Victoria Street, London, S.W.1., price 2s.

Antimony Control Order Revoked

The Minister of Supply has made the Control of Non-Ferrous Metals (No. 15) (Antimony) (Revocation) Order, 1945 (S.R. & O. 1945 No. 112, price 1d.), which comes into force on February 8th. This Order revokes the 1942 Order, under which the disposal and acquisition of antimony metal, crude antimony sulphide, antimony oxide, golden or crimson sulphide of antimony and antimony ore were subject to licence. Licences will no longer be required for the disposal or acquisition of these commodities.

Empire Broadcasting Conference

Post-war plans for broadcasting within the Empire are being discussed at a conference convened by the B.B.C. at Broadcasting House, from February 15th to March 9th. Wavelengths, exchange of programmes and information, re-broadcasting, and school and controversial broadcasting will be among the subjects considered. The delegates are:—New Zealand: Professor James Shelley (director, National Broadcasting Service of New Zealand) and Mr. J. R. Smith (chief engineer). Australia: Col. C. J. A. Moses (general manager, Australian Broadcasting Commission). Canada: Mr. Howard B. Chase (chairman, Canadian Broadcasting Corporation), Mr. E. L. Bushnell (director-general of programmes), and Mr. G. W. Olive (chief engineer). South Africa: Major R. S. Caprara (director, South African Broadcasting Corporation), Mr. Norman Filmer (branch manager, Transvaal Division) and Mr. Horace Collett (divisional engineer, Transvaal Division). India: Professor A. S. Bokhari (director-general, All-India Radio, and former chief of the B.B.C. Indian Service), Mr. C. W. Goyder (chief engineer) and Mr. S. Gopalan (development and planning officer).

Scottish Hydro-Electric Rating

The Stationery Office has published (price 2d.) the text of the Hydro-Electric Undertakings (Valuation for Rating) (Scotland) Bill prefaced by an explanatory memorandum. Details of the Bill were given in our issue of November 24th last (p. 743). The explanatory memorandum shows that in determining the rateable value of new Scottish hydro-electric works the constructional cost in excess of £30 per kW is disregarded. Examples are given of the application of the provisions of the Bill to new and existing undertakings. In the case of the latter relief is granted in such a way as to ensure that the rating authorities are not adversely affected.

Meter Interchangeability

Deliberations of a joint committee representative of electricity supply authorities and meter manufacturers have resulted in a proposal to standardise the dimensions of single-phase watt-hour meters of the quarterly reading type up to 50 A capacity (BS.37 rating, long range) to make them interchangeable in respect of (*a*) fixing centres, (*b*) position of terminal block in relation to fixing centres and projection, and (*c*) maximum projected rectangle and back-to-front projection. The suggested dimensions are illustrated in a sketch drawing reproduced in the *I.M.E.A. Journal* for January.

All the meter makers are said to have agreed to the proposals and they have the full support of the I.M.E.A., which hopes that the rest of the supply industry will accept them. No commencing date has yet been decided, nor have any recommendations yet been made in respect of prepayment meters. The joint committee is considering such additional factors as extension of the accuracy range, number of sizes required and the marking of meters, all of which will in due course involve the revision of BS.37—1937.

Supply of Lighting Fittings

In last week's issue it was reported that restrictions upon the supply of electric lighting fittings had been removed, but the Electric Light Fittings Association points out that although manufacturers may now supply these fittings without restrictions, many of the established fittings manufacturers are still very fully occupied on war work of high priority. Thus, production of the fittings 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 on a peace-time basis. Furthermore, production for export must receive preference.

The foregoing does not, of course, apply to industrial type fittings production of which must continue to be for work of national importance.

The Board of Customs and Excise reminds persons taking advantage of the relaxation of control that they will become liable to registration for Purchase Tax purposes if their gross takings from the sale of chargeable goods of their own manufacture are likely to exceed £500 per annum. Failure to apply for registration involves liability to heavy penalties. Applications should be addressed to the local officer of Customs and Excise, whose address may be obtained from the telephone directory or the Post Office.

Site for Norwich Showrooms

The Norwich Corporation Electricity Department has recently purchased a large site in the centre of the city for showrooms and offices after the war. The Corporation rescinded a resolution passed in 1939 that the new showrooms and offices should be at the rear of the City Hall, and unanimously decided that the proposed new site was suitable for purchase, at a price of £65,000. The site comprises the whole of the shops and buildings on the south side of Davey Place, with a large frontage on to the east side of Gentlemen's Walk, and on to Castle Street, the total area being approximately 1,663 sq. yd.

South African Imports

The South African Government is now lifting the ban, imposed for reasons of security, on the issue of statistics of external trade, and has released the import figures for 1942. In the electrical group there was a substantial decline compared with 1941, outstanding examples were cable and wire £458,000 (against £668,000); radio apparatus and accessories £321,000 (£656,000); heating and cooking apparatus, £103,000 (£287,000); secondary batteries £153,000 (£322,000); and motors £296,000 (£385,000). The only noteworthy increase was in dynamos and generators £99,000 (£44,000).

Great Britain was by far the principal supplier, with the United States a bad second and Canada represented in a few lines. It will be recalled that formerly several European countries shared in the electrical import trade of the Union.

Guides to Overseas Countries

Before the war the annual reports of trade commissioners and commercial counsellors to the Department of Overseas Trade often contained prefatory information about their particular countries for the guidance of business visitors and others. Sometimes this information was issued separately in pamphlet form by the D.O.T. Recently the idea has been revived in the shape of a series of booklets entitled "Hints to Business Men" which are obtainable from the Department of Overseas Trade, Hawkins House, Dolphin Square, S.W.1.

The first three deal with the United States, New Zealand and British East Africa. The one on New Zealand, which is typical, covers such points as travelling and hotels; population, currency and trade; terms of payment and credit facilities; import tariffs and customs procedure; advertising; and sales organisation. The last-named section outlines the general business arrangements in so far as imports are concerned and gives hints on the appointment of agents and the setting-up of branch establishments.

It is suggested that representatives of United Kingdom firms intending to visit the Dominions or foreign countries should call at the Department's offices before leaving, when they will be offered all the assistance which the Department can give.

Lease of Factories

Liverpool City Council is recommended to lease Unit Factory No. 5 at Speke, when derequisitioned, to the Automatic & Electric Co., Ltd., for 21 years, at £900 per annum.

The Dunlop Rubber Co., Ltd., is completing negotiations with the Government for the acquisition by lease of the Ministry of Aircraft Production No. 1 factory at Speke.

Accessories for Turkey

We have been asked to put a Turkish concern into touch with British manufacturers of electric lamps and lampholders, and will forward the names of any interested parties.

E.D.A. Bulletin

A view of one of the Electrical Development Association's all-electric kitchens appears on the front page of the January "E.D.A. Bulletin." This issue also contains a report of the silver jubilee dinner held on November 30th and accounts of E.D.A. activities in recent weeks in many parts of the country.

Plastics Trade Marks

By agreement, in order to avoid confusion between the plastics produced by Ray Mouldings, Ltd., Ealing, and the Ray Engineering Co., Ltd., Bristol, the latter company has registered the trade mark "Rencol" (Class 17, No. 62801).

Change of Name

The Merseyside Electrical Engineering Co., Ltd., is now named Crospool Contractors, Ltd.

Radio Components Exhibition

The Radio Component Manufacturers' Federation, 22, Surrey Street, W.C.2, is holding a private exhibition of radio and communication components at Grosvenor House Ballroom, Park Lane, W.1, from February 20th to 22nd. Admission will be confined to executives and technical employees of firms who must be holders of invitation cards.

Norfolk Agricultural Engineers

Closer collaboration between electrical engineers and farmers in Norfolk is made possible by the formation of a local centre of the Institution of British Agricultural Engineers. This centre, the first in the country, was inaugurated on February 3rd in Norwich and the city's initiative is being followed by the

formation of other such centres throughout the country. At the invitation of Mr. J. A. Sumner, city electrical engineer, the committee meetings and discussions are held in the Committee Room of the Norwich Electricity Department, Duke Street, which is also the official address of the centre.

Mr. Malcolm Crabbe has been appointed chairman and Mr. M. Wheatley vice-chairman. Mr. W. Newcome-Baker is hon. secretary and Mr. R. H. Chamberlain, the planning and development superintendent of the Norwich Electricity Department, has undertaken the duties of hon. assistant secretary. A representative committee has been appointed, including Mr. G. V. Harrap, deputy city electrical engineer of Norwich, and Mr. H. G. Waters, assistant general manager of the East Anglian Electric Supply Co., Ltd.

Agricultural Research

Speaking at a meeting of the Engineering Industries Association last week, Mr. A. P. Young (B.T.H. Co.) advocated a measure of co-operation between agriculturists, including the provision of a research fund of £3,000,000 a year. He was dealing with the relationship of agriculture to the engineering industry and said that electrical mechanisation should become the most potent new idea to 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 farmers could rely on the engineering and electrical manufacturing industries doing their part in making available mechanical and electrical mechanisms of the right quality and at the right price to meet the expanding needs.

Bolton Payments for Extra Work

There was another long discussion at Bolton Town Council last week on a recommendation of the Electricity Committee to pay £7,000 to the borough electrical engineer and his staff for work in connection with extensions at Back-o'-th'-Bank power station to be completed by September, 1946. The recommendation was confirmed. The grants were defended on the ground that the Council, having given the Electricity Committee power to settle, had no right to protest now. It was stated that Lancaster had paid £10,000, and Carlisle, Preston and Blackburn about £40,000. Councillor T. P. Longworth, chairman of the Electricity Committee said that by the settlement £30,000 had been saved.

New Sign Makers' Association

The Electrical Sign Manufacturers' Association (E.S.M.A.) has recently been formed to take the place of the Electrical Section of the Master Sign Makers' Association. The founder members are Claude-General Neon Lights, Ltd.; Elders Walker & Co., Ltd.; Electrolumination, Ltd.; the Franco-British Electrical Co., Ltd.; Ionlite, Ltd.; Nash & Hull, Ltd.; Oldham Sign Services, Ltd.; L. V. Pannell; Pearce Signs, Ltd.; the Sign Accessories Co., Ltd.; and the Sign Construction Co., Ltd.

It is claimed that these concerns represent at least 90 per cent. of the pre-war manufacturing capacity for electrical signs. Among the objects of the Association are the regulation of relations between its members and between members and their customers, and to formulate and suggest such conditions for the conduct of the electrical sign trade as may be considered desirable; to promote a high standard of quality, design and workmanship; and to promote and encourage propaganda on behalf of the industry.

The chairman is Mr. S. D. Moyse (Claude-General Neon Lights, Ltd.) and the vice-chairman is Mr. A. E. Beadnell (Elders Walker & Co. Ltd.). The offices of the Association are at 36, Kingsway, W.C.2. (Holborn 0502) and the secretary is Mr. W. E. Babb.

Domestic Copper Cylinders

To facilitate concentration of the production of domestic copper cylinders (Grades 1, 2 and 3) in order to meet anticipated demands for post-war building, B.S. 699 has been revised, thereby greatly reducing the range of sizes permitted by the 1936 edition. The new document caters for capacities of from 20 to 100 gallons and the table of dimensions now specifies external heights, instead of a range of stock heights in 3-in. increments, naming the actual capacity appropriate to each size. Confusion that has arisen in the past between nominal and actual capacities will be avoided if cylinders are ordered by the appropriate B.S. number rather than in any other way. Other changes include the specification of standard positions for connections for circulators and immersion heaters. All jointing is now required to be effected by brazing; thus the soldering of the top and bottom seams of Grade 3 cylinders is no longer permitted. The thickness of copper sheets has also been amended. Copies of the revised specification are obtainable for 2s. each from the British Standards Institution, 28, Victoria Street, London, S.W.1.

"Loud Hailers"

A booklet illustrating some of the many purposes for which "loud hailers" have been used by the Navy and Army has been issued by Ardente Acoustic Laboratories, Ltd., Guildford, Surrey. It is claimed that nearly 20,000 have been supplied. They consist of a hand microphone in a small weather-proof case fitted with a thumb-switch for remotely controlling a 15-W amplifier contained in a steel weather-proof case. The pressure type loud speaker, with permanent magnet and moving coil, is accommodated in an aluminium casing that forms part of the adjustable re-entrant horn projector; there are simple front and back sights which can be folded back when not in use. Non-interchangeable plug connectors are provided and the outfit (weighing 162 lb.) is energised from a 72-Ah, 12-V accumulator.

Welding in Shipbuilding

In a "Review of Modern Arc Welding in Shipbuilding," read recently before the North-Eastern (Tyneside) branch of the Institute of Welding, Mr. N. M. Hunter states that in the North-East area some ships up to 17,000 tons are 95 per cent. welded at present. He also says that from 60 to 70 per cent. of all steelwork in all sizes of ships is welded.

Standard Cookers

Apparatus for Emergency Houses

THE final design of the electric cookers to be standardised for the combined kitchen and bathroom units of the temporary "factory made" houses has now been settled and orders for about 35,000 have so far been placed by the Ministry of Works, deliveries to commence almost immediately. The cooker, which will be mass produced, is the result of co-operation between ten members of the Domestic Cooker Section of the British Electrical and Allied Manufacturers' Association, who have pooled patents and registered designs for the purpose; any member is free to make the cooker, but only for the Ministry of Works. Accordingly it has been possible to incorporate the most suitable features of each manufacturer's products and at the same time to introduce various up-to-date improvements.

The prototype, which Mr. F. G. Nesbitt (Simplex Electric Co., Ltd.), chairman of the B.E.A.M.A. Domestic Cooking Section, showed to us recently, differs only in unimportant details from the finished product. It is of the vertical type and is interchangeable in the kitchen-bathroom unit with the gas cooker as regards dimensions. It is 36 in. high, 21 in. deep and 21 in. wide, adjustable extension pieces being available at each side to fit into the "harness" so as to collect drips and direct them into the hot-cupboard. A rough adjustment for height is provided in the arrangements for clamping the cooker to the harness, adjustable hob hinges and fixing screws completing the levelling of the top flush with the other components.

To give access to the side panel which covers the switches, thermostat and connections the whole cooker can be pulled out from the harness on runners. The wiring is brought through a hole to the main terminals conveniently mounted in the front. These terminals, with grub screws for easy fixing, are disclosed by removing the base plate, which has a recess for the feet.

The thermostatically-controlled oven has a capacity of 13 in. cube. Its non-tilting shelves, which are 12½ in. square, are reversible to give, with the six runners, almost any arrangement desired. Both the oven sides and bases are withdrawable for cleaning and access to the plug-in element frames—one of 1 kW on each side and one of 400 W at the bottom. The door lifts off.

The hob equipment comprises an 8-in. diameter hotplate and a 10½-in. by 8-in. grill-boiler, each loaded at 2,000 W. Four heats are provided on the hotplate, with a simmering loading of 220 W. The hot-cupboard is more spacious than usual, 18 in. by 13¾ in. by 5½ in., and full use is made of it by arranging for the adjustment of the grill tin by a specially designed wire-mesh grid instead of by alternative runners.

Kitchen unit for the M.O.W. emergency houses, showing the electric cooker in the centre and the refrigerator on the right

Individual components have been standardised as far as possible. All the plugs and sockets for the oven element, the hotplate and the grill-boiler are identical, while the same refractory is used both for the oven elements and the grill-boiler.

An attractive colour scheme selected by the Ministry of Works provides for a cream oven door and hob top, with the rest of the apparatus in green, matching the refrigerator door and the top of the harness (except the cooker hob). There is a red surround for the thermostat, and the handles are of moulded material with nickel "trimmings."

Protective Gear

Facilitating Maintenance Work

By J. H. M. Sykes and R. S. Oliver

THE maintenance staff responsible for the operation and repair of the primary plant are not generally called on to make adjustments to protective gear, but in the exact division of duties between them and the relay engineer difficulties may sometimes arise. These notes are intended to offer a few suggestions to designers of protective systems with a view to smoothing out some of these awkward points.

One difficulty is in the isolation of auxiliary switches and small wiring in such a way that the maintenance staff may feel confident that they can safely work on all parts of the apparatus and, at the same time, the relay engineer may be satisfied that his protection is kept in complete operation. Bus-zone protective systems cause many difficulties of this nature. For instance, any scheme of busbar protection which discriminates between faulty and sound sections of busbars is very dependent on auxiliary switches, not only in the oil circuit-breaker but also in the link-operating mechanisms on the busbar selectors. These may carry current-transformer circuits or DC lock-out and tripping connections, and a dirty contact could easily cause incorrect tripping on a through fault. It is therefore particularly important that regular inspection and maintenance should be carried out at these points, especially as a busbar selector is often left unoperated for months at a time.

Grouped Tripping Circuits

To make these auxiliary switches dead for maintenance without either running the risk of tripping out the whole station or of rendering the protective scheme entirely inoperative is seldom easy. A method of minimising this awkward feature would be to marshal the tripping circuits for any particular panel in a kiosk, or in a portion of a general marshalling kiosk, and provide links with very clear and simple labelling so arranged that the maintenance staff could effectively make dead every auxiliary switch and secondary junction box on all parts of the feeder and at the same time be sure that the protective scheme was in full commission.

Another type of busbar protection is of the frame-leakage type. The relay engineer in commissioning a scheme takes care to ensure that the frame is adequately insulated from earth and that all possible fault currents return to the station earthing system *via* the current transformer. But a feeder has to be earthed for maintenance purposes, and unless adequate earthing facilities are provided at each switch enclosure, the safety earths applied by a maintenance engineer may short out the protective-gear current transformer and so vitiate the operation of the whole scheme. Moreover, equipment for maintenance work, such as portable hand-lamps, steel ladders, flexible oil hoses, air lines and the like may also short-circuit the protective c.t. in greater or less degree. Unless clear labels are installed in the most obvious positions, such work as additional conduit for new auxiliary switches and re-jointing of cable glands at the points where the sheaths are insulated from the frame, may possibly, unless the maintenance staff is fully acquainted with the consequences, again cause trouble.

All selective feeder protection, whether of the balanced or interlock type, depends on the gear at both ends being in commission and on the pilot cable or possibly the superimposed high-frequency channel being healthy. Routine checks of the channel will normally be done by the maintenance engineer's staff, and it is important that facilities should be provided which are simple and easy to operate, so devised as to provide a thorough check of every relay and contact in the scheme and very clearly labelled so that their operation and functions are clearly apparent.

If meters enter into the supervisory check scheme, they should be so scaled and labelled that their readings, when transmitted over the telephone to the relay engineer, convey to him a clear picture of the state of the gear. Permanently connected "Meggers" for insulation tests of the pilot and automatic or manual supervision of the continuity of the channel have proved very useful.

By-passed Switches

If a switch is by-passed or if its protection is out of commission, the protection at the remote end must also be rendered inoperative. This calls for careful co-ordination of routine methods between the system controller, the relay engineer and the maintenance engineer. Similarly, if the pilot cable or the high-frequency channel is out of service for repair, the protection at each end must be disconnected to prevent inadvertent tripping on a fault outside the protected zone.

By-passing feeders also raises the point that although the feeder is still supplying load, the current transformers for integrating and indicating meters are no longer in

circuit. As this may give rise to complications on the commercial side, the relay engineer is called on to devise temporary hook-ups, which involve the connection of the meters to the current-transformer and voltage-transformer supplies of another switch.

This trouble could easily be obviated if in the original design the secondary circuits concerned were all brought to a common point where switches similar to those used on ammeter circuits could be operated to permit the general maintenance staff to preserve the continuity of the metering when, perhaps at the shortest notice, they find it desirable to by-pass the feeder's own circuit-breaker.

Routine Trip Testing

Although maintenance work proper on the actual relays is carried out by the relay engineer, routine trip testing is normally done by the maintenance staff. There is no doubt that electrical operation of a protective relay is both a better test of its condition and much less likely to cause damage than hand operation. The latest protective systems, often involving telephone-type equipment, could easily be equipped with a simple, automatic test device, normally locked off, which could be operated as a routine measure, and it is not difficult to devise similar means for testing overloads, distance protection or any other well-known scheme; only the relay engineer need then have access to the relays, which could be sealed if desired.

Another modification which would make routine trip testing by the general maintenance staff much simpler is the installation of a master tripping relay for every switch. On many types of metal-clad gear, both of the horizontal- and vertical-isolation designs, the fitting of jumpers when the circuit-breaker is in the isolated position is difficult, arduous and often unreliable. But if, say, six tripping operations are to be carried out, it is not wise to do all these on load, and so the jumper equipment has to be used. If a master tripping relay had been provided, the first trip, obviously from the on-load condition, would prove that, say, the earth-leakage element trips the master relay and that the latter in turn trips the switch; and all further testing operations need only be carried out on the basis of operating the master relay, as it has been shown that the tripping circuits from here to the switch itself are sound. This scheme would only require one auxiliary switch in the tripping circuit, on the circuit-breaker itself. This would, of course, be in the trip-coil circuit, and the "healthy trip lamp," mentioned below, would automatically supervise the state of the contacts.

The maintenance engineer may not always realise, in connection with distance types of protection and all schemes which involve directional elements, how vital a part is played by the secondary supplies from the voltage transformers associated with the feeders concerned. Indicating lamps are frequently installed which draw attention to the blowing of a secondary fuse that would deprive one phase of its correct potential, but unless the implications of this are clearly understood, a feeder thought to be adequately protected by its directional protection may, in fact, be in an entirely unstable condition. If the failure of a potential element were to operate an alarm in addition, the attention of the maintenance staff would at once be drawn to urgent need for the defect to be rectified.

The source of supply to bus wiring on relay and control panels is often shrouded in mystery, as it may, for example, emanate from what was once the original left-hand panel, which is now somewhere near the middle and has had its name and function changed several times. The maintenance staff may have occasion to make this wiring dead for a few moments and it may take from half an hour to half a day to find the only man who knows the intricacies of the much-altered scheme. This can be avoided by installing a separate junction box, distinct from the panels themselves, to which all external supplies are first brought, and where they are fused and clearly labelled. In many older equipments such common wires as the "alarm-bell buswire" are not fused in each panel, and work on any one feeder equipment may mean the removal of at least the alarm feature from the whole switchboard.

Simple Check

One of the simplest methods of ensuring that the tripping supply to a circuit-breaker is available at the trip-coil terminals is to install a "healthy trip lamp" on each panel. This simple addition forms a kind of check which even unskilled labourers can be asked to observe at regular intervals. Moreover, when a non-technical maintenance man has to work on any of the auxiliary circuits on the switch, he has at least that easy check when he has finished, that the circuit-breaker will perform its prime function, which is to trip when required.

The designer, in laying out his small-wiring schemes, should always bear in mind that a semi-technical operative who is authorised for primary switching and at very short notice, may wish to isolate any portion of the plant, needs devices, such as entirely centralised link assemblies or ganged knife switches near the gear, that will enable him instantly to isolate every small-wiring connection without either disturbing the protective, metering or control schemes or

calling on the services of the relay engineer's department.

It cannot be too much emphasised that all members of the maintenance staff, while having a broad general knowledge of the protective schemes, must not always be expected to be familiar with the exact functions and the entire implications of every part of the protection equipment. Designers who pay detailed attention to such matters as the complete standardisation of the relay flags in any one scheme, centralisation of the alarm indicators on a common panel and clear and simple labelling detailing the functions, place in the scheme and points of isolation of every single piece of apparatus, would do much towards making the work of both the relay engineer and the maintenance engineer far less fraught with unexpected difficulties than it is at present.

Eire's Electricity Scheme

Probable Expenditure of £40,000,000

THE Minister for Industry and Commerce (Mr. Lemass) made a number of important declarations to the Dail during the second reading debate on the Electricity Supply (Amendment) Bill, which authorises the Electricity Supply Board to carry out post-war projects involving a probable expenditure of £40,000,000.

Comparing Eire's electrical development with that of other countries, he said that in 1942 450 million kWh was generated, equal to 162 kWh per head of the population, which still left Eire far behind other countries. The E.S.B. expected that there would be an increase in demand of from 35 to 40 million kWh per year during the next ten years; it might even be much higher. It was not possible to meet the needs by water power alone, as regularity of supplies could not be guaranteed. Plans for steam stations using turf exclusively as fuel were being considered. These would be situated on suitable bogs, the first being adjacent to Clonsast bog near Portarlington. In this way it was intended that ultimately all electrical energy would be derived from native resources.

Early Start on Erne Development

A scheme had been prepared to develop the Erne, and it was hoped that work would begin this year, subject to materials and equipment being available. The plant there would have a capacity of 60,000 kW, to be later increased to 80,000 kW. It was estimated that production in the first stage would be 200 million kWh in an average flow year, increasing to 250 million kWh in the final stage. The estimated cost was £3,500,000 but the actual cost was likely to be much higher. The Board had not been advised by the Northern Ireland authorities regarding their attitude, but while co-operation would facilitate the working of the scheme the development of the Erne would proceed whether it was forthcoming or not.

With regard to the rural electrification scheme, Mr. Lemass said that the need for it was evidenced by the fact that, out of a population of 2,968,000 (1936), 1,742,000 lacked electricity. The matter presented no technical difficulties; it simply entailed extending the 10,000-V lines. It was estimated, on pre-war prices, that the cost would average £45 a dwelling, varying from £49 in Wicklow to £34 in Louth. There were about 400,000 rural houses, needing an extra 75,000 miles of lines and 10,000 new transformers. At present there were only 3,840 miles of network, and 2,000 transformers.

It was proposed to ask the Board to complete the work in ten years from the time when materials became available. The work would employ 3,000–4,000 men. The capital cost was estimated at £17 millions and the subsidy would be calculated to ensure a 12 per cent. return to the Board. The intention was to make a simultaneous start from a number of centres including at least one in every county.

Steps would have to be taken to have electrical apparatus and equipment manufactured in Eire so far as possible. Manufacture should be done by private firms, particularly where consumers' apparatus was concerned. In the case of generation or transmission apparatus it was improbable that manufacture would be undertaken unless the E.S.B. itself arranged it. Discussions had been opened with the Board regarding the operation of a programme of manufacture. It was intended that these discussions should be continued with the private firms concerned.

In the course of the second day's debate, Mr. Lemass said there were no technical difficulties in the use of turf; it was merely a matter of adapting the boiler furnaces. Turf had half the calorific value of coal. Orders for plant were placed recently in Sweden and he understood that the manufacture was proceeding with a view to delivery after the war. It should be possible to bring the Clonsast station into production soon after the end of the hostilities. It would comprise two 12,000-kW units.

The second stage of the Bill was passed, the Dail being practically unanimous in recognising the necessity of fully developing the electrical resources of the country.

Scottish Building Centre

PRESIDING at the seventh annual meeting of the Scottish Building Centre held in Glasgow on January 30th, Col. G. Gardner-McLean referred to the gratifying progress made during the year. Not only had there been an encouraging increase in the number of exhibitors and of exhibits but there had also been a definite improvement in the numbers of visitors and of inquiries. The present year had opened under auspices which were both encouraging and satisfactory. A number of new exhibitors had already been secured, while some former exhibitors who had withdrawn earlier in the war were now reinstating their exhibits; furthermore, the prospects of obtaining the support of other manufacturers in the near future were distinctly promising.

Forthcoming Events

Saturday, February 17th.—*Swansea.*—Guildhall, 3 p.m. I.E.E. West Wales (Swansea) Sub-Centre. "Electrostatic Precipitation of Dust from Boiler Plant Flue Gases," by J. Bruce.

Monday, February 19th.—*Bradford.*—Technical College, 6.45 p.m. Bradford Engineering Society. "Removal of Scale and Deposits from Plant for Chemical Processes, and the Prevention of Scale Formation," by P. H. Flood-Page, A.M.I.Mech.E.

Liverpool.—Royal Institution, Colquitt Street, 5.30 p.m. I.E.E. Mersey and North Wales Centre. "Remote Switching by Superimposed Currents," by J. L. Carr, M.Sc.

Birmingham.—Grand Hotel, 6 p.m. Birmingham Electric Club "Brains Trust."

Tuesday, February 20th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Radio Section. Discussion on "Aspects of Post-War Valve Standardisation," to be opened by A. H. Cooper, B.Sc.

Luton.—Town Hall, 7.30 p.m. Luton Electrical Society. "Pulverised Fuel for Electric Power Stations," by R. A. W. Connor.

Stockport.—Mersey Hotel, 7.30 p.m. Association of Supervising Electrical Engineers (Manchester Branch). Branch papers.

Wednesday, February 21st.—*London.*—At Institution of Electrical Engineers, 2.30 p.m. British Society for International Bibliography. Papers by E. M. Bennett, B.Sc., A.R.C.S., and H. Rottenburg, M.A., M.I.E.E.

Coventry.—Technical College, The Butts, 7 p.m. Association of Supervising Electrical Engineers (Coventry Branch). "Commutator Motors," by L. T. Cross, B.Sc., A.M.I.E.E.

Nottingham.—Demonstration Theatre, Gas Department, 2.30 p.m. I.E.E. East Midland Sub-Centre. "Design and Performance of Domestic Electrical Appliances," by W. N. C. Clinch and F. Lynn.

Thursday, February 22nd.—*Newton Abbot.*—Globe Hotel, Courtenay Street, 3 p.m. I.E.E. Devon and Cornwall Sub-Centre. "Reinforced Concrete Transmission Line Supports," by E..C. Neate and W. F. Bowling.

Friday, February 23rd.—*London.*—At Institution of Electrical Engineers, 10 a.m. Institute of Fuel and National Smoke Abatement Society. Joint conference on "Atmospheric Pollution."

London.—Room 19, Livingstone House, Broadway, S.W.1, 6.30 p.m. E.P.E.A. Southern Divisional Meter Engineers' Group. "Maximum Demand Indicators," by A. T. Bailey.

Newcastle-on-Tyne.—Old Assembly Rooms. I.E.E. North-Eastern Students' annual dance.

Manchester.—Engineers' Club, 6.30 p.m. Manchester Association of Engineers. "Reclaiming and Hardening of Components by Electro-deposition," by H. Merryweather.

Manchester.—At Engineers' Club, 6.p.m. I.E.E. North-Western Centre Radio Group. "Television Broadcasting Practice in America, 1927-44," by D. G. Fink (to be read by Dr. D. C. Espley).

Saturday, February 24th.—*Bradford.*—Great Northern Victoria Hotel, 2.30 p.m. I.E.E. North Midland Students' Section. Discussion on "Frequency Modulation."

Monday, February 26th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Informal discussion on "Location of Industry," to be opened by D. B. Williamson.

Birmingham.—James Watt Institute. 6 p.m. I.E.E. South Midland Centre Radio Group. "Elementary Description of Some Molecular Concepts of the Structure of Dielectrics," by Dr. E. B. Moullin, M.A.

Newcastle-on-Tyne.—Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. "Standardisation and Design of Turbo-Alternators," by G. A. Juhlin.

Bristol.—Small Physics Lecture Theatre, Bristol University. 5 p.m. I.E.E. Western Centre Installations Group. Inaugural meeting. "Future of Domestic Wiring Installations," by Forbes Jackson and W. J. H. Wood (Part I) and G. Smith and E. Jacobi (Part II).

Tuesday, February 27th.—*London.*—At Institution of Electrical Engineers, 6 p.m. Television Society. "Vertical *v.* Horizontal Polarisation," by Dr. H. P. Williams.

London.—At Institution of Mechanical Engineers, 5.30 p.m. Illuminating Engineering Society. "Relationship between Interior Design in Building and Artificial Illumination," by Dr. J. W. T. Walsh.

Cardiff.—South Wales Institute of Engineers, 5 p.m. Same as February 26th (Bristol).

Newcastle-on-Tyne.—Neville Hall, 6.30 p.m. I.E.E. North-Eastern Students' Section. Students' Lecture: "Electrical Engineering Research," by H. W. H. Warren.

Distribution in London

THE distribution of electricity in London, covering an area in which sixteen municipal councils and eight companies provide electricity, is the subject of a paper which MR. E. H. JESTY read at a meeting of the Association of Supervising Electrical Engineers on February 10th.

The first half is a brief survey of legislation enacted on the subject. Referring to future possibilities, the author suggests the need for planned distribution areas of larger size than the present autonomous districts according to his "Plan for London" which he outlined in an article in the *Electrical Review* of August 20th, 1943.

In the second part of the paper the author comments on certain of the more notable stages in technical development. He feels that a bold policy of voltage standardisation is of supreme importance to future progress. In some parts of London, covering 1,841 sq. miles, load densities of 100,000 kVA per sq. mile have been exceeded and substations have been so closely spaced as from 150 to 200 yards. Distribution costs, which varied in 1938 among the London undertakings from 0·03d. to 0·27d. per kWh sold, had not shown any tendency to fall immediately before the war although continually expanding output might have led to some reduction being expected. During the ten years from 1921 to 1931 generating costs rose by 16 per cent. and distribution costs by 150 per cent., while consumption increased in the same period by 200 per cent., in which respects the high cost of oil-filled switchgear and the rating assessment of buildings necessary to house it have not been without influence.

Motor Starters

Views of Manufacturers and Users

IN opening the discussion on motor starters at a meeting of the Installations Section of the Institution of Electrical Engineers on February 8th (MR. D. RUDD's paper on the subject was summarised in last week's issue), 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. Regarding the suggestion that control gear had been developed from and restricted by circuit-breaker practice, he doubted whether manufacturers would admit that parentage. Commenting on costs, he said there were several designs on the market of small multi-step starters which did not require "automatic contactors" on each step. Laminated brushes did not soften so easily in hot atmospheres if the copper was alloyed with a little silver and he pleaded for the restraint of those conscientious maintenance men who filed up butt contacts when they had done a little service. Many more contacts failed by being filed away than by being worn away. Oil-immersed resistances were very undesirable; for heat storage capacity there was little to beat a good cast iron grid. Too many interlocks were undesirable.

MR. J. R. SMITH, referring to built-in types, asked whether there was any future for a composite motor and starter for individual drive up to, say, 10 HP. While there was a 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.

Rating of Fuses

MR. C. H. LAST (Metropolitan-Vickers) contended that the manufacturer was forced by circumstances to produce a variety of control gear and it was hardly possible to contemplate a serious reduction. As regarded protection, there should be a fuse rating of the order of three times the full load current of the machine. Single-phase protection was not justified except, perhaps, for large machines which ran continuously in unattended situations. The use of reverse current braking during the war had been troublesome due to unskilled operators.

MR. W. F. BAKER (G.E.C.) expressed disappointment that electronic motor control, a major development, had been neglected. The operation of DC motors from AC 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 variable speed were obtainable together with other desirable features. Embedded thermostats controlling direct trips in the starter provided the most satisfactory protection against overheating; provision for withdrawable thermostats should be made. This method dispensed with ingenious devices for providing against single-phasing and elaborate arrangements for matching the characteristics of thermal over-current trips to the thermal condition of the motor. It was impossible to attain such matching and motors were too readily tripped. The real criterion was that the starter should be capable of breaking the standstill current. In specifying the qualities of contact materials, it was essential to distinguish between carrying and arcing requirements.

Contact Alloys

MR. S. H. PARSONAGE (Compound Electro-Metals, Ltd.) said the performance of tungsten-copper was much better than that of copper alone and for butt contacts was more economical than silver-tungsten. Developments in progress suggested that contacts would eventually be made of extruded material, and he believed that in future small switchgear, particularly for machine tools, would incorporate a large number of contacts.

MR. E. H. B. MARTIN (B.T.H.) said that for machines with commutators the solenoid relay still held a very important position. On the other hand, the squirrel cage 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. In traction practice laminated brushes had been found practically useless and line-type contact was adopted in the tramway controller. There had been a tendency to adopt tramway practice for industrial work, especially for heavy hand operated duties. Silver contacts did not readily oxidise and needed a smaller spring pressure.

MR. G. A. COX (Watford Electric & Manufacturing Co.) said that there was a fourth type of starter on the market with multiple contacts. There had also been a starter on the market for almost forty years with rubbing contacts, which worked very satisfactorily. Was it better to have the starter and resistance in one container or as separate items? Separation eliminated a considerable amount of heating. He urged greater collaboration between makers of motors and starters.

MR. L. B. S. GOLDS (Edmundsons) 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, and were found to give every satisfaction.

DR. E. H. NORGROVE (George Ellison) thought that circuit-breaker design had not affected the design of starters and he could not support the author's curt dismissal of earth leakage protection as "another complication." And why should starter design in the future be based on the principle of restricted rupturing capacity? He did not feel enthusiastic about the system of tripping out motors by means of thermostats in the windings and iron circuit; to be really effective there would have to be too many thermostats, all in series. Contrary to the author's opinion, he had found that 70 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 for motor starting. With built-in control gear in machine tools access was difficult. Proper maintenance was one of the most important things in regard to control gear.

MR. R. SHINNIE thought that trouble with bakelite mouldings in control gear had been due more to the works electrician than to the design. The manufacturer could learn a great deal about this from reliable repair firms who had dealt with such equipment under service conditions. Troubles due to single-phasing, both on large and small motors, were invariably due to the up-grading of the overload trip. In many cases air-break starters had been superseded by oil immersed starters for heavy duty work.

MR. A. MORGAN asked for a switch which would not wear out, would resist abuse and did not require maintenance. The mercury switch appeared to be the best means of securing these ends.

THE AUTHOR, in the course of a short reply, said he was sorry that the user's point of view had not been put more forcibly. In his view it was more important for the average starter to be able to start two or three times followed by a relatively long cooling period than to be able to start on a repeated cycle. Although manufacturers did not make all types of enclosure, the fact that they were in the specification invited users to inquire for them. He would rather have a motor protected against phase failure than against overload. For the small motor he would be satisfied with protection which gave complete safety to the operator, and if anything more was required he would have phase protection. Speaking generally, he said the user was not concerned with the actual design of control gear but wanted a range of starters which, so far as dimensions were concerned, were interchangeable.

Highland Water Power

Second Constructional Scheme

CONSTRUCTIONAL Scheme No. 2 of the North of Scotland Hydro-Electric Board, now published (2s. 6d. net from the Board's Office, 16, Rothesay Terrace, Edinburgh) with the approval of the Electricity Commissioners, covers two projects, one in Perthshire and the other in Ross and Cromarty. In the first, termed the "Tummel-Garry project," the installed capacity will be 150,000 kW and the annual output 293 million kWh. For the other, the "Gairloch project," a station with an ultimate capacity of 3,000 kW for furnishing local supplies is to be constructed on Kerry River. The total capital cost is estimated at £6,450,000.

The Tummel-Garry project comprises three lochs each supplying water to a separate generating station. The upper (high-head) Errochty station, situated at the western end of Loch Tummel will receive water through a tunnel and pipe-line from a loch created by the construction of a dam in Glen Errochty. The middle (lower-head) Clunie station will be near the confluence of the Tummel and Garry rivers. The level of Loch Tummel is to be raised about 17 ft. by the building of a dam (with fish pass) across the River Tummel near the station. The lower station, Pitlochry, is to be incorporated in a dam (also with fish pass) constructed to form a loch on River Tummel. The water from Errochty station will pass through the other two after amplification by the waters discharged from the Grampian Electricity Supply Co.'s Loch Rannoch and Tummel Bridge stations.

Electricity is already available near Pitlochry from the Grampian Co. and growing demands can be met by bulk supplies from the Board, which will also provide bulk supplies to undertakings or supply electricity directly or indirectly for any new industries in its area. Technical details of the Tummel-Garry project are the work of Mr. J. Guthrie Brown of Sir Alexander Gibb & Partners and Mr. J. Williamson, both members of the technical panel of engineers advising the Board. Those for Gairloch were prepared by Sir William Halcrow, also a member of the panel.

Smoke Abatement

MAJOR G. Lloyd George, Minister of Fuel and Power, is to open a joint conference of the Institute of Fuel and the National Smoke Abatement Society in London on February 23rd. Subjects to be discussed will include, "A Statement of the Problem," by Dr. G. M. B. Dobson, F.R.S. (chairman, Atmospheric Pollution Research Committee); "The Effects on Civilisation of Atmospheric Pollution," by Major S. F. Markham, M.P.; "Domestic Smoke," by Mr. A. Blackie, M.A. (Fuel Research Station); and "Railway Smoke," by Mr. M. G. Bennett.

ELECTRICITY SUPPLY

Birkenhead and Durham Sites. Bromley Raid Damage.

Birkenhead.—SITE FOR POWER STATION.—The Electricity Committee has been considering the selection of a suitable site for the proposed new power station and has decided to state a case to the Electricity Commissioners for the acceptance of the offer of a site by Lever Bros., Ltd., at the southern end of the company's estate at Bromborough. The Committee has also decided to include a clause in the contracts for the power station requiring 90 per cent. of the men employed to be local.

HALF OF EACH.—The Corporation Estates Committee has decided that in half of the temporary houses gas shall be installed for wash boiler and cooker and electricity for lighting and immersion heater. Electricity is to be used in the remaining houses for all purposes. The Ministry of Health is being asked to state the type of refrigerator which will be supplied.

Bromley.—WARTIME EXPERIENCES.—Because of its proximity to London, Bromley suffered considerably from enemy air-raids, and during the period 1939-44 bombs were dropped on the borough on 107 days. Probably the worst experience, however, was on the night of April 16-17th, 1941, when a concentrated attack was made on the town and it was then that the electricity undertaking's staff were subjected to their severest test. The borough electrical engineer (Mr. W. G. Trend), in a report to the Council, records that the gravest situation arose at the main transformer station where an h.e. bomb exploded in adjoining premises, causing a dangerous fire. The south wall of the station was fractured and a bank of heavy switchgear displaced, but the reconstruction of the roof, carried out as an A.R.P. measure, saved at least half of the buildings from complete collapse and steel shutters prevented the fire spreading to the station, thereby saving plant and buildings to the value of £150,000. Another bomb which fell near the main entrance to the station fortunately failed to explode; had it done so there would have been serious casualties and complete dislocation of the supply. As it was, all supplies, except in a few isolated cases, were restored by mid-day on April 17th. Mr. Trend speaks of the devotion to duty of the staff when the raid was at its height and says that in spite of the fact that the houses of some had been seriously damaged not one failed to report at the normal time in the morning.

Coventry.—POWER STATION EXTENSIONS.—The Corporation Electricity Committee is seeking sanction to borrow £54,391 for extensions at Longford power station.

Dover.—FIFTY YEARS.—The electricity undertaking completes fifty years' operation in April and the Electricity Committee has decided to hold a luncheon to mark the occasion.

Durham.—INSPECTION OF ALTERNATIVE SITE.—It is reported that Mr. C. G. Morley New (Electricity Commissioner) and Mr. C. L. Pepler (Ministry of Town and Country Planning), who conducted the recent inquiry into the proposal of the North Eastern Electric Supply Co. to erect a station at Kepier, Durham, have inspected a suggested alternative site for the station. This is said to be at Washington, about six miles from Sunderland.

Leeds.—LOAN FOR POWER STATION EXTENSIONS.—Application is being made by the Electricity Committee for permission to borrow £960,000 for the 1947 extensions at Kirkstall power station.

Mansfield. — PREFABRICATED HOUSES. — It is expected that a start will be made in May on the erection of a hundred prefabricated houses of the "Orlit" type. The dwellings will be all-electric.

Oxford.—DEBATE ON HOUSE SERVICES.—Temporary houses in Oxford are to have gas cookers, refrigerators and wash boilers. The Housing Committee, making the recommendation, said that although there was little difference between gas and electricity as regards running cost, with electricity tenants were likely to be put to additional expense for kettles and saucepans, and it was further thought that gas was a more flexible medium for cooking. The city engineer reported that the houses would be built on sites to be occupied by permanent houses and it would cause less disturbance if gas mains were installed when the estates were being laid out. Alderman Dr. H. T. Gillett, moving an amendment in favour of all-electric houses, which was lost, said that with the combination of gas and electricity the cost would be something like 5s. a week while with electricity alone it would average 3s. 10d.

Paisley.—INCREASED CHARGES.—The Minister of Fuel and Power has sanctioned an increase in electricity charges as from the accounts for the quarter ending May 15th next. The charges were reduced in 1942 and will now largely revert to the previous level, the lighting flat rate, for example, going up from 4d. to 4½d. per kWh and the domestic service tariff secondary rate from 0·5d. to 0·6d.

Renfrewshire.—ELECTRIC LIGHTING PLANS.—The Second District Council of Renfrewshire proposes to convert the street lighting from gas to electricity in Potterhill, Elderslie, and Cardonald. Application is being made to the Secretary of State for consent to borrow the money.

St. Austell.—ELECTRICALLY EQUIPPED HOUSES.—The Urban District Council is to have fifty prefabricated temporary bungalows and has decided that these shall be equipped throughout with electric lighting, cooker, refrigerator and immersion heater.

South Shields.—RETENTION OF POWER STATION.—Recently the Town Council informed the Central Electricity Board of its intention to close down its generating station at the end of this year. The Board, however, has asked the Council not to dismantle or dispose of the station in case it is needed for a limited period after the end of the year.

CONVERSION OF LIGHTING.—The borough electrical engineer has prepared revised plans and estimates for converting gas lamps to electricity and providing automatic control for

lamps. The cost will be £27,200. Revenue will be about £12,188 and expenditure annually will be £10,978, leaving a revenue surplus of £1,210.

DOMESTIC EQUIPMENT.—The Town Council intends to install electric cookers and wash boilers in new houses.

Warrington.—UNDERTAKING'S RATE CONTRIBUTION.—The 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 1945-46.

West Bromwich.—TEMPORARY HOUSING.—The Council has decided that the first consignment of temporary houses shall be all-electric.

Wimbledon.—REPRESENTATION REQUEST AGAIN REJECTED.—Last year, by a majority of two votes, the Corporation decided not to allow the Malden & Coombe and Merton & Morden Councils to be represented on its Electricity Committee. The two authorities have recently made a further request for representation, with full voting powers, but Wimbledon has adhered to its former decision.

York.—SUBSTATION EXTENSIONS.—The Electricity Committee is seeking sanction to borrow £22,942 for extensions at Kingsway and Huntington, substations and transformers, etc.

TRANSPORT

Belfast.—MORE TROLLEY-BUSES.—The Transport Committee has decided to ask the Ministry of War Transport to allocate to Belfast 100 six-wheeled double-decked trolley-buses for 1946, in addition to those already allocated for the present year. Mr. R. Carlisle, acting general manager, says that the tramway tracks on a number of routes are nearing the end of their economic life.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Associated Electrical Industries, Ltd., has secured the consent of the Treasury to an increase of £1,363,000 in its authorised capital by the creation of that amount of 8 per cent. £1 cumulative preference shares. The present capital is £5,161,950 in ordinary stock (£4,921,838 issued) and £1,333,050 in 8 per cent. cumulative preference stock (£1,307,642 issued), a total of £6,495,000 (£6,229,480 issued). The necessary resolutions were to be placed before an extraordinary meeting yesterday (Thursday.) It is proposed to offer the new shares to the holders of the 7 per cent. cumulative preference shares of the British Thomson-Houston Co., Ltd., in the proportion of ten new shares for every eleven B.T.H. shares. Any share or fraction of a share which it is not possible to exchange is to be acquired for cash on the basis of 36s. per share, This will complete the acquisition by the A.E.I. of the whole of the capital of the companies constituting the group.

The Isle of Thanet Electric Supply Co., Ltd., is the first electricity supply company to take advantage of the lifting of the ban upon the publication of accounts by the issue of figures for the years 1941, 1942 and 1943. These show that the revenue for the three years was £53,442, £52,445 and £60,821 and generating expenses, rates, etc., £52,099, £40,075 and £39,635. After meeting sinking fund payments, debenture interest, etc., the deficits were £20,890, £10,055 and £1,331, but in 1942 excess rates amounting to £10,564 were written back, resulting in a surplus of £509. The report refers to the proposed purchase by the local authorities of the company's undertaking and says that the price would include a sum equal to the aggregate of all amounts by which the gross profits during the war have been less than the company's share of the profits as scheduled in the Margate, Broadstairs and District Electricity Act, 1937. The directors are confident that if for any reason the purchase is not proceeded with the company will return to a satisfactory basis within a reasonable time.

The Yorkshire Power Co., Ltd., announces that its net profit for 1944 was £772,307 and the report gives the corresponding figures for the preceding years: 1943, £738,231; 1942, £703,283; and 1941, £639,384. The ordinary dividend for 1944 is unchanged at 6 per cent.; £350,000 is allocated to depreciation and renewals, £50,000 to deferred repairs, £75,000 to plant renewals, £25,000 to war damage reserve, £75,000 to contingencies reserve and £5,000 to staff fund; £125,124 is carried forward. Resumption of construction at the new Mexborough station was permitted in 1942 and after many delays one set is now in operation. Directions have been given for the extension of the Ferrybridge and Thornhill stations. Negotiations are in progress for an issue of debentures.

Power Securities Corporation, Ltd.—The gross profit for the past year was £113,375 as compared with £113,632 for 1943. The ordinary dividend is unchanged at 6 per cent. and £58,791 is carried forward (against £49,738). A sum of £35,000 set aside for the nucleus of a staff pension fund is not now required as a nucleus has been made by Balfour, Beatty & Co.; it is therefore transferred to reserve, increasing this to £250,000.

A previously-circulated statement by the chairman, Mr. W. Shearer, which was presented at Wednesday's annual meeting, mentioned that few opportunities had occurred during the year for dealing with capital issues and other financial business. The principal activities had centred upon the business of Balfour, Beatty & Co., which the Corporation owned and controlled. During the last four years they had been engaged on civil engineering works of great magnitude for the Admiralty. They had participated in the construction of the "Mulberry" project.

The electrical construction department had been very 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. Similar important works were being carried out in various colonial and mandated territories. During the last two years they had sent repre-

sentatives on missions to various countries. They had been able to keep in touch with their friends in Iraq and negotiations were in progress for a resumption of activities in that country.

Given freedom to exercise initiative, untrammelled by inevitable wartime restrictions and controls, a great opportunity for the development of electrical and civil engineering projects in various parts of the world was open to British enterprise, notwithstanding the fact that powerful foreign competitors were in the field.

The Calcutta Tramways Co., Ltd., has informed shareholders that negotiations are still proceeding with the Calcutta Corporation, which has been told that if the company's latest proposal is not accepted it does not consider itself bound by the notice of June 27th, 1944, and remains in possession of its undertaking. If the proposal is accepted and the company is assured that the contract will be executed, it will be prepared to discuss the proposed transport board with the Corporation and the Bengal Government.

Electrical & Industrial Investments, Ltd., reports a gross revenue from interest of £55,221 for 1944 (against £54,585). The net revenue was £21,882 (against £21,175) and after payment of the preference and preferred dividends, 12 per cent. (same) is to be paid on the deferred shares, leaving £9,121 (against £8,675) to go to undivided profits.

R. B. Pullin & Co., Ltd., have declared a final dividend of 12½ per cent., making 17½ per cent. for the eleven months to September 30th last, against 20 per cent. for the preceding twelve months.

Mather & Platt, Ltd., from a net profit of £172,294 for 1944 (against £168,388), are paying a final ordinary dividend of 6 per cent., again making 10 per cent. for the year.

New Companies

Electric & Hardware Supplies, Ltd.—Private company. Registered in Dublin January 31st. Capital, £5,000. Objects: To manufacture, and deal in apparatus, plant, machinery and accessories used in connection with the generation and supply of electrical energy. Subscribers: K. P. Kelly, Hillsboro', Lucan, Co. Dublin; and Carmel Leigh, 16, Parnell Road, Harolds Cross, Dublin, typist.

E. S. Tanner, Ltd.—Private company. Registered February 1st. Capital, £1,000. Objects: To carry on the business of refrigerating, cold storage and electrical engineers, etc. Directors: E. S. Tanner, address not stated; D. S. Kite, 10, Romilly Crescent, Canton, Cardiff; and L. Palmer, Erw'r Delyn, Sully Road, Penarth.

Burts' Electric & General Supplies, Ltd.—Private company. Registered February 1st. Capital, £400. Objects: To carry on the business of wholesalers, importers and exporters of electrical and wireless goods, etc. F. Burt, 5, West Street, Ilminster, Somerset, is the first director. Secretary: C. Burt.

Radio Trade Service (Reading), Ltd.—Private company. Registered January 31st. Capital, £3,000. Objects: To acquire the business carried on by C. G. and Dorothy E. Witt, at 78a, Kings Road, Reading, as Radio Trade Service and to carry on the business of radio and electrical engineers, etc. C. G. Witt, and Mrs. Dorothy E. Witt, both of 23, Norcot Road, Tilehurst, Reading, are the first directors. Registered office: 78a, Kings Road, Tilehurst, Reading.

Companies' Returns

Statements of Capital

Electroflo Meters Co., Ltd.—Capital, £21,000 in 10s. shares. Return dated October 2nd, 1944. All shares taken up. £11,000 paid. £10,000 considered as paid. Mortgages and charges: Nil.

Apex Construction, Ltd.—Capital, £100 in £1 shares. Return dated October 23rd, 1944. 12 shares taken up. £12 paid. Mortgages and charges: Nil.

A. Anderson & Son (Electrical Engineers), Ltd.—Capital, £3,000 in £1 shares. Return dated September 21st, 1944. All shares taken up. £3,000 paid. Mortgages and charges: Nil.

Electrical Wiring Investment Co., Ltd.—Capital, £5,000 in £1 shares. Return dated July 26th, 1944. All shares taken up. £5,000 paid. Mortgages and charges: Nil.

West Cambrian Power Co., Ltd.—Capital, £800,000 in £1 shares. Return dated July 31st (filed August 14th, 1944). 690,000 shares issued and fully paid up. Mortgages and charges: Nil.

Electric Development & Securities Trust, Ltd.—Capital, £1,000,000 in £1 shares. Return dated August 22nd, 1944. All shares issued and fully paid up. Mortgages and charges: Nil.

Kalee, Ltd.—Capital, £79,246 in £1 shares (7,500 " A " preference, 61,250 " B " preference and 10,496 ordinary). Return dated November 10th. 6,215 " A," 61,250 " B " and 10,496 ordinary shares taken up. £20,695 paid. £57,266 considered as paid. Mortgages and charges: Nil.

Mortgages and Charges

Newport Electrical Co., Ltd.—Satisfaction to the extent of £400 on December 30th of debenture registered January 18th, 1930.

Dissolution of Partnership

F. J. Fisher, S. Phillips, J. S. Davis and **W. G. Watts**, carrying on business as electrical engineers and contractors at 97, Baker Street, London, W.1, as Phillips & Co., have dissolved partnership as from January 26th. Debts will be paid by F. J. Fisher, S. Phillips and J. S. Davis, who will carry on the business.

Receiver Released

M. & W. (Radio & Electrical), Ltd.—H. L. Nixon of 18, Orchard Avenue, Cambridge, ceased to act as receiver and manager on January 24th, 1945.

Bankruptcies

J. H. Etherington, electrical, wireless and cycle dealer, lately carrying on business at 6, South Road, Newhaven, Sussex.—Order made at Lewes, January 8th, suspending discharge for twelve months.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange prices keep very steady, notwithstanding comparative quietude of business. A view which meets general acceptance is that the end of the war is within sight, and although at one moment this is regarded as a bull-point, and at another as a factor of uncertainty, the investment of money in front-rank stocks and shares goes on without intermission. The first of the Home Railway dividends for 1944, that of the London Midland & Scottish, was at the same rate, 2½ per cent., as that of the previous year, and aroused little interest. The London Transport Board and the Metropolitan Surplus Lands announcements come on Thursday in this week. Industrial ordinary shares hold their prices with marked firmness. The complaint is common that money finds it difficult to obtain profitable employment in stocks and shares. If there were a larger supply, business would expand in the industrial sections of the market.

A.E.I. and B.T.H.

Associated Electrical Industries is offering ten of its 8 per cent. cumulative preference £1 shares in exchange for eleven 7 per cent. British Thomson-Houston preference £1 shares. In order to do this, the A.E.I. proposes to increase its capital by creating 1,363,000 8 per cent. preference. The A.E.I. was launched seventeen years ago, and has acquired all the shares and debentures of the constituent companies with the exception of the 1½ million British Thomson-Houston 7 per cent. preference that it is now proposed to take over. The Treasury has given its consent, and the shareholders' meeting to confirm the arrangement is to be held on Thursday in this week. The exchange appears to have been worked out on an equitable basis and the B.T.H. shareholders are not likely to cavil at the terms. All the B.T.H. ordinary shares are owned by Associated Electrical Industries. The B.T.H. 7 per cent. preference shares have risen 1s. 3d. to 36s. Associated Electrical 8 per cent. preference are unchanged at 40s.

Rises on Balance

Amongst the principal rises in the price lists this week are 3s. 9d. in British Insulated to 116s. 3d.; 2s. 6d. in Johnson & Phillips, 78s. 6d.; and in Canadian Marconi 13s. The last-named have again been in demand from Canadian sources, which apparently look for an increase upon the last-declared dividend of 4 cents per share. Callender's strengthened to 116s. 3d. and the 7½ per cent. "B" preference to 37s. 6d. Brazilian Traction, on publication of excellent earnings, rose a point to 27. Thomas Tilling at 61s. 6d. are unaffected by the dividend of 10 per cent., making 100 per cent. over the past ten years. International "Tel. & Tel." at 28½ have put on another $1½. Cable & Wireless stocks hold their prices. A florin rise lifted General Cables to 19s. Hopkinsons are easier at 74s. 3d. De la Rue escaped from the recent dullness which depressed the price to 9½, and at 9 13/16 the shares are 1/16 better on the week. Midland Electric Manufacturing, 7¼, Westinghouse Brake, 77s., Walsall Conduits, 52s. 6d., and Strand Electrics, 11s. 6d., have hardened upon the steady pressure of investment to accumulate industrials assumed to possess promising post-war prospects. Calcutta Trams rose 2s. upon the issue by the company of a long letter detailing the progress of negotiations now under discussion with the Calcutta Corporation.

Radio

Electric & Musical, E. K. Cole, Cossor and other radio shares responded cheerfully to the official announcement that £700 million will be paid in gratuities and post-war credits to members of the Forces upon demobilisation. This statement gave a fillip to the prices of shares in several companies which may be expected to attract some of this money. Moreover, the nearer approach of peace fans anew popular optimism relating to post-war television. Cossor rose to 33s. before reverting to 32s. E.M.I. at 34s. 9d. have 1/16 rise to their credit, and E. K. Cole are equally better at 41s. 3d. McMichael Radio advanced to 8s. 6d.

Power Securities

Power Securities Corporation holds its twenty-second annual general meeting this week, and amongst many interesting items in the chairman's statement is his reference to the construction of certain units of what is known as the "Mulberry" project.

As already announced, the Power Securities dividend is again to be 6 per cent. on the ordinary shares, the same rate as has been distributed since 1941, before which the dividends remained at 7 per cent. annually for some time. The Power Securities Corporation came into being twenty-three years ago, having been formed to carry on a general finance business, more especially in the development of electrical and allied undertakings. It owns all the shares of Balfour Beatty & Co., and controls the Hydro-Electric Development Co. and the Metropolitan Construction Co. At the present price of 29s. 6d. the yield on the money comes to a little over 4 per cent.

Electrical & Industrial

Another general meeting to be held this week is that of the Electrical & Industrial Investment Co., whose total net revenue, £21,882, for the year 1944, was about £700

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ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Feb. 13	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Ordinary					
Bournemouth and Poole	12½	12½	63/6	..	3 19 1
British Power and Light	7	7	33/6	..	4 3 10
City of London	7	5½	30/–	..	3 13 4
Clyde Valley	8	8	42/–	..	3 16 0
County of London	8	8	45/–	..	3 11 1
Edmundsons	6	6	32/–	..	3 15 0
Elec.Dis.Yorkshire	9	9	45/6	..	3 19 6
Elec. Fin. and Securities	12½	13½	61/–	..	4 8 6
Elec. Supply Corporation	10	10	51/–	..	3 18 6
Lancs. Light and Power	7½	7½	37/6	..	4 0 0
Llanelly Elec.	6	6	28/–	..	4 5 9
Lond.Assoc.Electric	3	4	26/6	..	3 0 6
London Electric	6	6	31/–	..	3 17 5
Metropolitan E.S.	8	8	44/6	..	3 12 0
Midland Counties	8	8	41/6	..	3 17 0
Mid. Elec. Power	9	9	44/6	..	4 1 0
Newcastle Elec.	7	7	32/–	..	4 7 6
North Eastern Elec.	7	7	35/–	..	4 0 0
Northampton	10	10	50/6	..	3 19 4
Northmet Power	7	7	43/–	+6d.	3 5 0
Richmond Elec.	6	6	27/–	+1/–	4 9 0
Scottish Power	8	8	40/6	..	3 19 0
Southern Areas	5	5	23/–	..	4 7 0
South London	7	7	30/–	..	4 13 4
West Devon	5	5	25/–	..	4 0 0
West Glos.	4½	3½	25/–	..	2 16 0
Yorkshire Elec.	8	8	43/–	..	3 14 5
Public Boards					
Central Electricity :					
1955–75	5	5	116	..	4 6 0
1951–73	4½	4½	106	..	4 5 0
1963–93	3½	3½	105	..	3 6 8
1974–94	3½	3½	101	..	3 4 4
London Elec.Trans.	2½	2½	98	..	2 11 0
London & Home Counties 1955–75	4½	4½	111	..	4 1 1
Lond.Pass.Trans.Bd.					
A	4½	4½	122½	..	3 13 6
B	5	5	123½	..	4 1 0
C	3	3½	69	..	4 14 2
West Midlands J.E.A. 1948–68	5	5	106½	..	4 14 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	6/3	–6d.	—
Calcutta Elec.	6*	6*	47/6	..	2 11 2
Cawnpore Elec.	10	7	42/–	..	3 6 9
East African Power	7	7	36/–	..	3 17 9
Jerusalem Elec.	7	5	28/–	..	3 11 5
Kalgoorlie (10/–)	5	5	10/6	..	4 15 3
Madras Elec.	Nil	4	31/6	..	2 10 9
Montreal Power	1½	1½	24½	..	—
Nigerian Elec.	8	10	37/6	..	5 6 8
PalestineElec."A"	5*	5*	38/–	..	2 12 8
Perak Hydro-elec.	6	7	13/–	..	—
Tokyo Elec. 6%	6	6	23½	..	—
VictoriaFallsPower	15	15	90/–	..	3 7 7
WhitehallInv.Pref.	—	6	26/–	..	4 12 4

Company	Dividend Previous	Dividend Last	Middle Price Feb. 13	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord.	10	15	62/–	..	4 16 9
Assoc. Brit. Eng.	6	7	53/9	..	2 12 0
Assoc. Elec. :					
Ord.	10	10	57/3	..	3 10 0
Pref.	8	8	40/–	..	4 0 0
AutomaticTel.&El.	12½	12½	65/3	–1/–	3 16 6
Babcock & Wilcox	11	11	52/6	..	4 3 10
British Aluminium	10	10	46/–	..	4 7 0
British Insul. Ord.	20	20	5 11/16	+ 1/16	3 5 6
British Thermostat (5/–)	18½	18½	20/9	..	4 9 0
British Vac. Cleaner (5/–)	30	30	33/–	..	4 11 0
Brush Ord. (5/–)	8	9	11/–	..	4 1 6
Burco (5/–)	15	15	16/–	+3d.	4 13 9
Callender's	15	20	5 3/8	+ 1/8	3 8 10
ChlorideElec.Storage	15	15	87/6	..	3 18 7
Christy Bros.	12½	17½	77/6	..	4 10 2
Cole, E. K. (5/–)	15	20	41/3	+ 1/3	2 6 0
Consolidated Signal	24	27½	6 5/8	..	4 0 0
Cossor, A. C. (5/–)	7½*	10*	32/–	..	1 11 4
Crabtree (10/–)	17½	17½	44/–	..	3 19 7
Crompton Parkinson Ord. (5/–)	20	22½	34/6	..	3 5 3
De La Rue	35	40	9 1/16	+ 1/16	4 1 8
E.M.I. (10/–)	6	8	34/9	+ 1/8	2 6 0
Elec. Construction	10	12½	63/–	..	3 19 4
Enfield Cable Ord.	12½	12½	63/–	..	3 19 4
English Electric	10	10	56/6	..	3 10 2
Ericsson Tel. (5/–)	22*	20*	54/–	..	1 15 9
Ever Ready (5/–)	40	40	44/–	..	4 11 0
Falk Stadelmann	7½	7½	34/9	..	4 6 2
Ferranti Pref.	7	7	31/9	..	4 8 2
G.E.C. :					
Pref.	6½	6½	34/6	..	3 15 4
Ord.	17½	17½	98/6	..	3 11 2
General Cable (5/–)	15	15	19/–	+2/–	3 19 0
Greenwood&Batley	15	15	48/3	..	6 3 0
HallTelephone(10/–)	12½	12½	31/–	..	4 0 8
Henley's (5/–)	20	20	27/3	..	3 13 9
4½% Pref.	4½	4½	24/–xd	..	3 15 0
Hopkinsons	15	17½	74/3	–2/–	4 14 1
India Rubber Pref.	5½	5½	24/–	..	4 11 9
Intl. Combustion	30	32½	7½	..	4 6 8
Johnson & Phillips	15	15	78/6	+ 1/8	3 16 6
LancashireDynamo	22½	22½	102/6	..	4 10 0
Laurence, Scott(5/–)	12½	12½	13/9	–6d.	4 11 0
London Elec. Wire	7½	7½	38/–	..	3 19 0
Mather & Platt	10	10	56/3	..	3 11 2
Metal Industries (B)	8	8½	47/–	..	3 12 6
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Mid. Elec. Mfg.	25	25	7½	+ 1/8	3 9 1
Murex	20	20	5 7/8	..	3 18 9
Newman Ind. (2/–)	20	20	7/3	..	5 10 0
Philco (2/–)	—	—	14/6	..	—
Power Securities	6	6	29/6xd	+ 1/32	4 1 4
Pye Deferred (5/–)	25	25	33/9	..	3 14 0
Ransome & Marles	20	20	87/6	..	4 11 4
Revo (10/–)	17½	17½	44/–	–6d.	3 19 7
Reyrolle	12½	12½	72/6	..	3 9 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Feb. 13	Rise or Fall	Yield £	Yield s.	Yield d.
Equipment and Manufacturing (*Continued*)							
Siemens Ord. ..	7½	7½	36/–	−3d.	4	3	4
Strand Elec. (5/–)	10	12½	11/6	+6d.	5	8	8
Switchgear & Cowans (5/–) ..	20	20	20/9	..	4	16	7
T.C.C. (10/–) ..	5	7½	25/–	..	3	0	0
T.C. & M. ..	10	10	58/–	..	3	9	2
TelephoneMfg.(5/–)	9	9	12/–	..	3	15	0
Thorn Elec. (5/–)	20	20	29/–	..	3	9	0
Tube Investments	20	22½	5 7/16	−1/16	4	2	10
Vactric (5/–) ..	Nil	22½	17/3	+3d.	6	10	6
Veritys (5/–) ..	7½	7½	9/–	−6d.	4	3	4
WalsallConduits(4/–)	55	55	53/–	+6d.	4	3	0
Ward & Goldstone (5/–)	20	20	30/6	..	3	5	8
WestinghouseBrake	14	14	77/–	+1/–	3	12	8
West, Allen (5/–)	7½	7½	8/9	..	4	5	9
Traction and Transport							
Anglo-Arg. Trans.							
First Pref. (£5)	Nil	Nil	2/6	..		—	
4% Inc. ..	Nil	Nil	6½	..		—	
Brit. Elec. Traction :							
Def. Ord. ..	45	45	1205	..	3	15	0
Pref. Ord. ..	8	8	190	..	4	4	3
Bristol Trams ..	10	10	57/–	..	3	10	2
Brazil Traction ..	1½	2	27	+1	7	8	2
Calcutta Trams	6½	7½	67/6	+2/–	2	4	4
Cape Elec. Trams	5	6	26/–	..	4	12	4
Lancs. Transport	10	10	49/–	..	4	1	8
Southern Rly. :							
5% Prefd. ..	5	5	77½	−½	6	9	2
5% Pref. ..	5	5	119½	..	4	3	8
T. Tilling ..	10	10	61/6	..	3	5	0
West Riding ..	10	10	49/–	..	4	1	8
Telegraph and Telephone							
Anglo-Am. Tel. :							
Pref.	6	6	125	..	4	16	0
Def.	1½	1½	30	..	5	0	0
Anglo-Portuguese	8	8	27/6	..	5	16	4
Cable & Wireless :							
5½% Pref. ..	5½	5½	118	..	4	13	3
Ord.	4	4	84½	..	4	14	8
CanadianMarconi	$1 Nil	4cts.	13/–	+2/6		—	
Globe Tel. & Tel. :							
Ord.	8½*	5*	41/–	−6d.	2	8	2
Pref.	6	6	31/–	..	3	17	5
Great Northern Tel. (£10)	Nil	Nil	29	..		—	
Inter. Tel. & Tel.	Nil	Nil	28½	+1½		—	
Marconi-Marine..	7½	7½	34/6	..	4	7	0
Oriental Tel. Ord.	4	4	50/–	..		—	
Telephone Props.	Nil	6	20/–	..	6	0	0
Tele. Rentals (5/–)	10	10	12/3	..	4	1	8

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 254)

greater than that of the previous twelvemonth. Dividends on the company's stocks are subject to a few pence in the £ Dominion income tax relief. The investments at or below cost stand at £607,709, the directors being satisfied that this is an under-valuation at current market prices. The deferred ordinary dividend is again 12 per cent. The preferred ordinary receives the regular 7 per cent. and the price of these shares is 23s. middle. Some of the preferred, and nine-tenths of the deferred stock are held by the British Electric Traction Co.

Marconi Marine

In March or April there will be forthcoming the final dividend for the year 1944 from the Marconi International Marine Communication Co. For years past the company has paid a regular 7½ per cent. per annum. For the year ended 1938 an extra bonus of 2½ per cent. was added, earnings that year having been especially good. For the year which ended last December, the usual interim dividend of 2½ per cent. was paid, less tax at 9s. 10d. in the £. At the general meeting last May, the chairman mentioned that the company's financial position had been maintained throughout the year, and its contribution to the war effort increased. He added significantly that the management and officials of the company constantly had in mind requirements for civil aviation more especially at the conclusion of the war.

At the present price of 34s. 6d., the yield on the money, £4 7s. per cent., hints at the expectation that the distribution will be advanced as soon as the occasion permits. Meanwhile, pending post-war developments, investment is content to keep the shares as a security which promises improved results in years to come. The company holds an exclusive licence from Marconi's Wireless Telegraph Co. for all maritime purposes throughout the world, except in the United States and a few other countries.

Palestine Preference

Several moderate lines of preference shares in the electricity supply group have recently come to market, amongst them being 5,000 Palestine Electric 4½ per cent. redeemable preference shares which can be bought at 20s. 9d., January and July dividends, to give £4 6s. 9d. per cent. The dividend service requires £21,690 per annum and in the last published accounts there was £486,000 available to meet it. The shares are redeemable by 1964 by purchase up to, or drawings at 20s. 6d.: also at any time up to 1950 at a guinea and thereafter at 20s. 6d. A similar line of the same company's 4½ per cent. second redeemable preference has been on offer at 20s. 3d., January and July dividends, returning £4 8s. 9d. The annual dividend requirement of £11,250 was covered many times over by the profits last year.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AUTOMATIC Telephone & Electric Co., Ltd., and E. Frydman.—" Thermal switching devices." 12065. July 24th, 1943. (567123.)

Automatic Telephone & Electric Co., Ltd., and L. J. Murray.—" Telephone or like signalling systems." 11836. July 21st, 1943. (567049.)

Babcock & Wilcox, Ltd.—" Construction and operation of tubulous vapour generating and superheating units." 9095/43. July 15th, 1942. (567078.)

Babcock & Wilcox, Ltd., and A. S. Boles.—" Means for regulating pressure drop." 10481. June 29th, 1943. (567118.)

Bell Punch Co., Ltd., and R. Milburn.—" Electric impulse-recording installations and circuit arrangements for use therewith." 7458. May 11th, 1943. (567112.)

F. Bradbury.—" Electric clocks." 6738. April 28th, 1943. (567006.)

British Thomson-Houston Co., Ltd.—" Thermally-responsive electric protective devices." 11868/43. July 21st, 1942. (567019.) " Control of electric motors." 12700/43. August 6th, 1942. (Addition to 526750.) (567023.) " Insulated coils and methods of making same." 17415/43. October 22nd, 1942. (567030.) " Control of electric discharge lamps." 2198/43. February 12th, 1942. (567041.)

British Thomson-Houston Co., Ltd., and C. A. Mason.—" Film sound reproducing." 4045. March 12th, 1943. (567104.)

British Thomson-Houston Co., Ltd., and W. L. Wise.—" Electric switches suitable for controlling a plurality of circuits." 11419. July 14th, 1943. (566989.)

Concordia Electric Safety Lamp Co., Ltd., and C. C. Bleach.—" Miners' and like lamps." 11965. July 22nd, 1943. (567085.)

F. B. Dehn. (Chicago Flexible Shaft Co.).—" Electrically heated sad-irons." 2806. March 3rd, 1942. (567034.)

English Electric Co., Ltd., P. L. Mardis and F. Wilson.—" Sliding type current collecting trollies." 15627. September 23rd, 1943. (567060.)

Furzehill Laboratories, Ltd., F. R. Milson and S. Smith & Sons (England), Ltd.—" Multi-stage thermionic valve amplifiers." 12235. July 27th, 1943. (567021.)

General Electric Co., Ltd., A. Abbott, C. J. O. Garrard and E. Friedlander.—" Over-speed protection and speed regulation of power systems." Cognate applications 12116/43 and 15981/43. July 26th, 1943. (566992.)

C. L. Heimann.—" Means for effecting electrical connection to revolving bandstands and the like." 8689. May 31st, 1943. (566985.)

W. T. Henley's Telegraph Works Co., Ltd., and W. F. O. Pollett.—" Manufacture of insulated electric conductors." 11067. July 7th, 1943. (567014.)

Igranic Electric Co., Ltd., and S. R. Wright.—" Electrical coils." 7559. May 12th, 1943. (567074.)

A. B. Mudie.—" Electrical circuit-breakers or switches." 12641. August 5th, 1943. (567089.)

Mullard Radio Valve Co., Ltd., and H. J. L. Herne.—" Electron-discharge tubes." 7414. May 10th, 1943. (567111.)

R. F. Oxley.—" Variable electric condensers." 9729. June 17th, 1943. (566986.)

Philco Radio & Television Corporation.—" Frequency control system." 10771/43. July 2nd, 1942. (566987.)

Philips Lamps, Ltd., and C. W. V. Davis.—" Magnetic separators." 1095. January 21st, 1943. (Addition to 527771.) (567064.)

Plessey Co., Ltd.—" Variable resistance devices." 11704/43. November 12th, 1942. (567017.)

Radio Transmission Equipment, Ltd., and C. E. Payne.—" Continuously variable inductances and the like." 100074. June 22nd, 1943. (567080.)

Siemens Bros. & Co., Ltd., and G. W. Sutton.—" Telephone instruments." 13522. August 19th, 1943. (567026.)

Siemens-Schuckert (Great Britain), Ltd., W. R. Turner and S. Flax.—" Rotary power-operated drilling machines." 112850. August 9th, 1943. (567024.)

Standard Telephones & Cables, Ltd.—" Low impedance oscillator." 11581/43. July 20th, 1942. (567083.)

Standard Telephones & Cables, Ltd., and H. Bullas.—" Connections for electric cables." 9659. July 10th, 1942. (567036.)

Standard Telephones & Cables, Ltd., and E. A. Richards.—" Metal rectifiers for electric currents." 11554. July 15th, 1943. (567016.)

Standard Telephones & Cables, Ltd., E. A. Richards and L. J. Ellison.—" Metal rectifiers for electric currents." 11533. July 15th, 1943. (567015.)

J. G. Statter & Co., Ltd., and J. G. Statter.—" Electric switch-fuses." 12440. July 30th, 1943. (567022.)

B. Taylor.—" Electric welding machines." 11802. July 20th, 1943. (567048.)

Westinghouse Brake & Signal Co., Ltd.—" Code-operated electric remote-control systems." 3124/40. March 25th, 1939. (567032.)

E. L. C. White, G. S. P. Scantlebury and R. T. Clayden.—" Electrical switching circuits incorporating electron-discharge valves." 10093. June 22nd, 1943. (567011.)

Sir H. E. Yarrow.—" Superheaters for water-tube boilers." 8561. May 28th, 1943. (567115.)

Amended Specification

556618. A. Reyrolle & Co., Ltd., and others.—" Electric fuse elements."

TRADE MARKS

THE following application has been made for a trade mark. Objections may be entered within a month from February 7th:—

MARDRIVE. No. 630,978, Class 7. Electric motors (not for land vehicles), and clutches. Marine Engineering Co. (Stockport), Ltd., 14, Bulkeley Street, Edgeley, Stockport, Ches.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—March 7th. 44,000-V switchgear (Spec. 384). City Electric Light Co., Ltd., Boundary Street, Brisbane (£2 2s.).

March 21st. Victorian State Electricity Commission. Paper and varnished cambric insulated cable (Spec. 44-45/41). April 4th. Electrical switchboard indicating and recording instruments (Spec. 44-45/25). July 4th. 40,000-kVA synchronous condenser (Spec. 45-46/1).

March 26th. P.M.G.'s Department. Induction coils (Sch. C4592). April 3rd. Automatic telephone switchboard and associated automatic trunk ticketing equipment and/or associated voice-frequency signalling equipment (Sch. C4608).

Belfast.—March 6th. Electricity Department. Materials including feeder and section pillars, armourclad compound-filled 6,600-V switchgear, meters and instrument transformers, I.v. fuse units, cut-outs, joint boxes, cables, lamps, switch tripping batteries and charging equipments, etc. (February 9th.)

Chesterfield.—March 1st. Electricity Department. One 500-kVA., 6,600/415-V, outdoor transformer. (See this issue.)

Leeds.—February 20th. Education Committee. Repairs and maintenance work at school buildings, in the trades of electrician and heating engineer. G. Guest, director of education.

Manchester.—February 19th. Public Health Committee. Three motor-driven hydro extractors. City architect, Town Hall (£1 1s.).

March 1st. Electricity Department. Four outdoor-type substation kiosks and switchgear. (February 9th.)

Shipley.—March 2nd. Electricity Department. Supply and delivery of paper insulated cables for twelve months. (See this issue.)

Tynemouth.—February 24th. Town Council. Electric lamps for the year ending March 31st, 1946. Borough surveyor, 19-20, Howard Street, North Shields.

Orders Placed

Leeds. — Electricity Committee. Recommended. Extensions at Kirkstall power station: Three boilers and pulverising and ash handling plant (£879,591).—International Combustion. Turbo-alternator and condensing plant (£188,695).—British Thomson-Houston Co. Cooling tower (£62,500).—Davenport Engineering Co. Completion of boiler house building (£26,505).—J. W. Shippen & Sons. Steelwork for boiler house (£14,260).—S. Butler & Co.

Notts.—Assistance Committee. Accepted. Electrical work at Mansfield institution (£299).—Frederick Lamb, Ltd.

Manchester.—Electricity Committee. Accepted. Electrically driven travelling cranes. —Clyde Crane and Booth, Lanarkshire.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Rebuilding Palace Hotel, damaged by fire in 1941; architect, L. N.E.R. Company, Edinburgh.

Chesterton.—Additions to works; J. Brittain & Son (Eng.), Ltd., Dragon Square, Chesterton, Staffs.

Coventry.—Extensions to Technical College; D. E. E. Gibson, city architect.

Durham.—Central kitchens at New Brancepeth; county school architect, 34, Old Elvet, Durham.

Finchale (Co. Durham).—Extensions to Sir John Priestman Hospital for the Disabled; W. and T. R. Milburn, architects, 17, Fawcett Street, Sunderland.

Lancaster.—Community centre, Ridge Lane housing site; F. Hill, city engineer, Town Hall.

Leicestershire.—Dining room and kitchen, South Charnwood, for school meals service (£2,700); E. G. Fowler, county education architect, Grey Friars, Leicester.

Manchester.—Office, workshop, etc., Burton Road, Withington; R. Martin, architect, 90, Deansgate, Manchester, 3.

Market Bosworth.—Works; Churchill, Ltd., tool manufacturers, Quinton Road, Coventry.

Norwich.—Kitchen and canteen (£2,300), Blyth School; borough surveyor, City Hall.

Nottinghamshire.—Mental hospital additions; (£180,000); county architect, Nottingham.

Rochdale.—Additions to Infirmary; P. G. Fairhurst, architect, Chancery Chambers, 55, Brown Street, Manchester, 2.

Romford.—Proposed new senior school, Mercury Gardens; C. G. Alderton, borough engineer, Town Hall.

Salford.—Works additions, Suffolk Street, Pendleton; A. Locket & Co., Ltd.

Smethwick.—Substation, pump house, etc., Spon Lane; Chance Bros., Ltd.

Southend-on-Sea.—Reinstatement of tuberculosis unit, Municipal Hospital; R. G. Baxter, borough engineer.

Southport.—Reconstruction of offices, messroom, etc., Canning Road, for Transport Department; H. L. Bunting, borough surveyor, Town Hall.

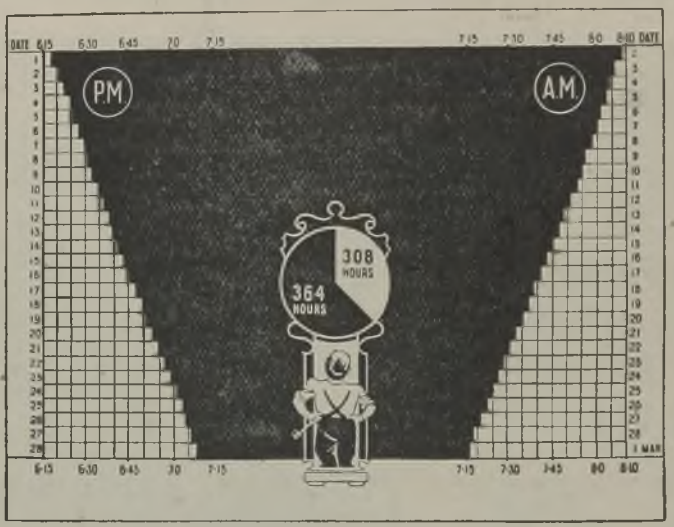
South Shields.—Conversion of premises in John Clay Street into factory (£4,500); Henderson Bros., builders, Tyne Dock, South Shields.

Rebuilding bomb-destroyed clothing store in King Street for Jacksons (Clothiers), Ltd.; E. M. Lawson, architect, Barras Buildings, Newcastle-on-Tyne.

Warrington.—Works additions; J. Smethurst & Son, brassfounders, Foundry Street.

The Turn of the Tide

DIM-OUT CHART FOR FEBRUARY



Reproduced from the Nautical Almanac by permission of the Controller of H.M. Stationery Office

**Times shown are those for the London area.*

It is in February that already we feel the approach of spring. Better weather is ahead, the dark days of winter are receding. In the industrial field, February heralds the narrowing of the dim-out chart, but during the shortest month, however, blinds must be drawn for over 364 hours.

Good lighting is still of the greatest importance in keeping up spirits and keeping down strain and fatigue. Osram can do much to help.

Osram

A GEC PRODUCT

THE WONDERFUL LAMP

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First post on Monday**, at Dorset House, Stamford Street, London, S.E.1.

THE CHARGE for advertisements in this section is 2/- per line (approx. 8 words) per insertion, minimum 2 lines 4/-, or for display advertisements 30/- per inch, with a minimum of one inch. Where the advertisement includes a Box Number there is an additional charge of 6d. for postage of replies.

SITUATIONS WANTED. — Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES TO advertisements published under a Box Number if not to be delivered to any particular firm or individual should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Letters of applicants in such cases cannot be returned to them. The name of an advertiser using a Box Number will not be disclosed. All replies to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. Cheques and Postal Orders should be made payable to ELECTRICAL REVIEW LTD. and crossed.

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES TENDERS, ETC.

SHIPLEY URBAN DISTRICT COUNCIL

Electricity Department

Tenders for Paper Insulated Cables

TENDERS are invited for the supply and delivery of Paper Insulated Cables for twelve months from the 1st of April, 1945.

Tenderers must be the actual manufacturers of cables offered, and specification, conditions and form of tender may be obtained from the undersigned.

Tenders must be received on or before Friday, 2nd March, 1945.

NIGEL L. DUNCAN,
Engineer and Manager.

Electricity Works,
Dockfield, Shipley, Yorkshire.
5th February, 1945. 1409

BOROUGH OF CHESTERFIELD

Electricity Department

TENDERS are invited for the supply and delivery of ONE 500-kVA. 6,600/415-volt Outdoor Transformer. Specification and form of tender may be obtained upon application to W. W. Grimes, A.M.I.Mech.E., A.M.I.E.E., Borough Electrical Engineer and Manager, 172, Chatsworth Road, Chesterfield.

Tenders must be delivered to the undersigned not later than the FIRST day of MARCH, 1945.

RICHARD CLEGG,
Town Clerk.

Town Clerk's Office,
Town Hall, Chesterfield.
6th February, 1945. 1410

SITUATIONS VACANT

None of the vacancies for women advertised in these columns relates to a woman between 18 *and* 41 *unless such woman* (*a*) *has living with her a child of hers under the age of* 14, *or* (*b*) *is registered under the Blind Persons Acts, or* (*c*) *has a Ministry of Labour permit to allow her to obtain employment by individual effort.*

NORWICH EDUCATION COMMITTEE

The Norwich City College and Art School, St. George Street, Norwich
Principal: Frank Briers, D.Phil. (Oxon)

WANTED, Lecturer in Electrical Engineering to teach day and evening students for London External B.Sc. (Eng.) and for Ordinary and Higher National Certificates in Electrical Engineering. Applicants must possess a University Degree or its equivalent, and have had industrial experience. Salary will be in accordance with the Burnham Technical Scale.

Forms of application, which should be returned to the Principal by the 9th March, may be obtained by sending a stamped addressed envelope to the Director of Education, City Hall, Norwich. 1411

MADRAS ELECTRIC TRAMWAYS (1904) LIMITED

31 Kingston Road, Leatherhead, Surrey

APPLICATIONS are invited from candidates for the following appointments:—

OPERATING ENGINEER, preferably with experience in operation and maintenance. Salary, Rupees 1,200 (at present £90) per month.

MAINTENANCE ENGINEER, to have charge of the maintenance of track, overhead and underground equipment and of rolling stock. Salary, Rupees 1,000 (at present £75) per month.

The appointments would be on a three years agreement, free passages to and from Madras would be provided, and the officers would, in addition to salary, receive free quarters or a house allowance in lieu of free quarters, and a cost of living increment. A Staff Provident Fund exists, to which both staff and the company contribute.

Applications, stating age of applicant, whether married or single, and giving particulars of experience, to be sent to the company at the address stated above.

3rd February, 1945. 1407

THE MADRAS ELECTRIC SUPPLY CORPORATION LIMITED

31 Kingston Road, Leatherhead, Surrey

APPLICATIONS are invited from candidates for the following appointments:—

JUNIOR SHIFT ENGINEER, for steam turbine A.C. Generating Station, preferably one trained in a manufacturers' works and with maintenance experience. Salary, Rupees 800 (at present £60) per month.

MAINS ENGINEER, with experience in A.C. and D.C. distribution and in maintenance of H.T. and L.T. Cables. Salary, Rupees 800 (at present £60) per month.

The appointments would be on a three years agreement, free passages to and from Madras would be provided, and the officers would, in addition to salary, receive free quarters or a house allowance in lieu of free quarters, and a cost of living increment. A Staff Provident Fund exists, to which both staff and the company contribute.

Applications, stating age of applicant, whether married or single, and giving particulars of experience, to be sent to the company at the address stated above.

3rd February, 1945. 1408

SLONETRIC HOUSE

REQUIRE the following staff and offer good prospects:

Male Clerical Assistant, with trade experience.
Junior Female or Male Clerk, for general office routine.

SLOAN ELECTRICAL CO. LTD.
Wholesale Electrical Distributors,
Albany Rd.,
Leyton, E.10.
LEY. 5015/6/7.

1396

BOROUGH OF HOVE

Electricity Department

APPLICATIONS are invited for the position of Technical Assistant Engineer.

Applicants must have had a sound technical education and practical experience in the preparation of plans, estimates and specifications in connection with E.H.T. and L.T. Distribution on Single, Three-phase and D.C. networks, operating and maintaining of Substations and Change-over to A.C. supplies.

Preference will be given to candidates holding an Engineering Degree and/or Membership of the Institution of Electrical Engineers.

Salary in accordance with the N.J.B. Schedule. Grade 3, Class F (at present £583 per annum). The appointment will be subject to the provisions of the Local Government Superannuation Act of 1937, and the successful candidate will be required to pass a medical examination.

Applications, stating age, qualifications, whether married or single, with details of scholastic, technical and practical training and experience, positions held, present position, when free to commence duties, accompanied by copies of recent testimonials, must be delivered to the undersigned not later than Monday, February 26th, 1945.

F. SWARBRICK,
Engineer and Manager.

Electricity Department,
Hove Street,
Hove, 3.
9th February, 1945. 1444

BOROUGH OF BEDFORD

Electricity Undertaking

Junior Shift Engineer

APPLICATIONS are invited for the position of Junior Shift Engineer at the Council's Selected Generating Station.

The salary will be in accordance with Grade 9, Class G, of the National Joint Board Schedule (at present £340 per annum).

Applications, stating age, giving particulars of training and experience, together with copies of recent testimonials, should be forwarded to the undersigned, suitably endorsed, not later than Friday, March 2nd, 1945.

P. G. CAMPLING,
Chief Engineer and General Manager.

Electricity Offices,
Prebend Street,
Bedford.
9th February, 1945. 1439

BOROUGH OF BEDFORD

Electricity Undertaking

Shift Charge Engineer

APPLICATIONS are invited for the position of Shift Charge Engineer at the Council's Selected Generating Station.

The salary will be in accordance with Grade 8, Class G, of the National Joint Board Schedule (at present £420 per annum).

Applications, stating age, giving particulars of training and experience, together with copies of recent testimonials, should be forwarded to the undersigned, suitably endorsed, not later than Friday, March 2nd, 1945.

P. G. CAMPLING,
Chief Engineer and General Manager.

Electricity Offices,
Prebend Street, Bedford.
8th February, 1945. 1427

ELECTRICAL Sales Room Manager, or live man to train as such, wanted for Bournemouth. Scope is all domestic appliances, including washing machines, refrigerators, immersion heating, radio, vacuum cleaners, etc., and rebuilt cleaners drawn from our own specialising workshops. Saleable area 50 miles radius. Permanency and progress to man of sales ability, electrical training, and military exemption, with progressive firm. State experience, age, salary required, and enclose photograph if possible to—S. C. Rogers, Electrical Engineer, 552, Wimborne Rd., Winton, Bournemouth. 6766

APPLICATIONS are invited for the post of Technical Assistant to take charge of the Rural Electrification Section of the E.R.A. Applicants should be qualified electrical engineers and must have experience of research work in agriculture and horticulture. Salary £600/£800 p.a. according to qualifications and experience. Applications should be addressed to the Secretary, British Electrical & Allied Industries Research Association, 15, Savoy Street, W.C.2. 142

ASSISTANT Technical Editors. An old-established company publishing and printing a number of books and journals dealing with trade and technical subjects and hobbies has several vacancies for assistant editors, book editors and bookreaders. Applicants should have either good general engineering qualifications with journalistic tendencies or journalistic experience with engineering tendencies. Apply—Box 1406, c/o The Electrical Review.

CHIEF Superintendent (Radar Research). Applications are invited for the post of Chief Superintendent in a Government establishment concerned with the development of Army Radar up to the stage at which equipment is to go to production, with research work connected with Radar, and with the development of certain other special equipments, including searchlights. The Chief Superintendent is technically and administratively responsible for the efficient working of the establishment. Applicants should have good educational qualifications, with a university degree and practical experience in research and design. They should also have experience in the planning and management of research and development and knowledge of the electrical and radio industries. The normal salary will be at the rate of £1,400 per annum, but a higher rate would be considered in the case of an applicant with exceptional qualifications. Applicants should write, quoting D.1082A, to the Ministry of Labour and National Service, Appointments Department, Central (Technical and Scientific) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned on or before 3rd March, 1945. 141

COUNTY Borough of Warrington, Electricity Department: Technical Assistant. Applicants must have had experience of the operation and maintenance of modern selected generating station and of an underground and overhead high and low tension distribution system with modern substation equipment. Some sales development and commercial experience will be an advantage. Preference will be given to corporate members of the I.E.E. Salary in accordance with Class H, Grade 5, of the N.J.B. Schedule, at present £564 p.a. for two years, £573 p.a. for third and fourth years, rising to £584 p.a. after the fourth year. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and a satisfactory medical examination, also to termination by one month's notice on either side. Copies of not more than three testimonials are requested. Canvassing, either directly or indirectly, will disqualify. Applicants should write, quoting D.1085XA, to the Ministry of Labour and National Service, Appointments Dept., Central (T. & S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 28th February, 1945. 142

ELECTRICAL component manufacturers in Scotland require (a) Works Statistician (Ref. No. 243M), with post-graduate course in theory of statistics, to compile production and quality records giving control on sound and statistical basis; (b) Experienced Light Current and Radio Engineer (Ref. No. 13M), to qualify for a supervisory post in test and inspection department; and (c) Time and Motion Study Engineers (Ref. No. 245M), fully trained in Bedaux or similar system. Salary (a) and (b) £6-£8 per week, (c) £7-£8 per week, according to qualifications and experience. Applications, in writing (no interviews), stating date of birth, full details of qualifications and experience (including a list in chronological order of posts held), and quoting appropriate reference number, should be addressed to the Ministry of Labour and National Service, Appointments Office, 5, Rothesay Terrace, Edinburgh, 3. 1420

FIRM of Consulting Engineers dealing with the design and supervision of large power stations at home and abroad require a senior and highly qualified Mechanical Engineer with specialised, up-to-date knowledge of the design and operation of large steam turbines and/or boilers for highly efficient steam cycles, to take charge of the department dealing with the specification and approval of such plant. Age preferably 40 to 45. Salary from £1,500 p.a. according to qualifications. Applicants should write, quoting C.2467XA, to the Ministry of Labour and National Service, Appointments Department, Central (Technical and Scientific) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 26th February, 1945. 1415

ELECTRICAL Wholesalers require Manager. Excellent opportunity. State experience and salary required.—Box 6761, c/o The Electrical Review.

FIRM of Consulting Engineers engaged on the design and supervision of a number of large power stations for the Central Electricity Board's programme have the following vacancies on their staff: A Resident Mechanical Engineer to supervise the installation of boiler, turbine and other plant in a 100,000-kW station now under construction: the salary, which will depend upon qualifications, will not be less than £600 (reference No. C.2468XA). Several Assistant Mechanical Engineers and Assistant Electrical Engineers for their London and Newcastle-upon-Tyne offices with experience in the design, specification and construction of power station plant. The salary, which will depend upon qualifications, will not be less than £500 (reference No. 2469XA). Applicants should write, quoting the appropriate reference number, to the Ministry of Labour and National Service, Appointments Department, Central (Technical and Scientific) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 27th February, 1945. 1436

GENERAL Manager required by small but rapidly progressing Wholesale Electrical Company. This is a splendid opportunity for an experienced young man of managerial ability who desires a position with a great future and who realizes the post war prospects in the electrical trade. Reply to—Box 1442, c/o The Electrical Review.

LEADING Manufacturers of Electrical Machinery in East Anglia offer advancement to keen young engineer in position of Departmental Superintendent (mechanical and electrical). Must be experienced in production of a wide range of industrial and marine electric motors and generators, A.C. and D.C., up to 1,000 h.p., and A.C. commutator motors. Good service and/or application experience desirable. Permanent progressive position. Salary £800-£1,000 p.a. Applicants should write, quoting C.2416XA, to the Ministry of Labour and National Service, Appointments Department, Central (Technical and Scientific) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 28th Feb, 1945. 1412

OVERSEAS (India): Assistant Electrical Engineer for Colliery Power House. Applicants must be fully qualified electrical engineers with good experience of construction, erection and maintenance of generating plant and power house equipment; must also be capable of taking complete charge of steam turbines, generating, power house and transmission equipment during the absence of chief engineer. Duration of engagement, four years. Age, early 30's preferred. Married men are eligible. Salary about £900 p.a., with annual increments of £45 p.a. Free furnished bungalow provided. First-class fares out and home, with six months' leave on two-thirds pay at end of agreement; also one month's local leave per annum. Applicants should write, quoting D.1023XA, to the Ministry of Labour and National Service, Appointments Dept., Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 22nd February, 1945. 1413

REQUIRED, one man as Meter Tester and Repairer. Must be experienced in repair of A.C. and D.C. meters and instruments, able to use potentiometer. Wages approx. £5 per week. Must be fit. Apply to the Manager, Employment Exchange, Aldershot, quoting O/N.873, and state age and full details of experience and present employer. 1428

RESEARCH Engineer required immediately to organise and control laboratory and experimental department of progressive manufacturing company, situated in N.W. London area. The Company is concerned with the production and development of building and engineering specialities of high priority both at present and for post-war requirements. Applicants should have wide experience of mechanical and electrical engineering, knowledge of organic chemistry and metallurgy an advantage. An inventive ability would be an additional asset. Salary from £800 per annum according to qualifications. Applicants should write, quoting C.2462XA, to the Ministry of Labour and National Service, Appointments Dept. Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms which should be returned completed on or before 12th March, 1945. 1437

SALES Manager, with experience of electrical accessories and cables. Must have initiative and ideas. Give full details.—Box 6768, c/o The Electrical Review.

SECRETARY wanted for small firm of Electrical and Mechanical Engineers, situated 15 miles north Charing Cross. Able to take complete charge of office. State particulars, experience and salary required.—Box 6749, c/o The Electrical Review.

SENIOR and Junior Estimators required, cable manufacturers and engineers, London area, good progressive positions. State age, experience and salary required (in confidence).—Box 1418, c/o The Electrical Review.

STORES Clerk required by electrical wholesalers. Good knowledge of electrical material essential. Apply—London Electrical Company, 92, Blackfriars Rd., S.E.1. 25

THE Wholesale Fittings Co. Ltd., 50-52, Commercial St., E.1 (Tel. Bis. 4356) and London branches, wholesale electrical distributors, have vacancies for Storekeepers, Office Staff and Counter Salesmen. Please apply above address, any day between 11 and 1. 1344

SITUATIONS WANTED

ADVERTISER, Chemical Engineer (27), B.Sc., 7 years' experience in electrical industry on technical development and production, desires responsible position with wide scope and good prospects. Special interest plastics and insulation.—Box 6703, c/o The Electrical Review.

ADVERTISER desires change, either immediate or post-war; complete charge of Commercial Inside Sales Organisation. Advertiser is capable of controlling large office, warehouse and despatch departments, and is prepared to take up position in either London or provinces. Replies giving fullest details as to position and salary offered.—Box 6769, c/o The Electrical Review.

A.M.I.E.E. requires post, 12 years mains assistant large municipality, 6 years' cable works experience, 1 year in senior executive post, three years supervising cable-laying contracts, London preferred.—Box 6764, c/o The Electrical Review.

A.M.I.E.E., with sound electrical, mechanical and administrative experience, requires change of position. Work of national importance with prospects of permanency desired. Experience covers installation and maintenance O.H. and underground, E.H.V., H.V. and M.V. distribution, wiring of buildings, medium Diesel and small steam engine driven generating plant, boilers and pumping equipment. Age 32. Home or abroad. Write—Box 6745, c/o The Electrical Review.

B.Sc., age 38, designer of transformers, motors, rheostats, free.—Box 6735, c/o The Electrical Review.

ELECTRICAL Engineer, age 26, having industrial and teaching experience, desires permanent, responsible and progressive position with Midland firm (would consider other area). Advertiser is particularly interested in electronic industrial applications.—Box 6739, c/o The Electrical Review.

ELECTRICAL Engineer, M.I.E.E., age 55, 30 years' experience (27 in Far East), retired from chief executive position with Colonial Government, now in temporary Government war post, seeks post-war employment; would travel.—Box 1342, c/o The Electrical Review.

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TECHNICAL Sales Engineer (50) wishes to represent electrical manufacturer in London and Southern Counties. Connection amongst Government depts., supply authorities and trade.—Box 6765, c/o The Electrical Review.

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All the boilers are fitted with usual mountings of Hopkinsons' make. Nos. 1 and 2 can be viewed under steam. No. 3 has been dismantled, but is available for inspection. All enquiries should be made to the undersigned.

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General Manager and Secretary.

Gas Department,
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1429

WATER TUBE BOILERS IN STOCK

Four	25,000 lbs.	evaporation.	175 lbs. W.P.
Three	20,000 lbs.	,,	175 lbs. ,,
One	15,000 lbs.	,,	175 lbs. ,,
One	12,000 lbs.	,,	175 lbs. ,,
One	12,000 lbs.	,,	200 lbs. ,,
One	12,000 lbs.	,,	160 lbs. ,,
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9th February, 1945.

1446

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GUARANTEED ELECTRICAL

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27

500 cu. ft. ROBEY vertical twin-cylinder, two-stage, water-cooled Air Compressor, 100 lbs. pressure, direct coupled to 100-h.p. BRUCE PEEBLES S.R. Motor, 400 volts, 3-phase, 50 cycles, 360 r.p.m., with starter, complete with auto unloader, intercooler and receiver.

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COMPLETE EQUIPMENTS OR SINGLE UNITS PROVIDED.
GUARANTEED HEAT GENERATORS.

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M.E.C. APPARATUS, DULL EMITTER SYSTEM

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Modern A.C. Geared Motor Units

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7½-kW Steam-driven Generating Set, Ashworth Parker vertical engine coupled to L.D.M. compound wound 230-volt generator, £120.—Stewart Thomson & Sons, Fort Road, Seaforth, Liverpool, 21. 54

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