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Fulham Power Station has come through the ordeal of war, scarred but more powerful than before. Henley Contract Engineers and Henley Cables have played an important part in bringing new plant into operation as well as m restoring raid damage.

Illustrations are typical of HENLEY Oil-filled Cables supplied and installed at Fulham. (Above) 66-kV single-core oil-filled Cables in Cable

tunnel. (Right) Sealing ends with oil reservoir tanks.



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November 16, 1945

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November 16, 1945



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ELECTRICAL REVIEW Managing Editor: Hugh S. Pocock, M.I.E.E. November 16, 1945 Technical Editor : Commercial Editor : C. O. Brettelle, M.I.E.E. J. H. Cosens Contents :--Page Page Editorial. -Supplies from the Grid 691 Recent Introductions . 716 The "Queen Elizabeth " 693 Registration of Contractors. By 696 E. A. Pinto, A.M.I.E.E. 717 London J.E.A. New Grid Tariff 697 Installation Inspection. By S. A. Views on the News 699 Daines, A.M.I.E.E. 718 Still in the R.N.V.R. By Lt.-Cmdr. Scottish Hydro-Electric Projects . 719 E. B. Watton . . . Electricity Supply Co-operative Research 70 F 720

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Vol. CXXXVII. No. 3547. NOVEMBER 16, 1945

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Supplies from the Grid

Effects of the Revised Tariff

The new tariff of the Central Electricity Board (particulars of which are given in this issue), the primary need to secure a revenue adequate to meet all outgoings is covered by the statutory obligation of the Board to balance its budget over a period. This period has been ten years, but wartime extensions of the term in individual areas has given an opportunity to unify area tariffs in the light of experience and of recent developments and the new period is five years.

Altered Conditions

In building up the grid system, the *status quo* provided a convenient basis for operational division into areas, which were self-contained as regards plant and fuel and loads. With the drastic alterations in these relationships due to the war and other causes, amplified by the diminution of effective plant capacity and by colliery reorganisation, sectionalisation became wholly inadequate and the grid was necessarily operated as a single network.

Preliminary acceptance of pre-grid conditions has been modified further in the new tariff by dropping the method of reducing the kW charge according to increments beyond the maximum demand reached in 1932. Whatever promotional value this method originally possessed has now passed into history, especially in view of possible legislation.

The increase in kW charges is less than many feared in view of higher manufacturing costs. They appear to be more favourable to the largest undertakings, but as the latter are selected-station owners, taking supplies for local distribution at what would have been the cost of generation at their individual stations if there had been no grid, the point is possibly an academic one. Nevertheless any step towards bringing assumptions nearer reality is to be welcomed.

Under the grid tariff, undertakings without selected stations enjoy the equivalent of lower generating costs than they would have incurred with independent generation. The consumers they serve are far fewer in the aggregate than those in the areas served by selected-station owners, which normally include a greater industrial component, to which even the smallest reduction in the price of electricity may bring a disproportionately big advantage.

Smaller undertakings with a preponderantly domestic load may benefit materially by the new method of measuring the maximum demand. Between the two half-hours taken at different parts of the year there is likely to be appreciable climatic diversity, which should materially ease the position in regard to charges for cold snaps.

Heavy Running Charge

It is the greatly increased running charge that provides most ground for concern. This, at more than $2\frac{1}{2}$ times the (unadjusted) old figure is now ominously based on the expectation of an average price of 38s. per ton for coal of only 11,000 BThU per lb.—a grim outlook for which the electricity supply industry is not responsible. It is satisfactory, however,

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to have the variation figure on a lowered and unified basis. A special responsibility falls to the C.E.B. of adjudicating between competing claims, so that the benefits of the national grid may be apportioned equitably among different classes of undertaking. In its new grid tariff the Board has provided, within its statutory powers, a framework for the gradual attainment, so far as this may be practicable, of the public wish for a uniform charge for electricity supplied for similar services everywhere.

Wages and Output

LAST week we reported the granting of a temporary increase of 2d. per hour in the wages of men

in the contracting industry. The announcement of this increase was accompanied by a statement to the effect that there had been a falling-off in "output" and that the Electrical Trades Union had undertaken to urge its members to see that the interests of the public were served by an improvement in this respect. "Output" in such a field as this is not easily measured, for conditions differ so much from job to job. There may often be waste of time but the keenest worker may take a long time to do an apparently simple task in which a number of hidden snags have been encountered. Thus " output " must depend mainly on the man himself and from our knowledge of them we should say that electricians, being one of the most enlightened sections of the community, will respond to any appeal to their sense of public duty.

ALTHOUGH there is a Exhibitions spate of local exhibitions of many kinds--planning,

electrical, agricultural, etc.-national shows on the pre-war scale are still part of the post-war plans. We are not forgetting the recent Women's Electrical Exhibition but that, if considered to be national, was somewhat restricted in scope. The very different kind of show arranged by the Gauge & Toolmakers' Association for January will, it is claimed, be the first industrial exhibition of any size staged since the war ended. Next will come the Industrial Design Exhibition in July, to which we referred last week and which should prove a great "draw." But we shall have to wait until 1947 for the next British Industries Fair and, presumably, for the other big shows, e.g., the Radio Exhibition and the Ideal Home Exhibition.

Rural Electricity

FARMERS can fairly claim that they saved this country's life during the war and are entitled to full

consideration now that the war is over. Their rights are stressed in a report published last week by the National Farmers' Union detailing the measures which they deem necessary to the survival and prosperity of British agriculture. This is not the place for a repetition of these details but it should be mentioned that electrification is one of the points included in the report. As we have said, electricity supply authorities are only too anxious to develop the rural areas if they can do it without ruinous loss, but they are entitled to ask that expensive extensions shall not be used merely for lighting purposes. Farmers are often prone to complain at being asked to guarantee a minimum consumption but it is to their interest to employ electricity as widely as possible to secure the muchneeded improvement in efficiency.

ELECTRICAL contractor-Utilities and retailers in this country Appliance Sales who have complained for years of the growing com-

petition from electricity supply authorities in the sale of appliances will be interested to hear that the important Southern California Edison Co. has decided to discontinue the sale of all types of electrical merchandise. The company will "engage in vigorous promotional campaigns for sales through dealers," states a vicepresident of the concern. It intends to provide a corps of experienced men to work with the dealers, to supply suggestions and materials for window displays and to carry out intensive advertising.

APPLAUDING the recent **Relations with** gift by the British Council Argentina of technical textbooks to

the Centro Argentino de Ingenieros, the Review of the River Plate considers this "gesture" to be an excellent piece of work. There is a tendency in the Republic to consider the British to be only business men and capitalists; they are not kept fully acquainted with other aspects of our character. To put it on the lowest plane, much benefit is to be derived from cultural relations for they are likely to foster a sympathetic spirit which will have an ultimate effect upon Anglo-Argentine commerce.

ELECTRICAL REVIEW

November 16, 1945

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Electrical Equipment of the Cunard White Star Liner

THOUGH the 85,000-ton Cunard White Star Liner Queen Elizabeth was completed early in the war, details have only just been made available of her electrical equipment. In general the installation follows very closely that of her sister ship, the Queen Mary, which we described in our issue of May 15th, 1936, but a number of improvements have been incorporated in the light of experience.

With the exception of the turbo-driven feed pumps all the auxiliaries in connection with the propelling machinery are electrically driven. The necessary electrical energy for this purpose and also for the "hotel" services is supplied by four turbo-alternators housed in two auxiliary engine rooms, selfcontained but interconnected. Each of the turbo-generators has a normal rating of 2,200 kW, 225 V, with an overload capacity of 25 per cent. for two hours and 50 per cent. for five minutes. While in certain unusual circumstances it is necessary to run all the machines at the same time, normally one set is kept in reserve. RPM and the speed of the generator 600 RPM. The sets are of the combined turbine and condenser type in which the condenser is integral with the turbine. They operate on steam at 390 lb. per sq. in. gauge pressure, 730 deg. F. total temperature. All the main electric generating plant was manufactured by the British Thomson-Houston Co., Ltd., which was also responsible for a large number of electric motors and control gear, heating elements and lighting equipment. In addition to the main generating plant there are two 75-kW Diesel-driven generating sets situated on one of the upper decks to provide light and power in case of emergency.

The two power stations are similar in arrangement, each supplying both hotel requirements and propulsion auxiliaries. They can work independently or be coupled together to function as one unit. Power is distributed *via* four main feeder boards to fifty auxiliary switchboards and can be so connected as to form several ring mains enabling the port and starboard boards to be fed from either the port or starboard generator



One of the four B.T.H. 2,200-kW geared auxiliary turbo-generators

Each set comprises a 12-stage turbine driving a DC generator through reduction gearing, the speed of the turbine being 4,500 complete ring mains, of $127/0 \cdot 013$ -in. (1 sq. in.) v.i.r. insulated, taped, braided, lead-sheathed, single-wire armoured, 660-V cable, were

room. These auxiliary boards are so disposed that each watertight or fireproof section of the ship has its own board, thus avoiding as far as possible the piercing of bulkheads for the passing of cables from one section to another.

To supply all the needs of the ship about 4,000 miles of wire has been required. Six

supplied by Callender's Cable & Construction Co., Ltd., together with special weather-resisting cable for Turkish bath and bathing pool installations and large quantities of hard cord the remainder to function. These power units are brought into or taken out of action by simply starting up motors, while an instantaneous change can be made from hydraulic to mechanical control.



braided flexible for hand lamps and cargo clusters. Sixty 1-in. cables feed the ring main for hotel services and one hundred and twenty-six feed the ring main for machinery services. To carry the cables W. Barns & Son supplied a large quantity of cable trays and bends, while for testing purposes several "Wee-Megger" testers and "Bridge-Meg" sets made by Evershed & Vignoles, Ltd., were used.

Altogether throughout the ship there are approximately 650 electric motors ranging from $\frac{1}{4}$ to 30 HP and totalling about 20,000

HP. All the deck machinery such as steering gear, windlass, capstans, cargo, baggage, mail and boat winches, etc., are electrically operated. For steering, hydraulically operated rams, two on each side of the rudder stock actuate the rudder itself. Oil is the hydraulic medium and this is forced by three rotary pumps, driven by 250-HP electric motors, into the ram cylinders through hydraulically operated oil valves. Separate pumps supply the oil to the valves, the opening and closing of which determine the direction of flow into the ram cylinders. These pumps are in duplicate and are driven by 4-HP servo

motors. The power units are arranged so that one, two or all three can operate the gear and any one or two can be removed and allow if required. The flow of oil into the valves is under the control of telemotor equipment which can, of course, be operated in conjunction with autogyro-compass matic equipment. The control switchboard was supplied by Brookhirst Switchgear, Ltd. Six electric cargo winches are provided, together with gangway winches, a warping winch, capstans

and windlass. The twenty-six lifeboats can be lowered in a few seconds under the control of one man. Intercommunicating loudspeaking telephones are fitted throughout the ship and among bridge equipment are submarine signalling apparatus, depth record dials showing the direction of rotation of each propeller and the RPM, wireless direction finder, electric telegraphs, electrically operated steam whistles and indicators of fire-detecting, alarm and extinguishing system. Engine room instruments include electrical selective salinometers, CO_2 indicators, pyrometers, and



Laurence, Scott motor-generators for warping capstans

smoke indicators. The workshop is equipped with lathes, drills, grinder, etc., and compressors are provided for boiler cleaning.

With very few exceptions, Laurence, Scott & Electromotors, Ltd., supplied all the electric motors for the engine room and deck auxiliaries. The total horse-power, including that of motor-generator sets for winches, etc., is over 19,000. All the motors are of the company's marine type, with modifications as required to meet the Cunard Company's specifications.

Six "Scott" reducer motor winches incorporate a modified form of Ward-Leonard control giving the most complete speed control and flexibility of operation, suitable for handling valuable cargo and baggage. Motors supplied by the English Electric Co., Ltd., comprise twenty-four of the totally-enclosed, weatherproof marine

type, compound wound, ranging from 9 to $16\frac{1}{2}$ HP.

Control equipments numbering 448 supplied by Allen West & Ltd., include Co., every type of DC starter. Among the more interesting equipments are those for the 250-HP main circulatpumps, 55-HP ing main condensate extraction pumps and 33-HP forced lubrica-

-

tion oil pumps for the main turbines. These are of the contactor type and are assembled in groups on open type panels, mounted in compartments adjoining the engine room. This type of equipment offers many advantages over the usual enclosed unit mounted in the engine room. Being of the open type and installed in its own room it is kept free from dirt and oil, and furthermore, can be conveniently inspected at any time. The space taken up in the engine room is considerably reduced and the small control unit can be mounted close to its pump and motor without affecting the engine room layout.

For the oil fuel pressure pumps of the Wallsend burners in the boiler room it was desired to give very fine speed control in order to provide close variation in oil pressure. These equipments were therefore provided with two field regulators, one acting as a vernier to the main field regulator, giving a total of 375 speeds between the limits of 1,500 to 750 RPM. Enclosed control pillars, both of the hand operated and automatic type, have their interiors hinged so that they may be swung forward for examination or readily removed from the housing if desired. Ammeters (Crompton Parkinson) on a large number of starters are illuminated through a window in the base of the instrument. Pilot lamps are included in all equipments to illuminate the ammeters to show that the motors are running.

The hotel services include the illuminative and decorative lighting, electric heating and cooking, ventilating fans, pumps for hot and cold water services, sanitary services, swimming bath, passenger and goods lifts, refrigerators, dumb waiters, cabin fans, etc. The kitchen equipment consists of electric cookers, fryers, salamanders, mixing machines, coffee grinders, ice-shaving machine, burnishing



Brookhirst control switchboard for the steering gear

machines for ranges and for silver, toasters, waffle irons, griddle plates, dish-washing machines, cutting machines, dough dividing and roll making machines, ice-cream machine, knife-cleaning machines, etc.

About 30,000 electric lamps are in use throughout the ship, other electrical equipment including clocks, steward call system, cinema equipment, intercommunicating telephones, ship-to-shore telephone system, tel-autograph system of communication, automatic manual fire alarm and radio equipment.

To operate the stateroom call bells and indicators, loud-speaking and intercommunication telephones, submerged log, fire alarm bells, electric clocks, etc., a 25-V supply is provided by means of motor-generators arranged in duplicate. Should the motorgenerators fail, a "Nife-Neverfayle" equipment is automatically brought into operation, consisting of a control panel and two batteries, each of nineteen nickel cadmium cells" of 120 Ah.

In conjunction with the fan ventilating

system several Metropolitan-Vickers motors were supplied, ranging from $\frac{1}{2}$ to 19 HP, of totally enclosed, weathertight, drip-proof, hose-proof and vertical types. In general they are continuously rated for 72 deg. F.,



I9-HP hose-proof Metrovick motor for the fan ventilating system

and have shunt series stability field windings, the speed variation being obtained by altering the shunt field current. Special attention has been paid to the design of the motors to ensure silent operation.

Management in Industry

I.E.E. Informal Discussion

THE question debated at last month's informal meeting of the Institution of Electrical Engineers was the desirability, or otherwise, of engineering concerns being managed.by engineers.

DR. P. DUNSHEATH, president, initiated the discussion with the allegation that the weakest factor in British industry to-day was its administrative side. He asked the meeting to consider whether the management of engineering firms as a whole had attained to anything like the efficiency exhibited on the scientific and technical sides. An indictment of management was to be found in the complete lack of that something which might be described as loyalty to the firm and that spirit of enthusiasm which would override everyday difficulties. While the fetish of scientific management with the aid of the stop-watch and motion study had been carried a very long way, there had been neglect of human psychology, which was the more vital aspect.

There was strong evidence that the time had arrived for a return to that state of closer human contact between manager and managed which was such a feature of industry half a century ago. Gontrol of industries, or direction of production, by finance was strongly deplored. A dangerous assumption existed in certain circles that industrial administration was an activity that could be conducted *in vacuo* by an individual who was otherwise completely ignorant of the particular industry he was to administer.

Twenty speakers took part in the general discussion, the trend of which was that an engineering training was a good background for men possessing managerial ambitions, although it was said that successful managers were born, not made. A plea was entered for devotion of more attention to management aspects in educational training courses. The president, in summing up, remarked that it seemed clear that the whole question was linked up with education.

London J.E.A.

New Administration Arrangements

UPON the forthcoming retirement of the clerk and solicitor (Mr. Leslie Gordon) and the chief engineer (Mr. F. W. Purse) the London & Home Counties Joint Electricity Authority proposes to appoint the following officers:—(a) a general manager and chief engineer; (b) a clerk and finance officer; and (c) a solicitor. It is proposed that upon his retirement Mr. Gordon shall be retained in a consultative capacity "during the pleasure of the Authority" and that the new general manager and chief engineer shall be permitted (if he so desires) to obtain advice and assistance from Mr. Purse on a consultative basis and on payment of a fee to be agreed.

The chief engineer has expressed the opinion that the following vacancies in the Authority's senior staff should be filled:—Two senior assistants, designated as area officers, responsible to the chief engineer for the work of the mains and consumers' departments respectively throughout all the districts; district officers for Twickenham, Surbiton and Sutton; and a purchasing officer.

Supply of Appliances

The General Purposes Committee has received a report upon the great difficulty experienced by the Authority in obtaining supplies of electrical apparatus for sale and hire to consumers and in maintaining appliances now on hire. The prices of appliances which the Authority has been able to obtain show a substantial increase above the pre-war prices and up to the recent decision to remove it from a range of domestic appliances the cost has been further raised by purchase tax. Replacement and labour costs in respect of apparatus on hire are also much higher. Notwithstanding these difficulties, an increasing number of inquiries are being received from consumers who desire to purchase or hire apparatus which in the circumstances the Authority is unable to satisfy. The Committee has given instructions for the position to be carefully watched and a further report on the matter is to be submitted in due course.

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New Grid Tariff

Arrangements to Operate from January 1st

ELECTRICITY supplied by the Central Electricity Board under Section 11 of the Electricity (Supply) Act, 1926, will be charged for under a new tariff which is to operate for five years from January 1st next in all areas except North-East England in which the current ten-year period expires at the end of 1947.

The tariff has been discussed between the Board and associations representative of the supply industry and has met with general approval from these bodies (as distinct from individuals).

The tariff comprises three parts. The first, an annual service charge for each point of supply in addition to the primary one, will be based on the available capacity of the transmission lines affected, the capital expended by the Board, the nature and extent of the supply and any special circumstances. The second part is an annual maximum demand charge for each point of supply of £4 for each of the first 2,000 kW, £3 16s. for each of the next 3,000 kW, £3 12s. for each of the next 3,000 kW and £3 8s. for each kW in excess of 8,000. A running charge of 0.44d. per kWh forms the third part of the tariff.

Measurement of Maximum Demand

Maximum demand is to be taken as the sum of the largest number of kWh supplied during any half-hour in the first three months and the last three months of a calendar year. Where however the Board's supply supplements a supply generated wholly or partly at a station not controlled by the Board or taken in bulk from another undertaking, the maximum demand may be reckoned as two-thirds of the kW for which notice has been given by an undertaking under (2) relating to notice of supply stated below if this amount is greater than the maximum demand as previously defined.

The fixed kW charge is subject to an increase of 5s. 3d. for each $0 \cdot 1$ or *pro rata* variation in power factor below 0.85. It is also subject to increase or decrease by 1s. 7d. for each 1s. or *pro rata* by which the local rates per kW installed at all selected stations average more or less than 4s. 3d.

The running charge will be adjusted at the end of each year in accordance with the price and heat value of the fuel consumed at all the selected stations in the area of the scheme in which the supply is taken. The total cost of the fuel will be divided by the total tonnage consumed, the result being multiplied by 11,000 and divided by the average gross thermal value in B.Th.U. per lb. as fired. If the sum so obtained varies from 38s. per ton, the running charge will be correspondingly varied by 0 0007d. for each 1d. difference, $\frac{1}{2}$ d. or more being treated as 1d.

The running charge has been newly calculated from fundamental characteristics in order to take into account the effects of the efficiency and methods of operation of some $4 \cdot 5$ million kW of generating plant to be installed within the next few years. Fuel adjustment is treated exceptionally in that it is still to be worked out independently for each grid area. From the accompanying table it appears that regional differences between average coal prices are as much as

COMPARISON OF RUNNING CHARGES UNDER OLD

AND NEW TARIFFS				
Area	Price of Coal 1945 s. d.	BThU per lb.	Present kWh charge d.	New kWh charge d.
Scotland M.E. Eng. S.E. Eng. N.W. Eng. C. Eng. S.W. Eng.	42 9 39 11 51 0 46 0 38 6 44 9	11,000 11,500 11,500 11,600 10,000 12,700	0.5510 0.5090 0.5460 0.5348 0.5140 0.5154	0.4799 0.4414 0.5303 0.4869 0.4764 0.4463

12s. 6d. per ton. Any attempt to unify them would upset the local balance between public and private supply economics. The table shows that the basic price of 38s. per ton (the average figure in 1944) is much more in the current year. It also shows that in all areas the running charges under the new tariff would be less than those prevailing.

Among the general conditions for the supply of electricity at the grid tariff is one stipulating that an undertaking when making application for a supply shall state the maximum demand expected in each of the first five years, and shall every January advise the Board of (1) the maximum number of kW required during six months from April 1st and (2) during three months from October 1st of the same year and (3) during six months from October 1st of the following year. The demand at any time of the year shall not be more than 20 per cent. above that in (2).

Supply will be delivered at any point where

service apparatus of the Board is installed and at any voltage available at its terminals or elsewhere or at any other voltage provided the outlay thereby incurred by the Board in providing main transmission lines is not unreasonable. Alternatively the supply will, if the undertaking so requires, be delivered at any other point and voltage subject to an extra annual payment and other terms authorised by the Electricity Commissioners.

Transformers included in the service apparatus will be provided with taps to enable the undertaking first supplied from it to change the voltage within agreed limits. Taps on transformers of not less than 2,000 kVA will permit of on-load operation.

Comparison with Present Tariff

As compared with existing arrangements, there will be from the beginning of next year one grid tariff only, instead of individual tariffs in each of the seven areas of the Central Electricity Board, apart from the exception mentioned. As before it is a three-point tariff with an identical service charge procedure, but the kW charge is differently assessed and the running charge is based on present-day coal prices. A straight maximum demand charge, reduced from £4 per kW in three stages for the first 8,000 kW is substituted for one in which reductions from £3 10s. (usually) to £2 15s. per kW are based on increments on the demand in 1932.

In arriving at the maximum demand, the previous method of multiplying by two the highest meter reading during the first or last two months of any year is replaced by one in which the highest of the half-yearly readings during the first and the last three months are added together.

Increase of kW charge for power factros below 0.85 follows the old rule, but the amount is 5s. 3d. instead of 4s. 6d. The effect of the power factor charge has been deterrent only; its provisions have never had to be enforced. In regard to rates, the new basis of 4s. 3d. compares with 3s. to 6s. 8d. in the different areas, while the 1s. 7d. variation of charge per 1s. deviation from the basis takes the place of 1s. 10d. to 2s.

In the existing area tariffs, running charges range between 0.185d. and 0.24d. per kWh with basic costs of fuel from 12s. to 16s. per ton, B.Th.U. per lb. from 10,000 to 12,700 and variations of charge per 1d. above or below the basic cost of from 0.0008d. to 0.001d. The new running charge of 0.44d. is based upon coal of 11,000 B.Th.U. per lb at 38s. per ton with 0=0007d. per 1d. variation either way and adjustments for calorific value.

Taken in conjunction with the kW charges, the overall saving to undertakings as a whole should be about $2\frac{1}{2}$ per cent., the only area not benefiting being S.E. England. The kW charges have to take into account the gradual coming into service of the new plant at prices some 80 per cent. above pre-war level, although lower money rates may offset the effect of this to some extent. The concession in regard to the half-hour maximum demand periods at different times of the year means that of the 10s. 6d. by which the average kW charge under the new tariff, £3 12s. 9d. per kW, exceeds that under the existing tariff, £3 2s. 3d., the amount due to averaging the demand in this way is 4s. 1d.

Electrical Brains Trust

A GATHERING of about 150 members of the I.E.E. London Students' Section attended the "Brains Trust" meeting on November 6th, when six prominent members of the Institution gave entertaining and instructive replies to the several questions propounded to them by the question master, Mr. Shorland, the Section chairman.

The first three questions concerned the suitability of engineers to manage engineering concerns, the future of street tramways and the economic possibility of high-voltage DC transmission of power. The suggestion that it might be wiser not to recommence television services with pre-war transmission standards brought forth a strong case to the contrary which seemed to satisfy all present. To an inquirer wishing to know whether there was any connection between telepathy and radio was returned the statement that though both were forms of radiation, different types of receivers were required.

A question on the possibility of obtaining useful electrical energy directly from "atom power " instead of obtaining it via a heat engine received a non-committal reply, suggesting atomic boilers to be the first possibility. A request for information on the best training for a potential electrical engineer brought forth a reminder that a good engineer has a mechanical sense as well as technical knowledge, and that the former is best acquired through practical experience. "Sight and sound can already be transmitted electrically, could smell also?" was the last question. Whilst provoking amusing comments on the doubtful entertainment value of such transmissions, no clear answer to the question was given.

A vote of thanks was accorded to the Trust (Mr. W. N. C. Clinch, Sir Arthur P. M. Fleming, Mr. A. J. Gill, Mr. S. E. Goodall, Mr. J. Hacking and Mr. B. N. Maclarty). Ņ

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Views on the News

Reflections on Current Topics

T a recent meeting of the Torquay A Electricity Committee a councillor alleged that the Electricity Commissioners made it a condition of sanction to loans for electric cookers that they should be sold to consumers, not hired. Upon seeing the report, I had a word with the Commission and found, as I expected, that no stipulation of this sort is made. Electricity undertakings themselves have been doubtful about instituting or restoring hire schemes on account of the purchase tax burden, considering it sounder finance to pass the burden directly to the consumer by employing hire-purchase methods. Now that purchase tax has been removed from cookers they will no doubt reconsider the position and go ahead with hire schemes where they are demanded by the public or forced on them by competing gas suppliers.

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One of the few reliefs that the end of the war brought with it was the abolition of " black-out " and the restoration of street lighting. It is extremely regrettable therefore that the fuel and plant situation should have been such as to preclude the full public enjoyment of this relief. The streets are only half lighted; no illuminated signs are to be seen (although this may not be an unqualified evil); and, above all, the shop windows remain in darkness. Even the approach of Christmas cannot soften the iron determination of the Minister of Fuel and Power to allow nothing in the way of display or decorative lighting; he told a questioner in the House of Commons last week that there could be no relaxation of the restrictions on shop-window lighting during the Christmas shopping period. As things are it seems as though we shall have to await the harnessing of atomic energy to give us back our lights.

Sir George Nelson, chairman of the English Electric Co., Ltd., expressed grave concern regarding the labour situation when I met him a few days ago. In common with electrical manufacturers generally, his company has the factory accommodation, the plant, the materials (with a few exceptions) and the orders, but only a small proportion of the workers, especially skilled workers, needed to produce its peacetime manufactures. The position at the company's Rugby factory, where turbines and similar large plant are made is particularly bad, only just over half of the labour required being available, and permission to "import" redundant foundry-men from Glasgow has been refused.

Sir George emphasises the Government's responsibility for dealing promptly with this urgent matter. In response to its demands for stimulating the export market, the company has accepted very substantial orders from overseas, but without necessary labour it will be quite unable to uphold its reputation for prompt delivery. The fact that the labour situation is likely to show a marked improvement within the next six months or so does not appreciably alter the position. The labour is wanted *now* and unless it is forthcoming this country's export trade is going to be irreparably damaged.

Mr. De la Bere, the member for Evesham, is a persistent questioner in the House of Commons on the subject of electricity in country districts but I suspect that he is not fully aware of all that has been done in this direction. Last week after being told by Mr. Shinwell that the questions of charges for installations on farms and longterm guarantees were being considered in connection with the general reorganisation of the electricity supply industry, he asked :--"Is the Minister aware that these matters are being considered year after year and that the rural areas never get anything done about electricity?" I am sorry to see that instead of putting Mr. De la Bere right on this point Mr. Shinwell merely said that he was aware that there had been delay but he was going to see that the matter was dealt with very shortly.

With none of the reticence shown in this country regarding their future plans, American domestic electrical appliance manufacturers are already giving full details of their new products, even though it will probably be some time yet before models are likely to be available in any quantity. Perhaps the most striking development noticeable is that the incorporation of a quick freezing compartment is now almost a standard feature of every make of refrigerator. Another innovation in connection with frozen foods is the dipping of the food before freezing into a molten thermoplastic material, which when solid has distinct advantages over waxed paper or "Cellophane." Quite a few dish-washing machines are now listed, one of them being also usable as a clothes-washer, a potato peeler, a churn and an ice-cream freezer. Care in streamlining and avoidance of dust-traps is apparent in all apparatus, and temperature control is provided on an ever-increasing range of appliances, including toasters.-REFLECTOR.

NEW BOOKS

Radio Receiver Manual. Domestic Electricity.

Electricity Substations. By T. H. Carr. 56 pages; 35 figs. Published by the Draughtsman Publishing Co., Ltd., 965, George's Square, S.W.1. 2s. net.

This little book by the electrical engineer and manager of the Bradford Corporation Electricity Department might be regarded as, in some respects, a companion to his work on "Power Stations." Its approach to its subject is elementary, but it covers a wide enough range to be of service to senior members of the transmission and distribution staffs of electricity supply undertakings. Illustrating its practical outlook the numerous diagrams are dimensioned where appropriate. In addition to the strictly technical features, mainly relating to public supply systems—there are notes on statutory requirements in connection with substations in factories, coal mines and cinemas and on the choice and acquisition of sites.—C.O.B.

Radio Receiver Design—Part 2. By K. R. Sturley, Ph.D., B.Sc., M.I.E.E. Pp. 480; illus. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price, 28s.

The first part of this treatise on the design of radio receivers was published in January, 1943; it dealt with the receiver up to and including the detector stage, and covered aerials, R.F. amplification, frequency changing, superheterodyne oscillators, I.F. amplification and detection. The second part, just published, continues from that point and deals with audio-frequency amplifiers, the power output stage, power supplies, automatic gain control, push-button, remote and automatic tuning, and the measurement of receiver performance. In addition, it includes lengthy sections on frequency modulated reception and television reception.

The treatment of the subject matter in Part 2 naturally follows the same lines as that of Part 1. It is mathematical (though not beyond the powers of understanding of the average student), the mathematics being introduced mainly with a view to the calculation of correct or permissible values of the electrical characteristics of the various circuits In other words, the student (and designer) is shown how to derive the values of the components, etc., needed in practical receiver design.

The chapter on frequency modulated reception, a system not yet used for broadcasting in this country, but already in use in America, follows closely the lines of a monograph on the same subject by the author, and contains adequate information for the design of a complete receiver. The television section occupies over 100 pages, and deals, of course, with the pre-war B.B.C. system, which will be resumed shortly. This section covers all the main features of television reception, but it is felt that at a later date a separate treatise on television receiver design by the author would be welcomed. The present treatise is authoritative (the author, previously associated with the Marconi School of Wireless Communication, is now head of the Engineering Training Department of the B.B.C.) and it is extremely comprehensive in its scope.—W.E.M.

Electricity in the House. By J. E. Macfarlane, B.Sc. (Eng.). M.I.E.E., A.M.I.Mech.E., A.M.I.I.A. Pp. 203; figs. 152; plates 8. English University Press, Ltd., St. Hugh's School, Beckley, Kent. Price 3s. 6d. As one of the "Teach Yourself Building

As one of the "Teach Yourself Building Series," this book has as its primary object the instruction of those wishing to acquire information regarding building practice. The method of treatment of the subject, however, renders the work suitable for much wider circulation and anyone who wishes for an introduction to modern domestic electrical installations and apparatus will find much to interest him. The style is such as to impart information in its most easily assimilated form.

The book is not intended to take the place of text-books or recognised courses of study at technical colleges. Theory has been kept to the minimum and the ten chapters cover electricity as a utility, conductors and insulators, main switches and fuses, flexible leads, accessories and fittings, domestic lighting, space heating, the layout of the installation, transformers and accumulators. Excellent photographs and diagrams greatly clarify the descriptive matter.—W.R.C.

Post-war Britain : A Blue-print for Our National Life. Edited by Sir James Marchant. Pp. 240; illus. Eyre & Spottiswoode (Publishers), Ltd., 15, Bedford Street, Strand, W.C.2. Price 12s. 6d.

A 25-page article on "The Future Development of Electrification," by Capt. J. M. Donaldson forms one of eleven contributions from leading authorities on the most probable developments in the main spheres of national activity. Capt. Donaldson deals concisely with generation, transmission and distribution, as well as the principal uses to which electricity is put, namely lighting, traction, heating, kitchen and telecommunications. Lord Woolton has written an introduction to the work, other contributors including Lord Horder (health), Sir John Orr (food), Sir Ernest Simon (home building), Dr. A. W. Ashby (agriculture), Dr. E. F. Armstrong (chemistry), E. G. Cousens (plastics), Dr. A. Parker (coal), Dr. C. H. Desch (iron and steel), Sir William V. Wood (railway and allied transport) and Sir Edward V. Appleton (organisation of scientific research).--W.R.C.

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Maintenance under Difficulties

N a previous article* I gave some idea of what it was like, in the early days of the war, to build up, from nothing, an organisation for dealing with electrical maintenance of minesweeping trawlers. I ended with a reference to my quieter life at a larger base. That was not to last, however, as My Lords of the Admiralty soon sent me several thousands of miles to do it all over again.

There I find myself in a kind of Butlin's holiday camp—though lacking in all its amenities and largely built of palm-leaf matting. Water comes in two four-gallon petrol cans carried by an obliging black

gentleman (sanitation is by means of the same gentleman going in the opposite direction).

On one side of the camp are vast quantities of sea; on the other, sand and scrub. There is a railway (one train per day), but the road ceases one mile out of the camp. To give some idea of the distances involved, imagine the camp located at Eastbourne. The nearest main road begins at London; the nearest large town, by rail, is at Aberdeen and, by sea, at Amsterdam. The temperature falls in the evening, around Christmas time, to that experienced in England at midday in August. The atmosphere is moist and salt-laden-a steel rule will rust overnight. It rains twice a year (February and October) for a month at a time.

Off-shore lie a number of minesweepers, American-built, which are full of the most complicated electrical gadgets that are miracles of ingenuity, but using commercialtype motors which are not intended for this climate and apparently designed so as not to be repaired. The ships are full of defects. Facilities? There's a bench in the carpenter's shop and several screwdrivers, a hand grinder, pliers and stacks of insulating tape. On the other hand such things as sheet brass, bakelite, brass nuts, cable and winding wire are unobtainable.

To make bricks without straw is one thing: to make them without clay and with both hands tied behind one is another. It was obvious, however, that something had to be done—and quickly.

· Electrical Review, Nov. 5th, 1943.

The first item was stores—raw materials, tools, and the like, and the methods used in acquiring these are what are known in service circles as "organising" and in Civvy Street in harsher terms. However, raw materials were "organised" somehow, and a few power tools (drills, etc.) were borrowed from the ships themselves. The next snag was a power supply, which was refused on the grounds that the power station was already overloaded.

This power station, incidentally, was a native-run concern situated outside the camp. It contained three aged and bronchial Diesel

By Electrical Lieut.-Commander E. B. Watton, R.N.V.R.

sets, of varying capacities (or incapacities) no two of which would run in parallel owing to

governor trouble. The method of control was simple. The camp was allowed a total of 100 A. If the load exceeded this, a dusky mechanic twiddled the field regulator (or throttle) until the current returned to the set figure, the result being that the nominal 230 V was, at peak load, in the neighbourhood of 160. During the day, however, it was possible to obtain 190 or 200 V on special occasions.

Being now completely steeped in crime, the small matter of a private tapping to the overhead line gave me no twinge of conscience, and the current which a pair of 3/029 in. v.i.r. leads was made to carry would horrify the I.E.E. Wiring Regulations Committee. As all the tools I had managed to borrow were wound for 110 V, the "diversion" of some motors from their legitimate use to form motor-generator sets, became necessary and a set was often started up to heat a soldering iron.

Sad experience has taught me that wherever salt water and electrical apparatus are within a mile of each other, a drying oven is a primary necessity. Ours consisted of a large steel tool chest, standing on end. Hot dry air was supplied by means of a small blower, which I had found, and a "preheating chamber" consisting of an old petrol can bolted to the chest, having a Gargantuan blow-lamp playing on it. Some idea of the shortage of materials may be gathered from the fact that the "exhaust trunking" was constructed of Woodbine tins soldered together. Temperature control was simple. Every three minutes someone looked at the thermometer. If the temperature was rising, they pulled the blow-lamp further away; if falling, they slowed down the blower by means of a tram-car controller many times its own size, which was originally intended as a spare for an anchor windlass, but had been carelessly left lying around.

The net result of this conglomeration was exceedingly striking (Heath Robinson fashion) and I was mortified to find that everyone referred to it as "Watton's Folly." My only defence was the French saying *Ilest brutale—mais il marche*, and no one could deny that it was a great advance on the previous practice of putting things out in the sun.

A vacuum impregnating plant was at one time in course of construction. The vacuum chamber (old lorry silencer), boiler (oil drum), etc., had all been completed, together with a real vacuum pump originally supplied by a beneficent Admiralty for the upkeep of Sperry gyros. The project was, however, reluctantly abandoned (we had to use the copper piping for refrigerator repairs) but we obtained good results by plain dip-andbake.

A Stroke of Luck

Materials and tools now being available, the man-power situation was examined. Most of my wiremen were wiring experts with little or no repair-shop experience. I had, therefore, to spend most of my time in the workshop as a kind of working foreman. but I had one or two strokes of luck. While armature winding is a highly skilled occupation, repairing small armatures is a trade within a trade. One day, a ship's wireman reported to me to be examined for leading hand. Asking him the usual stock question, "What did you do in Civvy Street?" I was amazed to hear him say, " I wound armatures, sir." My eyes must have popped out of my head, for he hastily added, " Only little 'uns, though." So I stole him too.

Our first rewind, a $\frac{1}{4}$ -HP refrigerator motor, took five weeks. First, the commutator was down between segments. Scraping and puttying proving useless, a rebuild was tried. It was of typical American design, the cones being held together on a piece of copper tube with punched-over ends, which had to be completely wrecked in dismantling. A new bush, of conventional design with flange and nut, turned out to be too long to allow the motor end-shields to bed down. Also the usual "mush" winding of enamel wire had obviously been wound in an automatic machine, and three separate attempts to get hand-wound d.s.c. turns in the same space had to be made. Still it worked somehow, at last.

Orthodox maintenance men would be astonished by some of the "impossible" or "uneconomic" jobs which have cropped up. I have found only five things which cannot be repaired. These are: lamp bulbs; vitreous enamelled resistance tubes; cheap rotary snap switches; metal-sheathed heating elements of the "Torribar" type; and thermostatic overloads which have experienced (but not survived) heavy short-circuits.

" Uneconomic " many repairs undoubtedly are, but if replacement parts are six months away, economics does not enter into it. The classic case was an enclosed spiral heater for a galley range. The element had space for a spiral wound of 21 s.w.g. wire and the only wire available was 19 s.w.g. It was decided to draw the wire down. I made the dies myself, out of bits of softened file. The holes were bored with dental drills cadged from the Surgeon-Lieut. (D), and coned and polished with gramophone needles and grinding paste. It took ten days to produce an unbroken length, and I am convinced that, under commercial conditions, it would have cost as much as solid gold wire. But it did its job, and the crew got hot food once again.

Sometimes I look longingly back at conditions in England where, if no spare is available, there are well-equipped dockyards or commercial firms to "carry the can" for me, and where I have not been faced with problems like the repair of an oil-burner ignition transformer, needing twelve thousand turns of 48 s.w.g. enamelled wire to be wound by hand—knowing that somehow it *must* be done. At other times I find it rather fun. But I could do without the additional handicaps of temperature, humidity and clouds of sand.

Caithness Water Power Survey

SURVEY of the water resources of the Caithness area is being carried out on behalf of the North of Scotland Hydro-Electric Board. The engineers are Sir Alexander Gibb & Partners. The preparation of a scheme of hydro-electric development in Caithness is complicated, the Board points out, because it is a low rainfall area, and most of the land is of comparatively low elevation.

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CORRESPONDENCE

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

Motor Protection

THE letter from Messrs. Shipton & Shreeve in your issue of November 2nd raises two interesting points. Many large modern motors are designed to carry a maximum of 10 per cent. overload for short periods only and relays protecting such motors would therefore be set to trip at less than 115 per cent. If the margin of operation of the relay is 10 per cent. it may not trip even when the continuous load is as high as 120 per cent, which would cause the motor to burn out or seriously damage the insulation. Under such conditions a relay affords no protection whatever, and what is worse, gives a false sense of security. It would appear to be advisable for the margin allowed in the B.S. to be reduced to closer limits, which it is suggested might be 3 per cent. above or below the setting, to bring the specification more into accord with modern practice.

The second point concerns delta-wound stators. The writer has been informed by one good authority that the use of delta windings is "an old Spanish custom," and by another, that it enables a smaller frame to be used for a given HP and speed. Which, if either, is correct?

P. & B. ENGINEERING CO., LTD. Mitcham. E. F. EVENDEN, Director.

Meter Testers' Status

THE Electricity Supply (Meters) Act, 1936, was enacted to ensure the highest possible degree of accuracy in the metering of consumers' current and it made provision for Class A meter testing stations to be equipped to maintain a standard of accuracy second only to that of the National Physical Laboratory.

The men who have operated these testing stations and have made this Act a working reality are:--(i) Meter testers (Class 1) who are of necessity educated up to Higher National Certificate standard; and meter testers (Class 2) who are usually highlyskilled men who have undergone specialised training with meter manufacturers and have nearly always some technical education.

Now the N.J.I.C. has thought fit to grade

these men who have worked without official recognition or rate for the past nine years. Their rate is to be considerably less than that of electrical wiremen and fitters (Class 1); and $\frac{1}{2}d$, an hour more than indoor labourers (Class 2).

" METER TESTER (CLASS 1)."

Release from the Forces

WOUR leader in November 9th issue is to the point and I also endorse the remarks of Mr. Thomas and "War Weary." I have received a number of letters from high-class manufacturers who complain bitterly about the continued shortage of skilled staff and key men, and there is no doubt that the situation has reached a serious point. Small contractors have been engaged on work of equal importance to that of their bigger brothers but have not received the slightest help from the Government; indeed, many of these contractors have been pushed out of business.

Regarding "Class B" your question is pertinent—"Is it impossible to exercise some sort of intelligent discrimination in this direction"? My answer to that is: No: if the "powers that be" scrap red tape and substitute common sense, but possibly the absence of the latter necessitates the former.

Glasgow.

ALEX. MILNE.

SLIGHTLY amended, the well-known passage in "Henry V" appears to be very apt at the present time from the employers' standpoint, particularly electrical contractors:—

"Oh that we now had here but one ten thousand of those men in the forces now abed that do no work to-day."

Leighton Buzzard. R. J. GRIFFIN, Managing Director, Griffin Bros. Electrical, Ltd.

Maximum Demand Control

AXIMUM demand is usually taken as twice the greatest number of kWh provided during any half-hour throughout a month or year and a consumer who is in a position to have some portion of his load taken off or reduced for a few minutes each half-hour, is of great value to supply authorities. An example of this type of load is provided by electric resistance or induction furnaces.

My first experience of this method of reducing demand was in 1930. The supply authority was using a meter fitted with a kVA-demand indicator suitable for 30-min. periods, while the consumer also had installed a similar meter with kVA-demand attachment, but incorporating also a pair of adjustable signal alarm contacts.

It was found, by experiment, that the load could be reduced by 400 kVA for about 8 min. in each half-hour. By setting the alarm contact device to operate when the demand recorded 880 kVA, which it would do in $22 \cdot 0$ min. and then dropping off furnaces, the demand, which if uncontrolled would have been in the region of 1,200 kVA, was reduced to just over 1,093 kVA.

On the operation of the pre-set alarm contacts the load by various means was reduced by 400 kVA to 800 kVA, which load, during the final $8 \cdot 0$ min. of the halfhour, would cause the demand indicator to push on a further 213 kVA, bringing the final reading at the end of the period to 1,093 kVA.

The consumer under mention has had during the war a demand of between 8,000

and 9,000 kVA, which if it had not been controlled, would have been in the region of 11,000 kVA, so that there was a saving of nearly 18 per cent. on demand charges, coupled with a slight reduction of kWh charge.

A firm of meter manufacturers had commenced, before the war, to fit the signal alarm contact device by request to their power meters before delivery from the works, at a small extra charge. By agreement with the local supply authority, use could be made of this by the consumer, thereby obviating the necessity of a separate instrument for the purpose, the total cost being the number of bells or other forms of alarm plus the small installation charge.

An instrument is now available in which the whole of the operations are automatically carried out on a progressive basis, maintaining the load to a pre-determined curve with resultant improved load factor, and also doing away with the immediate dropping of a large block of load at one period. The saving by the installation of such an instrument would soon repay the initial capital outlay. The use by smaller consumers where possible of the before-mentioned methods would also be advantageous in many cases. Broadway, Worcs. H. J. KNIGHT.

Norway's Electricity Requirements

LTHOUGH Norway has the largest hydroelectric power resources in Europe—about 10,000,000 kW of which about 2,000,000 kW is exploited—it is calculated that conditions warrant at least a 50 per cent. increase in electricity output if the present shortage is to be overcome.

Between April, 1940, and May, 1945, twenty new hydro-electric plants were put into operation, generating 25,000 kW, while the capacity of twenty of the older plants was increased by an additional 150,000 kW. A further four new plants, producing altogether 200,000 kW, are nearing completion, and extensions at four others which will soon be finished will provide an additional 100,000 kW. The total capacity will then have increased by almost 500,000 kW (25 per cent.) on the pre-war figure.

For industrial use, Norway imported before the war about 1,000,000 tons of coal annually, and about 700,000 tons of coke and cinders for domestic heating. To replace these fuels by electricity would require nearly 2,000,000 kW, almost as much as is used to-day. Norwegian industry is developing, and new industries will need more electricity. Electricity is also needed for districts not previously supplied, and for purposes to which it has not previously been applied.

During the five and a half years of war, the Norwegian State Railways used electricity to the value of about 13,000,000 kr. on the 700 km. of electrified railroad, while it would have cost almost 58,000,000 kr. to maintain the same traffic with coal. This saving of 45,000,000 kr. corresponds to what it cost to electrify the 700 km. of railroad. On October 30th, the Director-General of the Norwegian State Railways stated that only electric locomotives would be built in future.

As regards new industries, there is general agreement in Norway that a large iron and steel plant is needed to meet the whole of the domestic demand for iron and steel rolling mill products. This would need about 200,000 kW a year.

There are still at least 500,000 people in Norway living in districts not supplied with electricity. It is likely that the Government will finance distribution schemes in these areas, where commercially it has not been profitable to supply electricity in the past. In fact, during the war the Norwegian State has contributed 22,000,000 kr. to the cost of hydro-electric plants for such areas, or almost 50 per cent. D'ER Fnd

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ELECTRICAL REVIEW

Victory Ball

E.I.B.A.'s First Post-war Function

OVER six hundred people got together last Friday at Grosvenor House, Park Lane, W., for the Victory Ball of the Electrical Industries Benevolent Association. Many more

Then Mr. J. N. Stephens, the president, made a few remarks in the course of which he mentioned the work of his immediate predecessors Messrs, P. V. Hunter and E. E. Hoadley and

tickets could have been sold if greater accommodation had been available. In spite of the rather limited space, however, all those present thoroughly enjoyed the event.

Music was provided by Jack Payne's band and there was a cabaret show in which Jack Train, Margaret Eaves and Michael Howard were the artistes.







During the supper interval Mr. L. C. Penwill, chairman of the Court of Governors, reminded those present of the custom of taking up a penny collection for the Association at all electrical gatherings which had somewhat fallen into desuetude during the war. He said that the practice was to be revived and suggested that as this was a victory celebration the collection should be a silver one. laid stress upon the fact that the Association was not merely concerned

Top: Mr. J. N. Stephens (president) with Mr. Oliver Lyttelton and Mr. L. C. Penwill (chairman). Centre: General view of the gathering. Bottom: Mr. E. E. Hoadley (past president) with Mrs. Hoadley, Miss Caroline Haslett and Mr. and Mrs. V. W. Dale

with the doling out of money. It treated each

case with sympathy and consideration.

During the evening "allocation" was made of a washing machine presented by the Hotpoint Electric Appliance Co., a radio set from the General Electric Co., Ltd., and an electric fire from the English Electric Co., Ltd.

The success of the event was largely attributable to the work put in by the secretary Mr. H. Senior Fothergill and his staff.

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PERSONAL and SOCIAL

News of Men and Women of the Industry

THE O.B.E. has been awarded to Lieut.-Col. R. V. Powditch, A.M.I.E.E., R.E.M.E., in recognition of distinguished service in N.W. Europe with the 6th Airborne Division. He was in the T.A. before the war and has since served with a number of divisions in the field force. He is a parachutist, and landed in Normandy on "D" day. Lt.-Col. Powditch now commands the R.E.M.E. in the 52nd (Lowland) Division, B.A.O.R. Before the war he was with Crompton Parkinson, Ltd., to whom he expects to return in due course.

Electrical Commander J. D. Markland, R.N.V.R., A.M.I.E.E., who as announced recently has been appointed chief engineer to

the Maidenhead Electricity Department, has served in the Royal Navy throughout the war. Cdr. Markland, who is thirty-five, is a native of Rugby, where he attended the Technical College and received his engineering apprenticeship with the British Thomson-Houston Co., Ltd. In 1934 appointed he was assistant mains engineer Northampton the to



Cdr. J. D. Markland

Electric Light & Power Co., Ltd., and a year later became assistant development engineer to the Westminster Electric Supply Corporation, Ltd. On the merging of the latter company into Central London Electricity, Ltd., he was in 1937 appointed deputy manager, Kensington, Brompton and Knightsbridge District, a post which he held until the outbreak of war. He expects to take up his new position in December.

Mr. W. Horsfall, Mr. F. Lonsdale, Mr. R. E. Robinson and Mr. W. H. Williams have been appointed directors of the General Electric Co., Ltd. Until 1923 Mr. W. Horsfall was assistant manager of the G.E.C., Cardiff Branch, when he was appointed manager of the Newcastle Branch, subsequently becoming manager of the North Eastern Area, which embraces the Newcastle, Hull and Middlesbrough branches of the company. Mr. F. Lonsdale joined Fraser & Chalmers, Ltd., in 1909, and when that company was absorbed by the G.E.C. in 1918 became sales manager, being appointed joint general manager of the Erith works in 1938.

Mr. R. E. Robinson joined the company in 1908 as chief engineer of the Telephone Works, Coventry. He relinquished this post in October when he was appointed general manager of the company's Telephone and Radio Works at Coventry. Mr. W. H. Williams has been with the G.E.C. since 1916 and soon after joining was appointed assistant manager of the Osram Lamp Department. He held this office until 1930 when he was given the position of manager of the Department at Head Office. He is now manager of the whole of the Osram lamp sales organisation. In collaboration with the late Mr. J. Y. Fletcher, Mr. Williams has played a prominent part in all the activities, both at home and overseas, connected with the electric lamp industry. He was recently chairman of E.L.M.A.

Mr. A. J. Haselfoot has recently been released by the Central Electricity Board to take up a position with ASEA Electric, Ltd., and its associated company, Fuller Electrical & Manufacturing Co., Ltd., as manager of its Power Mr. Haselfoot obtained a first Department. class honours degree in engineering science at Oxford University and subsequently received his practical training with the B.T.H. Co., at Rugby. After fifteen months' experience with Merz & McLellan on work in connection with the construction of the grid, he joined the staff of the Central Electricity Board, S.E. England District, in 1932 as an assistant in the Technical Department, later becoming senior assistant technical engineer and ultimately senior assistant operation engineer.

Three directors of the Mycalex Co., Ltd., who were in the Forces have now returned to the company. Mr. M. W. Ingram, who was a major in the Grenadier Guards, is now taking over the post of managing director.

Alderman S. A. Bailey and Alderman H. Deacon, chairman and vice-chairman of the Norwich Corporation Electricity Committee, have been elected lord mayor and sheriff of the city respectively.

Mr. A. E. Upton, who was manager of the No. 2 dispersal factory of Macrome, Ltd., at Enderby, Leicester (now vacated), has taken up his duties as works manager at the company's main factory at Alcester.

Sir A. Gordon Smith, managing director of S. Smith & Sons (England), Ltd., has been appointed chairman in succession to the late Mr. W. Henderson-Cleland.

Mr. F. C. Barford and Mr. G. W. Johnson have rejoined the staff of the British Thomson-Houston Co., Ltd., and are now attached to the Manchester District office. Mr. Barford was on the staff of the Glasgow District office before the war, during which he served in the R.E.M.E., attaining the rank of lieutenantcolonel. Mr. Johnson was one of the company's switchgear sales engineers on the outbreak of the war. He reached. the rank of major in the

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R.E.M.E. Both Mr. Barford and Mr. Johnson were B.T.H. apprentices and both were members of the Territorial Army.

Mr. G. Machin has been appointed chief clerk in South Shields Corporation Electricity Department in succession to Mr. J. Woodhouse, who has retired.

Major Peter G. Roberts, M.P., has recently joined the Board of the Wellman Smith Owen Engineering Corporation, Ltd. Major Roberts is a barrister and is the son of Sir Samuel Roberts, Bt., chairman of the Corporation.

Mr. T. K. A. Douglas, power station superintendent at Hull, has been promoted to the position of generation engineer. He succeeds Mr. I. D. Campbell who, as already reported, has been appointed deputy general manager of the Sheffield Electricity Department.

After four years' service in the R.A.F., Mr. A. L. Sharpe has returned as manager of the recently re-opened Newcastle-on-Tyne premises of Berry's Electric, Ltd.

Mr. J. W. Perotti, the new mayor of Fulham, is employed at the Lots Road power station of the London Passenger Transport Board.

Mr. E. C. Best, district electrical assistant to the L.N.E.R. at Nottingham, recently retired after thirty-five years' service with the company. He has served as electrical assistant in connection with the installation and maintenance of electrical power plant at various places on the company's system.

Mr. H. Nutley, deputy city electrical engineer of Winchester, is retiring after thirty-four years' service.

The Rugby Advertiser reports that Mr. B. S. Seymour, who is in charge of the plant of the Bermuda Electric Light, Power & Traction Co., Ltd., is on a visit to this country in connection with the purchase of generating plant from the English Electric Co., Ltd.

Dr. William T. Griffiths, chairman of the Mond Nickel Co., Ltd., has been appointed vice-president and director of the International Nickel Company of Canada, Ltd.

Mr. R. J. R. Measham, C.M.G., Regional Director for the Post Office in Scotland, retired on October 31st. He is succeeded by Brigadier L. H. Harris, C.B.E.

A presentation was made on November 9th by Mrs. H. Joseph, wife of the late Mr. Henry Joseph, founder of the Midland Electric Installation Co., Ltd., to Mr. L. Higgs and Mr. H. Vaughan on their completion of twenty-five years' service.

The Hammersmith Borough Council is advertising for a chief electrical engineer to succeed Mr. J. R. Jones who is going to Battersea. The commencing salary for the post is $\pounds1,780$ per annum. vellum, expressing thanks for his services.

ELECTRICAL REVIEW

Mr. W. F. Bishop, C.B.E., a director of W. T. Henley's Telegraph Works Co., Ltd., and its subsidiaries, has recently received a number of handsome gifts on the occasion of his com-

Ryan is to receive a resolution, mounted on



Mr. W. F. Bishop receives from Sir Montague Hughman tokens of good wishes on completing fifty years' service with Henley's

pleting fifty years with the company. Sir Montague Hughman, chairman of Henley's, who made the presentations, handed to Mr. Bishop a framed copy of a resolution of the board expressing appreciation of his valuable services. The gifts included a Sheraton cabinet and a Chippendale chair from the company, three handsome pieces of antique silver from the staff of Henley's and its subsidiaries and a cigarette casket from the directors.

The third conversazione in connection with the Henley Education Scheme was held on November 3rd, at Woolwich Polytechnic. The proceedings were opened by Mr. A. W. McArthur, M.I.E.E., manager of Henley's Woolwich works, who, after outlining the opportunities offered by the scheme, called upon Sir Montague Hughman, chairman of the Henley organisation, to present prizes to students for examination successes during the 1944-45 session. Sir Montague also distributed prizes to students for the best entries in the arts and handicrafts display arranged as a part of the conversazione. Mr. E. G. Savage, C.B., B.A., Education Officer, L.C.C., said that most of the few schemes for the education of juvenile employees were found in the electrical industry. He mentioned that within the next five years the Ministry of Education would establish a system of colleges and it would be compulsory for firms to give students the necessary time off to attend these colleges.

Mr. E. E. Judge, manager of Henley's Gravesend Works, proposed a vote of thanks to Mr. Savage and one of the students, John A. Rayson, ably expressed the appreciation of his colleagues and himself of the company's scheme.

Dr. P. Dunsheath, O.B.E., director and chief engineer, and President of the I.E.E., spoke of the difficulties and risks which had to be faced in operating such a scheme, and emphasised that the closest co-operation of the works managers and heads of departments was essential to success.

Obituary

Professor M. MacLaren.—The death occurred on September 24th of Professor Malcolm MacLaren, chairman of the Department of Electrical Engineering, Princeton University. Professor MacLaren, who was seventy-six years of age, was for several years, up to 1908, chief electrical engineer to the British Westinghouse Co. in Manchester. He was at Princeton University from 1908 to 1938.

Mr. E. R. Hudson.—We regret to hear of the death of Mr. E. R. Hudson, of Ilkeston, the Midlands representative of Crompton Parkinson, Ltd. (Derby Cables) since the foundation of Derby Cables, Ltd. Mr. Hudson was for over thirty years secretary of the Midland Branch of the Association of Mining Electrical and Mechanical Engineers and he was national president of the Association in 1944-45.

Mr. Walter S. Steljes, of the Steljes Fire Alarm & Electrical Appliances Co., died on October 29th, at the age of fifty-nine. He was well known in the Fire Service as an expert on the "Gamewell" fire alarm system which he subsequently improved by inventing a talking street fire alarm.

Mr. R. Margetts.—The death occurred at Bradford recently of Mr. Robert Margetts, proprietor of the firm of Penty & Margetts, Bradford, members of the Electrical Contractors' Association. He was sixty-two years of age.

Mr. A. H. Wright.—News has been received of the death, at Palembang Camp. Sumatra, on February 9th, 1945, of Mr. Alfred H. Wright, A.M.I.Mech.E., A.M.I.E.E., F.R.S.A., of Oil Palms of Malaya, Ltd.

Wills.—Mr. J. G. Sneath, of J. G. Sneath, Ltd., electrical contractors, left £32,949 (net personalty £32,074), the residue of his estate going ultimately to charity.

Mr. A. J. Popert, of the Hove Electricity Department, left £1,736.

Fuel Economy

IKE the majority of its twenty-three predecessors, the 1945 issue of the Fuel Economy Review (Federation of British Industries, 2s. 6d.) contains much of electrical interest. It opens with a survey of hydroelectric resources of the world (E. G. Saunders) in which are presented figures for total kWh produced from both water and steam (including estimates for the present year), potential and developed horse-power in various countries and the capacity of the largest installations in 1940-41. General particulars of hydro-electric stations in the British Isles are given for 1943 and of Highland developments up to June last.

Recent progress in electric furnaces with particular reference to resistance types is discussed by Verdon O. Cutts, who points out that the very considerable increase in their use has been due mainly to their inherent merits in providing precisely the right quantity of heat with automatically controlled distribution and with a minimum of dependence on the human element.

Other articles are on the grid in the war (previously dealt with in the *Electrical Review*), boiler-water treatment, high-pressure steam in a large engineering works, steam-flow measurement, thermal insulation of structures, coal mining and the use of gas in industry during the war. In the last mentioned case, the proportions of the total output consumed by industry was about one-third, compared with nearly twothirds of the electricity supplied by public undertakings.

Simultaneous Motor Starting

HERE a considerable proportion of a load consists of automatically started motors, difficulties are likely to be encountered in restoring supply after a prolonged interruption. An instance is cited in the Electrical World (September 29th, 1945) in which several hours were spent in trying to localise a fault incorrectly supposed to exist because of the repeated tripping of a breaker after a half-hour shutdown. The cause was an inrush of current to 1,744 refrigerators and 295 small pumps amounting to six times the ordinary peak, thus greatly exceeding the breaker setting. As the duration of the supply failure increased there had been a progressive loss of the normal starting diversity, so that all the appliances were ready for immediate automatic restarting. Shorter operatingtime cycles would aggravate this effect.

Magnus Maclean Memorial

It is proposed to establish a scholarship or a prize as a memorial to the late Dr. Magnus Maclean who, for twenty-five years, was Professor of Electrical Engineering at the Royal Technical College, Glasgow. Dr. Maclean died in 1937 and the question of a memorial had to be postponed on account of the war. MB

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Street Lighting

Advocacy of Greater Uniformity

MHE discussion of MR. E. C. LENNOX'S paper on this subject at the I.E.E. Installations Section meeting last week (see Electrical Review, November 9th. p. 669) was opened by DR. C. C. PATERSON, who, referring to the Departmental Committee of the Ministry of Transport, said that the principles laid down were being copied all over the world. They were well understood by experts, but he was not sure that the idea had got across to Therefore, this the lighting authorities. paper would be a reminder of the things that really mattered in street lighting. The main point was that the amount of light provided in the streets was really secondary to the composition and distribution of that light. For instance with unidirectional lighting the wattage could be cut down by 60 per cent. with improved visibility.

The specification now in course of preparation (Dr. Paterson is chairman of the B.S.I. Committee concerned) would be in the nature of a Code of Practice for the sort of roads we had in this country.

Dr. J. W. T. WALSH (N.P.L.) said that the fact that a driver could detect objects and not suffer any actual disability from glare was by no means the whole story. Any form of glare was disadvantageous and led to a lowering of the performance of the driver of a car. The metal filament lamp still had an important part to play in street lighting.

Distinguishing Colours

MR. W. N. C. CLINCH (Northmet Co.) hoped that lamp manufacturers and designers would help to overcome the present lack of uniformity in developments. With regard to DC injection as a method of control of street lighting, he did not share the author's view that there should be a relay in every post; it was better to have one relay controlling a group of lamps. He favoured mercury discharge lamps for all main thoroughfares and the use of sodium and other smaller wattage lamps for Class B roads; in that way the side roads would be distinguishable by the change of colour.

MR. CHAMBERLAIN (Commissioner of Police Office) complained of the variations in street lighting. Within five miles of Charing Cross there were five different authorities all of whom had very fine lighting systems, but the variation among them might lead to danger. He also hoped that consideration would be given to the lighting of the footways and sidewalks, as well as the roadways. The lighting of refuge bollards, roundabouts and traffic signs also needed more attention. On the general grounds of the prevention of crime, he deprecated the reduction of street lighting.

MR. A. CUNINGTON (Southern Railway) thought that insufficient attention had been given to the cut-off type of lighting. For lighting railway yards, which was a not dissimilar problem to that of street lighting, a larger number of small powered lamps gave better results than a few larger lamps. That principle should be more largely adopted in street lighting, although perhaps it was impracticable from the cost point of view.

Control Methods

Mr. H. Horwood did not believe that synchronous motor-driven time switches had a life of 15 to 20 years. Ripple control relays were practically stationary for most of the time and could be said to operate for an aggregate of only four or five days in twenty years.

MR. J. M. WALDRAM (G.E.C. Research Laboratories) said that the non-cut-off system had made street lighting possible in the past at a cost which could be borne; when more money was available more attention would be paid to the cut-off system, but there were physical limits to its use. While a patchwork effect in street lighting might be undesirable and distracting, he doubted whether it actually interfered with vision.

MR. W. J. JONES (E.L.M.A.) after agreeing on the need for greater uniformity in street lighting, said that immediately before the war this country had 1,000 miles of first class discharge lamp street lighting, which was rather more than the quantity of the same type of lighting in the rest of the world. With discharge lamp installations it was possible either to save 20 per cent. of the cost or, alternatively, have 100 per cent. more light for the same cost. The fluorescent type of lamp would be used for central areas when the restrictions on economy and the amount of energy that might be used generally were raised. For all-night street lighting a charge of 1d. per kWh was unwarranted; it should seldom exceed $\frac{3}{4}$ d. per kWh.

MR. F. C. FUKE speaking from the motorist's point of view objected to the noncut-off type of lantern because of the glare which was continually approaching the motorist and then disappearing. He suggested the use of unidirectional lanterns shining across the roadway so that a motorist could judge his position in fog by the direction of the beam.

MR. HOCHMEYER, as a buyer of street lighting, said that development of the cut-off type of distribution with low intensity sources would enable one to see better although the cost might be higher.

MR. LENNOX, in reply, said the prevention of glare was entirely a question of economics. The difference between the costs of spacing at 90 ft. and 120 ft. was an increase of something like 30 per cent. He was convinced that sooner or later mercury discharge lamps would have a better colour. He did not think street lighting should be looked upon solely from the motorists' point of view. The aim must be to secure the maximum visibility during the maximum time the lamps were alight.

High-Voltage Overhead Lines

Improvements During Last Fifteen Years

OW the overhead high-voltage power lines forming the grid have been improved during the past fifteen years is told in a paper prepared by MR. W. J. NICHOLLS (C.E.B.) for the Transmission Section of the Institution of Electrical Engineers.

Most of the modifications made are of a practical nature based on experience, such as the change from cone to compression joints for the conductors; although insulator improvement is more technical due to research. Since cadmium-copper and steelcored copper conductors have been in use for less than three years, as a wartime alternative to steel-cored aluminium, judgment upon them must be postponed. Corrosion of conductors, which has occurred to a very limited extent, is now being investigated.

Faults due to conductors clashing when unloading snow have been minimised because lines are not now transposed *en route*; sufficiently good electrostatic balance of the grid as a whole is provided by transposing complete lines at substations. The tension of earthing wires has been reduced in the same ratio as for line conductors.

Mechanical Strength Improved

The chief insulator changes have been in the general adoption of single strings of heavy duty tension patterns in place of duplicate strings of normal designs as well as the use of anti-fog shedding. Thus mechanical strength has been improved, flashover values raised although the leakage path is less, weight reduced by 22 per cent. and cleaning intervals lengthened. Glass insulators have been in use for five years, but it would be premature to compare them with porcelain.

The design of lattice steel towers has been modified in conformity with requirements for extra sag of conductors and the use of double earthing wires. Tower extension pieces have been simplified and an improved design of cross-arm for double circuit towers has been adopted to facilitate their manufacture, transport and erection. Storm damage experience has confirmed the wisdom of loadings and safety factors (132-kV lines) which have remained unchanged for fifteen years. There have not been any failures of tower foundations, apart from mining subsidence.

Increased Vertical Spacing

Many different designs of towers are used for 66-kV and 33-kV lines. The general tendency is to increase vertical spacing between adjacent conductors as well as between top conductors and the earthing wire, resulting in increases of tower height, weight and overturning moment. Some modification of tower foundations has taken place and the same span length is now used for both sizes of conductor.

In calm weather, free from electrical storms, 33-kV lines are apt to flash over about dawn in the summer months. The cause has not been determined, but the author states that it appears to be associated with heavy dew deposit.

Relaxation of the Electricity Commissioners' safety requirements at road crossings should relieve what has been a heavy economic burden.

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Transformer Protection

New Instantaneous Magnetic-Balance System

THE main requirements of a system of protection for power transformers with on-load tap changing may be summarised as follows:-Adequate sensitivity in regard to faults to earth, between phases, between tapping points of the ratio adjuster mechanism and between turns; instantaneous operation in the event of any such faults; operation when a fault occurs within the transformer, concurrently with the passage of through fault current; immunity from operation under switching conditions, when large rushes of magnetising current may flow into the transformer; liberal stability on any form of "through" fault; use of protective transformers of the bushing type.

Limitations of Ordinary Methods

Ordinary forms of protection are subject to certain limitations. Over-current protection, for example, must be associated with some time delay and, therefore, except as a standby, cannot be regarded as either sufficiently discriminative or rapid in operation in the event of an internal fault.

Restricted earth-fault protection, applied separately on the higher-voltage and lowervoltage sides, is fully discriminative and instantaneous in action, but is not sensitive to faults between phases, between tapping points in the ratio-adjuster mechanism or between turns. Although an inter-turn or inter-tap fault may quickly spread to involve earth, the time interval may be sufficient not only to permit greater damage but also to cause operation of the protective gear on some associated zone.

Various balanced-current (or voltage) methods, while responsive to a fault within the protected zone and rendered stable under through-fault current conditions and on all the different turn ratios provided by an onload tap changer, have until recently involved either a time-delay feature on the relay or some means of temporarily depressing the sensitivity to prevent unwanted operation when switching on the power transformer. Gas-actuated relays, although they afford discriminative protection, are not always sufficiently rapid in operation and are responsive only to faults within the transformer tank.

In modern systems of supply, every form

of unit protection must be instantaneous in action; otherwise there may be lack of discrimination on an associated zone of protection, for example on the protective gear of a feeder connected to the power transformer. Instantaneous protection also tends to restrict damage at the fault. This is one reason for the frequent adoption of restricted earth-leakage protection for power transformers, but this leaves the transformer





virtually unprotected in regard to interphase, inter-turn or inter-tap faults.

With a view to meeting the demand for instantaneous protection coupled with stability on through faults, notwithstanding

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the effect of on-load tap changing and the rush of magnetising current when switching in, the British Thomson-Houston Co., Ltd. has developed a system which is an extension of the normal form of magnetic-balance protection but which is especially designed to employ an instantaneous relay of the attracted-armature type.

Application to 132/33-kV Transformer

This instantaneous magnetic-balance protection has been applied to a 30-MVA 132/33kV transformer with on-load tap changing which is now in service. Within the protected zone is included an earthing transformer, connected to the 33-kV side of the power transformer. The current transformers on each phase of the 33-kV side are dual wound on a common core, one set of windings balancing the protective transformers on the 132-kV side. The other set is broken-delta connected in conjunction with the current transformer in the earthing transformer neutral. Sensitive protection against 33-kV earth faults is obtained by means of an instantaneous relay associated with the latter transformers, while 132-kV earth-fault, phasefault, inter-turn, and inter-tap fault protection is achieved by instantaneous relays connected to the current transformers on that side.

The design of the current transformers follows the normal magnetic-balance principle whereby current in the relay windings is negligible with a healthy circuit and restraint is exercised against the effect of tap unbalance during through-faults. By special design, restraint is also exercised within these transformers against false operation due to inrush of magnetising current of the power transformer during switching on either the 132- or 33-kV side.

This protective gear was tested at the B.T.H. Rugby works for sensitivity under all possible fault conditions within the protected zone and also for stability under transient and steady straight-through fault current.

Tests were also taken on site to check immunity from operation when switching the transformer on to the 132-kV grid. Having regard to the very pronounced DC component of the magnetising current inrush, normal current transformers were unsuitable for its measurement and non-inductive shunts were connected in the earthed neutral ends of the 132-kV windings.

A large number of switching tests were taken at maximum line voltage, even on minimum winding tap, with a view to obtaining the greatest magnitude of switching current. The latter is very largely dependent upon the point of the voltage wave at which the switch is closed and the state of magnetisation of the core prior to switching in. These site tests indicated initial peak values of magnetising current in-rush of approximately five times normal RMS value of fullload current.

Readings of the oscillograph connected to the relay circuit indicated that the comparatively large secondary currents which would tend to flow in the relay and cause operation when switching in the power transformer were suitably quenched by the restraining action exercised by the protective transformers. The protective gear was found to be entirely stable on every test taken on site and under service conditions.

Further tests were taken on site to determine the actual reactance on the various tap sections of the power transformer windings, so that from a knowledge of the actual sensitivity in primary-operating current, assessment could be made as to the minimum number of turns which would require to become short-circuited to cause operation of the protective gear. This was less than the number between adjacent taps.

Performance Data

Quantitative data in regard to the performance of the protective gear equipment under mention is as follows:—Full-load current on 132-kV windings, 130 A; on 33-kV windings, 520 A. Sensitivity—to earth-fault fed from 33-kV side, 135 A; to earth-fault fed from 132-kV side, 45 A; to phasefault fed from 132-kV side, 120 A; to phasefault fed from 132-kV side, 30 A. Time of operation of protective gear for any nature of fault, not above 5 cycles, thus complying with Class 2 instantaneous classification of B.S. 142. Stability for through, earth and phase faults, 15 × full-load over full range of ratio-adjuster settings.

The maximum full rating of the highervoltage protective current transformers is approximately 200 A, and that of the lowervoltage transformers approximately 800 A.

Acknowledgements are due to Messrs. J. G. Wellings and P. Mathews of the British Thomson-Houston Co., Ltd., who desire to thank the Central Electricity Board, Messrs. Highfield and Roger Smith and Coventry Corporation Electricity Department for their co-operation in carrying out site tests and for permission to publish the data.

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COMMERCE and **INDUSTRY**

New "Peacetime" Factories.

Further Factories Allocated

• Saturday last the Board of Trade announced the allocation for civilian production of sixteen more Government factories. These include two at Oldham which have been acquired by the General Electric Co., Ltd., for the production of fluorescent lamps; one at St. Albans where Marconi Instruments, Ltd., will make measuring and testing apparatus, etc.; and two at Castlereagh in one of which the Brftish Vacuum Cleaner & Engineering Co., Ltd., will make vacuum cleaners while in the other P. R. Mallory & Co., Ltd., will produce dry batteries.

Clydeside Developments

Development of an industrial area, extending to 125[‡] acres on the south bank of the Clyde, by the Clyde Navigation Trust is announced. The biggest area on the estate has been acquired by Glasgow Corporation for the building of its new power station. Sites have been allocated to Scottish Cables, Ltd., who intend to extend the factory which has been in operation on an adjoining site for some time. Among others who have been allocated sites are the Central Electricity Board and the King Aircraft Corporation which, with its associated companies, produces components for aircraft, refrigerators, etc.

Cable-drum Makers' Wages

Following a claim by certain workers in the cable drum-making department of British Insulated Callender's Cables, Ltd., for payment, as from April 1st last, of 2s. 1d. per hour, the National Arbitration Tribunal has awarded that the company shall pay a minimum of 2s. per hour. This rate is to be subject to rise or fall in accordance with decisions made by the Joint Industrial Council for the Wood Box, Packing Case and Wooden Container Industry.

Sales Management Conference

A two-day electricity supply sales management conference is to be arranged in London next spring by the Electrical Development Association. Details of the conference are to be made available shortly.

German Equipment Exhibition

Among the items shown at the Exhibition of German Aircraft and Equipment at Farnborough, opened to the public last week-end, was aircraft electrical equipment, including generators, motors and control gear. The generators appeared to be generally slightly lighter and smaller than British counterparts, but did not maintain their output over such a wide speed range. Another difference was the provision of a flexible drive from the engine. On British aircraft carbon pile voltage regulation has completely superseded Tirrell vibrating contact types, but the German design has endeavoured to overcome the inherent disadvantage of the Tirrell type—contact troubles at over 1½ A

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German Aircraft Equipment.

field current—by split fields and by interposing relays which introduce extra contacts when the field current increases at low generator speed.

Aircraft distribution panels show a marked preference for the use of circuit-breakers instead of the fuses that we use, and some clever designs of circuit-breaker of exceptionally compact design were shown in ratings of from 6 to 125 A. In the wiring section was exhibited a quick method of joining two cables without solder—it comprised a light metal sleeve placed over the bared conductor ends, clamped in position and covered with an insulating sleeve.

Electrical bomb release control of simple design, landing lamps and small Selsyns and Dersyn type motors were also shown, together with a selection of German motors with their performance characteristic curves. A new type of alkaline accumulator has improved characteristics over its British counterpart, but is believed to be expensive to manufacture.

Illuminating Engineering Course

The Northampton Polytechnic Institute, London, E.C.1, is initiating a course in illuminating engineering, specially adapted to meet the needs of those desiring to take the examination of the City and Guilds of London Institute. The course is to commence in the first week of December. Students will attend for three evenings a week, and enrolments (at a moderate fee) can take place up to November 30th. Mr. H. S. Barlow (tel. CLE. 1662) will be responsible for the course and will be pleased to give further information.

Application for Patent Extension

Application has been made for an extension of $4\frac{1}{2}$ years of the term of Patent No. 337398 (1929) and Patent of Addition No. 398419 of 1933 for "Improvements in and Relating to Directional Street Refractors" granted to Holophane, Ltd., and S. English. Notice of opposition must be lodged with the High Court, Trower, Still & Keeling, solicitors, 5, New Square, Lincoln's Inn, W.C.2, and the Solicitor to the Board of Trade, at least eleven days before the hearing on December 18th.

Electrical Engineering Society

The annual general meeting of the South-East London Technical Institute Electrical Engineering Society held recently was the first since the outbreak of war when the Society's activities were interrupted. The Society now has a membership of well over a hundred. All the officers and committee were unanimously re-elected.

Bath Chief Engineer's Salary

At a recent meeting of the Bath City Council Alderman W. F. Long, chairman of the Electricity Committee, spoke of the difficulty the committee had experienced in appointing a successor to Mr. J. W. Spark, who recently retired from the position of city electrical engineer. He said they had advertised the position at a salary of £1,300 but did not get an engineer. The Committee was satisfied that it would have to pay according to the Walker scale which would give the engineer a commencing salary of $\pounds 1,553$. To prevent further delay, the Council authorised the Committee to advertise the position at a salary according to the Walker scale.

Nife Carnival Exhibit

A lorry exhibit entirely prepared by amateurs at the works of Nife Batteries, Ltd., Redditch, has been entered in a number of local hospital carnivals, the most recent being the Birmingham University students' procession a few days ago. The display was illuminated by "Nife" nickelcadmium-alkaline accumulators, and was considered to be the brightest spot in the torchlight



The Nife lorry exhibit in the Birmingham University students' procession

procession. Considerable interest was aroused by the miners' cap lamps and hand lamps and also by the exhibit, for the first time, of the smallest alkaline accumulator yet made. It measures 13 mm. by 11-5 mm. by 25 mm. and has a capacity of 1/10 Ah. Thousands of these miniature cells were made during the war.

Telecommunications Conference

The Opening and Plenary Sessions of the Telecommunications Conference between Britain, United States and Empire Countries which begins in Bermuda on November 21st, will be held in public. Sir Claud Hollis, acting chairman of the Commonwealth Communications Council, heads the British delegation, which includes Sir Raymond Birchall, deputy director, G.P.O., and Sir Stanley Angwin, assistant director.

English Electric Exhibition

Considerable interest is being taken in the exhibition which the English Electric Co., Ltd., is now holding at its Kingsway showrooms in London to demonstrate its wartime activities and the transition to peacetime production. The research section in particular is attracting much attention with a cathode ray oscilloscope used for strain-gauge measurement, an industrial X-ray unit and working models of highfrequency heating equipment and the highvoltage laboratory at the Stafford works. In addition to photographs indicating the company's wide range of peacetime engineering work, there are prototypes of new cookers, washers, fires, etc., as well as a model of one of the four 30,000-kW turbo-alternators at Little Barford power station.

Electro-Plating Aluminium

For many years the problem of successfully electro-plating aluminium has been one that has, to a great extent, baffled chemists both here and in the United States. Processes have been evolved that have either partially been

successful in dealing with large output or completely successful on individual items but not both. A process has now, however, been evolved which is claimed to be completely successful for the electrical deposition upon aluminium of lead, iron, copper, tin, silver (matt or polished), cadmium, zinc, gold, brass, nickel (dull or polished), copper (polished and (polished lacquered), zinc (passivated), etc. This development means that aluminium can now be put to uses in circumstances and situations previously not possible. Chemical works, for example, will find many applications for lead-coated aluminium, whilst the fact that silver can now be effectively plated on aluminium as well as zinc (passivated) allows the radio and electronic industries to make use of this metal in equipment intended for use where light weight is an essential, and in tropical situations. Samples and data are available from the inventors of the process A.E.R. (1938), Ltd., 120, Green Lanes, London, N.13.

Electricity in Quarries

The Electricity Regulations for Quarries and similar regulations for metalliferous mines which came into force in July, 1938, allowed quarry owners a period of seven years in which to bring cables and other apparatus then in use, and constructed or adapted so as to comply with the requirements previously in force, into compliance with the new regulations. As supplies of cables and apparatus had to be conserved during the war quarry owners were advised in 1943 that they need not replace this equipment if it was still serviceable and that if necessary the period would be extended. The need for the conservation of cables and apparatus continues and so the Minister of Fuel and Power has accordingly made regulations postponing the date for compliance with the 1938 Regulations until July 1st, 1947. (S.R. & O. 1945 Nos. 1350 and 1351, Stationery Office, 1d. each.)

Austria's Economy

A booklet "Austria's Economy" recently published outlines the country's resources and achievements and the difficulties with which it has had to contend. The potential hydroelectric power, for example, is estimated at

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1,600,000 HP at minimum and 6,000,000 HP at maximum flow, with 900,000 HP actually installed (in 1935). Regarding future prospects, it is considered that there is every reason to believe that on this occasion post-war recovery will be swifter and that prosperity will soon be established. The booklet (price Is.), with a foreword by Sir Henry Bunbury, is issued by the Free Austrian Movement in Great Britain, 14/15, Craven House, 121, Kingsway, London, W.C.2.

Coventry Electric Club

At a meeting of the Coventry Electric Club on November 6th, Mr. F. W. Godden, city electrical engineer, Coventry, presided and Mr. P. W. Cave, B.Sc., MI.E.E., lectured on "Cables for Special Conditions." These "special conditions" were defined as those for which cables to British Standards could not be used without qualification. Six classes were mentioned:—Indoor (vertical) installations, submarine installations, installation in corrosive soil, tropical conditions, 33 kV and higher operating voltages outside the scope of present B.S. specifications, and abnormally high ambient temperatures.

Warning Against Unsafe Wiring

At a meeting of the Chester Electricity Committee the electrical engineer reported that a number of cases of unsatisfactory wiring had been brought to his notice. The town clerk was authorised to issue a warning to the public pointing out the need to employ competent persons in order to comply with the safety regulations.

Dissolution of Partnership

G. M. Brewster and R. H. Church, carrying on business as Miller-Hepworth, designers and manufacturers of fluorescent lighting and electrical accessories, 19, Lindsay Avenue, Levenshulme, Manchester, 19. — Partnership dissolved as from October 31st. Mr. Church will attend to debts and continue the business at 76, Broadwalk, Pownall Park, Wilmslow.

Trade Publications

Britannia Batteries, Ltd., Windsor House, 46, Victoria Street, London, S.W.1.—Publication (No. 101) containing general data and dimensions of steel-alkaline accumulators with tubular positive elements for electric trucks and vehicles.

G. & J. Weir, Ltd., Cathcart, Glasgow, S.4. Illustrated leaflet (No. 135) describing a refrigerating machine for the food industry, suitable for either methylchloride or freon, with automatic motor starter.

Victoria Instrument Co., Ltd., Midland Terrace, Victoria Road, London, N.W.10. Price list, with dimensions, of miniature type measuring instruments.

Craig & Derricott, Ltd., Royal Works, Sutton Coldfield, near Birmingham.—Temporary price list of the "Diacam" rotary multi-position switch for domestic and industrial uses.

A.E.W., Ltd., Imperial Works, High Street, Edgware.—A leaflet describing the "Rosyglow" convection radiator.

Drayton Regulator and Instrument Co., Ltd., West Drayton, Middx.-Illustrated catalogue describing a selected range of temperature and pressure regulators, switches, indicators, meters, gauges, valves, strainers and traps.

Mitchell Engineering, Ltd., 1, Bedford Square, London, W.C.1.—Illustrated brochure (available by post free from IEDA, Publications Department, Stanground, Peterborough) describing coal wagon tippler installations of several kinds.

Sunvic Controls, Ltd., Stanhope House, Kean Street, Aldwych, London, W.C.2. Illustrated leaflet (EA.10 (a)) describing an electronic relay operated by a few micro-watts for controlling a load of 2 kW at 250 V.

Applicants should write on their firms' business paper.

Trade Announcements

The Vickers Train Lighting Co., Ltd., states that arrangements have been made whereby as from December 31st, it will cease to supply train lighting equipment, and the Metropolitan-Vickers Electrical Co., Ltd., will be the sole supplier of the Vickers "V.1." train lighting equipment under the name of the "Metro-Vickers" set. All inquiries for spare parts should be sent to the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester. after December 31st.

Berry's Electric, Ltd., have re-opened their branch premises at 55, New Bridge Street, Newcastle-on-Tyne, with the exception of the showrooms, which will not be available until essential repairs can be carried out.

The address of the Bristol office of C. A. Parsons & Co., Ltd., is now 15, Great George Street, Park Street, Bristol, 1 (telephone: Bristol 22178-9).

The London and district sales office of the Electric Construction Co., Ltd., has been moved to 61, Catherine Place, Westminster, S.W.1.

The London Electric Wire Co. and Smiths, Ltd., is opening a sub-branch office at 16 Market Street, Brighton (telephone: Brighton 4850) in the near future, the provisional date being November 19th.

Macrome, Ltd., has vacated its dispersal factory at Enderby, Leicester, and has now concentrated its activities at Alcester.

Graham Farish, Ltd., has opened a depot at Perry Road, Bristol, 2. Mr. J. A. Uppington has been appointed branch manager for S.W. England.

The British Brown-Boveri, Ltd., has moved to Artillery Mansions, 75, Victoria Street, London, S.W.1 (telephone: Abbcy 5777; telegraphic address: Reactance, Sowest, London).

F. C. Blackwell & (o., 1td., have increased their selling prices to 60 per cent. above the figures shown in their 1939 list and subsequent issues.

The London office of G. & J. Weir, Ltd., Glasgow, has returned to Royal Mail House, Leadenhall Street, E.C.2. New branch offices have also been opened at Cardiff, Birmingham and Birkenhead.

Change of Name

S. Hathaway & Co., Ltd., have changed their name to S. Hathaway & Co. (Liverpool), Ltd.

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RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Toroidal Resistances

MOOTHLY variable resistors of the toroidal pattern are now being manufactured by RESISTANCES, LTD., 30, Oxford Road, Finsbury Park, London, N.4. They are built up on a complete ring of porcelain on which the element is closely wound, or slightly pitched when necessary to obtain the desired ohmic value, thus enabling standard gauge wire of the largest area to be utilised, all wire being oxidised. Nickel-copper alloy wire is employed for the smaller ohmic values and a nickel-chrome alloy for the larger sizes to avoid the use of excessively fine gauge that might possibly be damaged in handling.

The windings terminate in connections to robust terminals taken through the wall of the ring, provision being made to stop the terminals



Porcelain wound 260 ohm toroidal resistor

from turning. Collection from the windings is effected by rotating gear fitted with coppercarbon brushes which are located in a dic-cast arm.

Consistent contact is achieved by means of heavy vertical pressure on the brushes exerted by helical springs above them and by copper pigtails which connect the two brushes together. The resistance has a third terminal taken from the collection plate, making it suitable for either series or potentiometer connection.

The ring is held in its correct position relative to the collection plate by a die-cast bracket which also carries a nickel plated brass bush forming the bearing for the nickel plated mild steel spindle which is insulated from the brushgear, the spindle bush also being insulated from the collection plate. The bush is extended to form the means of fixing the resistance to a panel by the use of a hexagon nut. Location is fixed by a pin cast on the bracket. Insulation throughout is of black moulded bakelite and a fluted control knob of the same material is provided as a standard. The angle of rotation is 285 deg.

The makers claim that the rotation is sweet by reason of the self lubrication of the coppercarbon brushes and the method of obtaining even and consistent pressure on the brushes. The sweep is long for the space taken up.

This resistance can at present be supplied in a range of ratings from 50 to 150 W in back-ofboard, enclosed bench, wall mounting and ganged types.

Vacuum-seal Bushings

Bushing-type insulators, which were primarily designed to form vacuum-tight seals but have numerous general applications, are announced by FERRANTI, LTD., Hollinwood, Lancs. The device consists of a glass insulator with a copper flange for attachment by ordinary soft solder (not silver) to the metal case of the component to be sealed and a copper end-cap through which the lead-out is soldered; the cap is supplied pierced (up to $\frac{9}{32}$ in. hole) to customers' requirements. The maximum working potential is 1,000 V. These vacuum seal bushings cannot "breathe" due to temperature variation, and therefore all moisture is excluded from the enclosure.

Two ways of fixing are suggested; with the extrusion method a glass ring below the flange avoids any risk of the lead-out becoming short circuited to the case, while the intrusion method enables an insulated flexible lead to be brought out in such a way that the sealed component can be handled with safety without need for further protection against shock.

Hearing Aid

An electrical hearing aid, the "Pylon," is now being made by PARK ROYAL SCIENTIFIC INSTRUMENTS, LTD., 52, Minerva Road, Willesden, London, N.W.10. The crystal microphone with three-valve amplifier and three dry batteries are contained in one case weighing 10 oz. complete and measuring $4\frac{1}{5}$ by $3\frac{1}{5}$ by 1 inches. The flat rectangular instrument can be held in the palm of one hand, or conveniently worn. A single combined switch and volume regulator is provided and only one earphone cord is necessary.

The dry batteries are of standard Ever Ready sizes, two "U-10" for the filaments and a 30 V "Batrimax 105" for the anodes. A printed list of after-sale fixed service charges is available and for a half-yearly deposit fresh batteries will be dispatched monthly without further notification from the client. Sile.

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ELECTRICAL REVIEW

The Case for Compulsory Methods

A.M.I.E.E., M.I.E.Con.

READERS of Mr. A. H. Dykes's article in the *Electrical Review* of October 19th will probably be puzzled by this late effort to enlist support for a system of voluntary registration. Unfortunately, Mr. Dykes wrote little to enlighten us or to encourage such support, for the only relevant figures which he gives tends merely to confirm that voluntary registration has failed to realise the hopes or expectations of those who, like myself, supported it from its inception but have had regretfully to recognise its failure.

The 1938 peak membership the N.R.E.I.C., namely of 1,723, shows how very meagre has been the support given to

that institution by the general body of contractors who, even more than the general public, might expect to benefit from a real registration plan.

In addition to the objection taken by Mr. Alex. Milne to Mr. Dykes's comparison with the medical profession, I am informed by the British Medical Association that although an unregistered medical man may practise to a certain extent, he is nevertheless controlled by law in some respects. He may not prescribe certain dangerous drugs, nor can he issue a valid certificate required by any Act of Parliament. Further, he cannot recover charges for his services in a court of But the unregistered electrical conlaw. tractor may, and sometimes does, do dangerous work and he can issue certificates, e.g., test records, to those asking for them. and he can sue for payment.

Another objection to a voluntary system is one which confronted me several times when endeavouring to induce contractors to become registered. Briefly, the contractor would argue " If I become registered and if. through bad work on the part of a supposedly efficient employee, I am let down and, in consequence, struck off the Register, the stigma will remain and will be made use of by a certain type of competitor until I am driven out of business. If I do not register, I avoid that risk altogether."

What, then, is the solution? In the Electrical Review of October 27th, 1944, a report was given of the opinions of several of the bodies interested in the matter and it is noteworthy that the E.C.A., the E.T.U., the

A.S.E.E. and, apparently, the E.P.E.A. were all in favour of compulsory registration. The only doubtful voice was that of the I.E.E. which, through its Post-War Planning Committee, merely said that there was not sufficient evidence at present to justify compulsion, but added the proviso that proposed regulations might form the basis of an agreed compulsory code "at some future date." One of the E.P.E.A. representatives is reported as having suggested that inspection should be in the hands of the electricity

supply authorities. It is scarcely necessary to warn contractors By E. Arthur Pinto. of the danger of such a course.

> The revival of interest in this subject permits attention to be drawn to my article which appeared in the Electrical Review of December 8th and 29th, 1944, which, it is claimed, gives a complete justification for compulsory registration and regulations (the two are really quite inseparable). It summarises a mass of information collected on the spot in Canada and the United States and it states the views and conclusions of those who have had actual practical experience of the working of such systems and who can, therefore, speak with greater authority than those of us in this country who have only theoretical ideas by which to be guided.

> In the course of this investigation I did not come across a single engineer who expressed an anti-compulsion opinion. Most of the authorities consulted did not see how electrical installation work could be carried on with safety and satisfaction without at least some measure of compulsion. Most of them, indeed, favour and actually enforce a complete system of registration of both contractors and operatives, all working under a compulsory code, usually a national code. As these two countries claim that they enjoy, in general, greater freedom of action in their daily lives than do any others, their ready acquiescence in the control of electrical matters indicates the importance they attach to it.

> In view of these considerations one is at a loss to understand how opposition to compulsory registration can be justified. To bolster it by saying that "established British custom has served us so well in the past" is

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to beg the question. After all, has it served us so well? This would not be the opinion of the many fully qualified contractors and their skilled employees who have, in the past, suffered so much from irresponsible competition. They, and the general public, are at this moment threatened with an even greater measure of this danger by an influx of newcomers who have learned a dangerous little in war industries or in the Services and who will not, under present conditions, feel

called upon to take the trouble to complete their training, although, if they would do this and so render themselves an asset to all concerned, they would find a welcome awaiting them in the industry. Only by compulsory registration can these men be guided toward the course which would enable them to become of benefit not only to the industry, but also to themselves, to say nothing of the protection which would be afforded to the community at large.

Installation Inspection

By S. A. Daines, A.M.I.E.E.

SYSTEM change-over, blown fuses, change of tenants and, in some cases, just good common sense, all in course of time are responsible for electrical installations being re-tested and re-inspected.

Wiring practice has changed considerably

REPORT ON ELECTRICAL INSTALLATION LIGHTING and/or fusegear and/or Jusegear Switch polarity is wrong in..... Shockproof switches required in..... Shockproof lampholders Flexibles require renewing in Bathroom defects. Kitchen defects. Bell-transformer requires earthing/fusing/or HEATING No. points.....Ins. res. (between poles)......Conty. Res...... System......Ins. res. (to earth)......Earthing..... Defects in main switchgear and/or fusegear Three-pin socket-outlets required in place of two-pin Switch polarity wrong in..... Other defects.

over the last twenty years and the inspector is often required to notice, *inter alia*, a multiplicity of obsolete patterns of fittings, which do not comply with modern regulations, as he visits each part of the installation. Notebook and/or instruments in hand, he is apt to jot down in a disorderly manner the many defects which eventually need to be tabulated in his report.

By means of a log sheet similar to the

one illustrated, he is saved the laborious repetition of main headings at each job and merely fills in the location details as and where necessary. Moreover, by keeping strictly to a log sheet designed to cover every eventuality, he has eliminated the possibility of missing an important item which should have obtained prominence in his report. In fact, if the inspector conscientiously answers every question on the log sheet, he can be confident that there is nothing in the installation that he has forgotten to observe.

Such sheets, if numbered and made in the form of a duplicating book, enable him to keep his own record and to supply the office, or the consumer, with a copy for filing. Further, if the authority maintains a consumers' card index system, a numbered cross reference on the consumer's card assists in the speedy tracing of

the last installation report. The value of this facility is very highly appreciated by all concerned with an important but little publicised duty.

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Scottish Hydro-electric Projects

THE following details have been published showing the preliminary and approximate programme of the North of Scotland Hydro-Electric Board. It is subject to expansion and amendment from time to time as further survey work proceeds:---

PROJECTS	INCLUDED	IN PU	BLISHED	00	NSTRU	CTIONAL
~						kW
Construction	onal Scheme	No. 1			(;	approx.)
Loch Sl	ру				4.1	130,000
Loch M	orar				1.1	2,000
Lochals	h					4,000
Construction	onal Scheme	No. 2				
Tummel	-Garry	1.0	1.0			150,000
Gairloch	1					3,000
Constructi	onal Scheme	No. 3				
Fannich	· · · · ·			10		24,000
	Total			4.00		313,000

PROJECTS TO BE INCLUDED IN CONSTRUCTIONAL SCHEMES TO BE PUBLISHED SOON

					K W
				(approx.)
Cowal					3,000
Shira					44,000
Affric					60,000
Duntelchaig					32,000
Skve					2,000
Ullapool and	Lochi	nver			1.000
- ·					
Τ	otal		 		145.000

PROJECTS ALREADY SURVEYED AND STILL TO BE PUBLISHED AS CONSTRUCTIONAL SCHEMES

				(2	approx.)
Quoich (Inverness-shi	ire)				60,000
Lyon (Perthshire)					60,000
Giorra (Glen Lyon)					000,01
Lawers (Loch Tay)					20,000
Lednock Earn (Loch	Earn)				20,000
Foyers (Loch Ness)					30,000
Glascarnoch (Ross-sh	(ire)	1.			25,000
Luichart (Ross-shire)					24,000
Tor Achilty (Ross-shi	re)				10,000
Orrin (Ross-shire)					14,000
Strath Farrar Beauly	River	(Inveri	ness-shi	re)	60,000
Tarff (Inverness-shire)			·	20,000
Total					353,000

The approximate total annual output from these developments will be 2,250 million kWh.

Schemes to supply electricity in the following areas have been surveyed. They can only be proceeded with if the major Constructional Schemes are carried out:—Orkney, Shetland, Skye, Lewis, Harris, North Uist, South Uist and Benbecula, Barra, Mull and Iona, Seil and Luing, Islay, Arran, Bute, Great Cumbrae, North and West Sutherland, Lochinver, Ullapool, Jeantown (Strath Carron), Lochaber and Onich, Ardnamurchan, North Cowal and South Cowal.

The total number of people living in the area in which the Board is entitled to supply electricity is 140,000; approximately 70 per cent. of these will be able to receive a supply from these schemes.

Hydro-electric schemes to supply Kintyre and Caithness have also been surveyed. The Board

is also proceeding with additional surveys of major projects and of the electricity requirements of other parts of its distribution area, including Coll and Tiree, Colonsay, Glenelg and Little Loch Broom.

Municipal Reports

Preston

WHE borough electrical engineer of Preston (Mr. G. A. Robertson) reports that, in spite of labour shortage, reasonably good progress has been made with the second half of the new Ribble generating station and he is hopeful that the plant will be commissioned on the dates required—the first set in December, 1946, and the second a year later. The estimated cost of the work in hand is £2,127,000, making the total final cost of the completed station, with an installed capacity of 126,000 kW, £3,897,000, or £30 per kW installed. The station was described in our issue of September 7th last.

A total of 426.3 million kWh was generated during 1944.45, compared with 285.5 million in the previous year. Sales in the Preston area amounted to 123.3 million kWh (against 120.6 million), an increase of 2.3 per cent. Under the domestic "home system" tariff sales rose from 45.7 million to 53.4 million kWh, while motive power supplies decreased from 53.4 million to 46.9 million kWh. The engineer considers that there are very bright prospects for the development of the farming load in the rural area.

Financial information shows that the total revenue of the undertaking increased from $\pounds 929,306$ to $\pounds 995,306$, there being a net surplus on the year of $\pounds 16,455$ (against $\pounds 25,042$) before meeting $\pounds 7,448$ ($\pounds 8,006$) capital expenditure out of revenue.

Derby

The Derby Electricity Department also records a drop in power supplies (of nearly 10 million kWh) counterbalanced by an increase in domestic sales. Altogether 159-1 million kWh was sold, equal to 847 kWh per head of the population and representing an increase of 0-5 per cent. on the previous year. The revenue from electricity sold was £601,068 (0-907d, per kWh) compared with £595,609 (0-903d.) in 1943-44. Total revenue was £639,443 (£633,115) and working costs were £490,008 (£456,559), with a net surplus on the year of £1,866 (£9,463). From the total of £60,244 available on appropriation account £11,826 has been applied to capital expenditure, leaving £48,418 to be carried forward.

The chief engineer and general manager (Mr. F. H. Pooles) reports that no major extensions were carried out during the year (the undertaking's fifty-first). Dust conditioning plant which has been installed ensures that no dry dust nuisance is experienced during loading operations at the station or discharging at the tip.

BLECTRICITY SUPPLY

Aldershot.—REDUCED CHARGES.—Reductions in electricity charges to operate from the approved by the Town Council. Under the lighting flat rate and prepayment meter (Scheme "A") tariff the charges are reduced by $\frac{1}{4}$ d. per kWh. A 10 per cent. rebate is to be allowed on the domestic two-part tariff fixed charge for the two winter quarters if accounts are paid within a month. The tariff for supplies to theatres is also lowered.

Bangor.—DEFICIT.—The gross profit of the electricity undertaking for the past year was £12,765, but after allowing for loan charges, income tax, etc., there was a deficit of £335. As the result of negotiations with the North Wales Power Co., regarding the charges for bulk supply, it is expected to obtain a net refund of approximately £1,600 in respect of the years 1939-1944. In the year 1944-45, the Corporation purchased 2,000,000 kWh less than in the previous year, but had to pay £1,000 more.

Bath.—ELECTRICITY CHARGES.—Presenting the accounts of the Electricity Department for CHARGES.—Presenting 1944-45, which provide for a contribution of £5,747 to the rates, Alderman W. F. Long, chairman of the Electricity Committee, stated that next year there might be a heavy deficiency to meet. Prices to consumers would need to be increased if a profit was to be secured, but it was felt that prices should be maintained and any loss taken out of the balance.

Chester.-HIRE PURCHASE.-The Electricity Committee has decided to resume hire-purchase sales of appliances.

Coventry.—New SUBSTATION.—The Electri-city Committee proposes to erect a new primary substation at Humber Road in view of the present and anticipated heavy demands for electricity supplies in the Whitley area.

London.—RECONSTRUCTION OF SOUTH METRO-POLITAN STATION.—The South Metropolitan Electric Light & Power Co., proposes to re-Electric Light & Four control proposes to the construct its Blackwall Point generating station at an estimated cost of $\pm 3,279,210$. The work involves the demolition of the existing station, the clearing of the site and the erection of new buildings to accommodate 90,000 kW of new plant. The sanction of the Electricity Com-missioners has been received and the Central Electricity Board proposes to issue the necessary directions to the company.

Sheffield. — EXTENSIONS AT NEEPSEND. — A direction has been received by the Electricity Committee to extend the Neepsend generating station under the 1949 programme by the in-stallation of one 50,000-kW turbo-alternator with ancillary plant, three boiler units and the necessary buildings and one cooling tower.

Torquay.—LOANS.—The Electricity Committee has obtained sanction to borrow £6,763 for overhead line from Newton Abbot to Torquay and is seeking sanction to borrow £32,200 for power station extensions.

Wallasey.-LOAN APPLICATIONS.-The Electricity Committee is to apply for sanction to

Rebuilding a London Station. Bulk Supply in Yorkshire.

borrow £10,000 for the purchase of apparatus for hire, £5,000 for unspecified mains and services, and £16,190 for supplying electricity to the Mariners' Homes and Manor Road areas.

West Lothian. — ELECTRIC WASHING MACHINES.—The County Council Housing Committee has remitted to a sub-committee the question of installing electric washing machines in new council houses instead of ordinary wash-boilers.

Yorkshire.—BULK SUPPLY CHARGES.—Last week the Electricity Commissioners opened an inquiry at Leeds into an application by 21 Yorkshire local authorities and Gainsborough for a determination under Section 12 of the 1926 Elec-tricity (Supply) Act and a direction under Section 3 (2) of the 1935 Act as to the payment which should be made to the Yorkshire Electric Power Co., for electricity. An original application on the subject was made by Ilkley Urban Council. The applicants contended that the charges for bulk supplies were too high and that although agreements were subject to information being supplied that would enable the local councils to assess the costs, this information had not been given. The applicants suggested that it would be in the general interest if the electric transmission lines, cables, voltages and sub-stations were pooled for the purposes of ascertaining charges and allowances in respect of the transmission component under the 1926 Electricity (Supply) Act. The hearing was adjourned until a date to be fixed. The Commissioners stated that it would be in the general interest to give a direction subject to any limitations which might be necessary. Those concerned were urged to supply all information available without delay.

Overseas

United States .- EXTENSION OF GRAND COULEE PLANT.-Plans are in hand for the addition of a further three 108,000-kW sets to the Grand Coulee Dam on the Columbia River, probably by 1948. This will raise the capacity of the undertaking to 972,000 kW; it is anticipated that ultimately there will be eighteen 108,000-kW sets at Grand Coulee.

TRANSPORT

Canada.—TROLLEY-BUSES FOR VANCOUVER.— The Electrical News (Toronto) reports that the first trolley-buses to be used in Vancouver are expected about the middle of next year. The British Columbia Railway Co. has already placed an order for sufficient buses to replace motor vehicles on two of the city's routes.

Cardiff.—LOAN FOR TROLLEY-BUSES.—The Transport Committee is seeking sanction to borrow £298,650 for trolley-buses.

Mexborough. — TROLLEY-BUS PLANS. — The Mexborough and Swinton Traction Co., Ltd., is to spend £50,000 on a programme of trolley-bus replacements. In addition, further expenditure is to be incurred on improving the service in other directions.

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Co-operative Research

Government Support for Associations

THE need for more co-operative industrial research was the theme of the speech delivered last week by Mr. Herbert Morrison (Lord President of the Council) on the occasion of the resumption of activities by the Conference of Research Associations. Mr. Morrison said that the working partnership of science and industry in war production must continue for the achievement of industrial efficiency at home and the furtherance of export trade. Scientific research would have the full support and encouragement of the Government. It was essential that some of the money to be gained by relief from taxation should be invested in research. Large organisations would, he trusted, establish or extend their own research departments. Smaller concerns, which could not be expected to maintain adequate individual research departments, should give their full support and co-operation to existing associations. No single section of industry, if it was to be virile, could afford to be without that essential scientific partnership.

Research would be useless to industry if its results were not applied, so Government support must be backed by a readiness to use its results. Therefore associations had every right to expect their members, even if they could not maintain fully equipped research staffs, to employ at least some trained scientists who could co-operate with the Associations and help in the interpretation and application of the results they presented.

Insurance and Investment

Expenditure on research should be regarded as an essential cost, an insurance, a sound investment. The original intention was that monetary grants should cease as and when individual associations grew to proper stature. Now it had been decided in the national interest that grants must form a permanent part of the activities of the Department of Scientific and Industrial Research. The present system of a block grant with an additional grant would continue. When the appropriate scale was reached the additional grant would cease, but a new block grant would be made and continue indefinitely so long as the D.S.I.R.

was satisfied with the activities of the particular association. Thus finance would be assured and regular. In suitable cases single grants would be made to finance capital expenditure on such special purposes as buildings, re-equipment, the purchase of particularly expensive apparatus, or the provision of semi-scale plant. The training of research workers was receiving very urgent attention, but there was a scarcity of teachers too; within the resources available all possible assistance would be given in respect of the provision of laboratory accommodation.

Sir Edward Appleton (secretary, D.S.I.R.) speaking at the same function, said he was sure that the research association movement, founded on the basis of co-operation with independence within given industries, was entirely in harmony with the temper of the country to-day. It was in his opinion the only effective way in which the smaller manufacturing firms could reap the benefits of industrial research.

Chinese Reconstruction Plans

WRITING in the October BEAMA Journal, Mr. D. Maxwell Buist mentions that with a population of 450 millions China has only a million kilowatts of generating plant. The Chinese National Resources Commission has evolved a five-year plan which envisages the installation of a further 2,000,000 kW of plant, about 600,000 kW of it during the first two years. This total will represent many separate steam stations ranging in capacity from 1,000 to 10,000 kW. In the second stage of the plan the erection of larger stations will be undertaken and the development of the country's water-power resources, with long-distance transmission will also be considered.

During the three years which preceded Japan's attack on China the average annual importation of electrical equipment was valued at fully £2.7 million; of this Germany was responsible for 28 per cent., Japan for 17 per cent., the United States for 24 per cent. and Great Britain for 21 per cent. Mr. Buist considers that this country's contribution should be much greater in future having regard to the traditional friendship and mutual confidence between Great Britain and China and the elimination of Japanese and German competition. British manufacturers are urged, however, not to rely solely on these factors but to place all their skill, experience and resources at the service of China.

Another article in the same issue gives an account of the recent visit of Chinese trade and engineering delegates to this country.

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FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Jerusalem Electric & Public Service Corporation, Ltd.—At the annual meeting last week the chairman (Mr. W. Shearer) said that the number of consumers had reached 24,580, an increase of 6-7 per cent. over the previous year. The total quantity of electricity sold (154 million kWh) constituted a record and was some 22 per cent. more than in 1943-44. The maximum demand, the highest yet experienced, was 6,390 kW (against 4,860 kW). Such an unprecedented increase unfortunately necessitated a moderate restriction of supplies during the winter months. Two orders had been placed each for an additional 2,000 kW of generating plant. After inevitable delay due to the war the manufacturers had been making special efforts to speed up delivery to fit in with the programme of erection arrangements. It was disappointing to record, however, that all efforts to accelerate the dispatch of the new plant and essential spare parts had been frustrated by the practical cessation of shipping facilities through the dock strike. In consequence some restriction of electricity supply would again be necessary during the winiter.

Dealing with the cost of living allowances to the staff which, together with a special bonus and reclassification of grades, cost the corporation £28,287 in the year under review, he said that while the arbitrators laid down certain increased salaries and improved grades it was disturbing to note that there was no suggestion of the inauguration of any system of trade efficiency tests by the appropriate Government Departments.

As to the current year's prospects, the chairman said that the operating position caused anxiety as the plant had been working under high pressure for the past two or three years. The uncertain political outlook in Palestine also necessitated constant watchfulness.

At a subsequent extraordinary general meeting, and at separate class meetings of the preference and ordinary shareholders, resolutions were passed with reference to the income-tax deductable from the preference dividends and altering the articles of association accordingly. The chairman in his speech explained that, briefly, the proposal was that preference shareholders would receive the same net dividends as they would have done had the corporation been incorporated in the United Kingdom.

Acrialite, Ltd., reports a trading profit of $\pounds 22,283$ to which is added $\pounds 1,000$ from reserve for deferred repairs written back and $\pounds 5,953$ brought in, making $\pounds 29,236$. The various charges absorb $\pounds 3,248$, taxation takes $\pounds 13,224$, and the dividends paid during the year amount to $\pounds 3,054$, leaving $\pounds 9,710$. After meeting the dividend on the preference shares it is proposed to pay a final dividend of $12\frac{1}{2}$ per cent. on the year), which leaves $\pounds 8,066$ to be carried forward.

In a statement accompanying the accounts the chairman and managing director (Mr. L. S. Hargreaves) refers to the fact that the annual meeting is the first since Aerialite, Ltd., became a public company. During the year the whole of the stores section of the Castle Works at Stalybridge was destroyed by fire, but it has now been replaced by a new and modern building. Apart from the company's aerial business, its "Ashton" lighting and power cables and flexibles are said to be in very substantial demand.

Britannia Electric Lamp Works, Ltd.—After provision for depreciation and taxation the accounts for eleven months show a net profit of £8,101 (compared with £8,433 for the preceding twelve months), less £2,500 (same) written off good will and trade marks. The dividend is maintained at 7 per cent. and £12,690 is carried forward compared with £13,214 brought in. A special resolution to be proposed at the annual meeting on November 29th provides for the remuneration of any director holding the position of managing director or any other office or place of profit.

The Electric Furnace Co., Ltd., records a loss of $\pounds 1,771$ on the year to March 31st last, compared with a profit of $\pounds 79,262$ for 1943-44. In addition there is $\pounds 4,000$ (same) dividend from subsidiary, and an E.P.T. credit (less income tax for 1945-46) of $\pounds 25,000$; in the previous year tax provision amounted to $\pounds 55,000$. After payment of dividends of 8 per cent. (same) on the preferred ordinary and ordinary shares and transferring $\pounds 10,000$ (same) to general reserve, $\pounds 10,312$ ($\pounds 9,733$) is carried forward, subject to directors' remuneration.

Peto Scott Electrical Instruments, Ltd., report a trading profit for the year to March 31st last of £62,400, compared with £59,608 in 1943-44. After providing £52,500 (£53,249) for taxation and £4,735 (nil) for deferred repairs and taking credit for £340 excess debenture interest reserve, the net profit amounted to £5,505 (£6,359). A dividend of 25 per cent. is recommended, leaving £9,084 (£7,299) to be carried forward

Ferranti, Ltd., are paying a first and final dividend on the ordinary shares of 6 per cent. tax free, the same as last year. The net profit for the year to June 30th was £95,678 (against £96,237).

The Paterson Engineering Co., Ltd., in its accounts for the year ended April 30th last, shows a net profit, after taxation, of £9,055 (against £9,614). The ordinary dividend (10 per cent.) and bonus $(2\frac{1}{2}$ per cent.) are the same as last year, and £47,649 (£47,161) is carried forward.

Yarrow & Co., Ltd., report a profit of £49,634 for the year ended June 30th (against £61,091), after providing for depreciation. A dividend of 10 per cent. and a bonus of 5 per cent., both tax free, are again paid and £71,122 (£43,988) is carried forward. There is this year no allocation to general reserve (against £30,000).

The Lincolnshire & Central Electric Supply Co., Ltd., reports a net profit for 1944-45 of £54,842, after adjustments in respect of the taxation of the subsidiary company (Mid-Lincolnshire Electric Supply Co.). The figure

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ic Sept nul v (16 e fice for the preceding year was £53,961. The dividend is maintained at 9 per cent. and £2,500 is again placed to general reserve, leaving £42,768 (against £36,551) to be carried forward.

Solus Teoranta (Eire), reports a profit for the year to June 30th last of £13,494 (against £15,978). Depreciation takes £6,160 (£6,339) and £3,900 (£8,000) is provided for taxation. After payment of a final dividend of $2\frac{1}{2}$ (against 5) per cent., making $7\frac{1}{2}$ (10) per cent. for the year, £2,231 (£2,357) is carried forward.

Sydney S. Bird & Sons, Ltd., have announced an interim dividend of 20 per cent. for the fifteen months to December 31st next. In the year to September 30th, 1944, a first and final dividend of 30 per cent. was paid.

Ward & Goldstone, Ltd., are increasing their interim ordinary dividend from 10 to 15 per cent.

The Revo Electric Co., Ltd., is again paying an interim dividend of 5 per cent.

The Ebonite Container Co., Ltd., announces an interim dividend of 5 per cent. (same).

Johnson & Phillips, Ltd., are paying an interim dividend of 7¹/₂ per cent. (same).

New Companies

Electrical Heating, Ltd.—Private company. Registered in Dublin October 31st. Capital, £5,000. Objects : To carry on the business of manufacturers, importers and exporters of, and dealers in, electrical equipment of all kinds for space heating, industrial and domestic processes, etc. Directors: F. J. Ryan, 11, Kincora Road, Clontarf, Dublin, J. C. Costello, 21, Leeson Park, Ranelagh, Dublin.

P.E.C.O. (Electrical Contractors), Ltd.—Private company. Registered November 2nd. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, etc. First directors: N. Fairman, 210, Church Road, Flixton, Manchester, J. Nott, 12, Granmere Drive, Sale, Ches. Registered office: 210, Church Road, Flixton, Manchester.

Manning Electrical Co., Ltd.—Private company. Registered November 3rd. Capital, £200. Objects: To carry on the business of electrical, refrigerating, heating, sanitary, hydraulic, civil, constructional and general engineers, etc. Directors: A. E. Manning and Mrs. L. Manning, both of 51, Chaucer Road, E. 7. Registered office: 74a, Regent Street, W.1.

H. W. Nicholsonex (Refrigeration), Ltd.— Private company. Registered October 29th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, and contractors for the installation of, and servicing engineers for, refrigerators and refrigerating plant and equipment, and electrical goods, etc. Directors:—H. W. Nicholson, 54, Springfield Road, Sale, Ches., and H. Redmond, 268, Barton Road, Stretford, Lancs. Registered office: 1, Hartington Street, Moss Side, Manchester, 14.

Celmor Supplies, Ltd.—Private company-Registered November 5th. Capital, £500. Objects: To carry on the business of manufacturers of, and wholesale and retail dealers in, and agents for manufacturers of domestic and general electrical and other equipment and appliances, including washing and cleaning machines, wringers, refrigerators and cold storage apparatus, etc. Subscribers: L. D. Morris and Mrs. Sheila K. L. Morris, both of 8, Biddulph Road, Maida Vale, W.9. Permanent director: L. D. Morris. Registered office: 64, Clerkenwell Road, E.C.1.

Marshall Electric (1945) Co., Ltd.—Private company. Registered October 29th. Capital, £1,000. Objects: To acquire the business of electrical and mechanical engineers carried on by F. H. Marshall & Co., at Potters Buildings, Warser Gate, Nottingham. Directors:—F. H. Marshall, 137, Windmill Lane, Nottingham, and four others. Registered office: Waverley House, 37, West Gate, Mansfield, Notts. Somerste Plastics & Electrical Apparatus, Ltd. —Private company. Registered November 2nd. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in

Somerset Plastics & Electrical Apparatus, Ltd. —Private company. Registered November 2nd. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, plastic, modelling and moulding materials, electrical equipment specialists, etc. Directors: F. J. Tottle, 52, Bath Road, Bridgwater, Som., and two others. Registered office: 52, Bath Road, Bridgwater, Som.

Frank Hollis & Co., Ltd.—Private company. Registered November 2nd. Capital, £500. Objects: To carry on the business of manufacturers, importers and exporters of, and dealers in, electrical goods and equipment of all kinds, etc. Philip Millis, 30, Brondesbury Road, Kilburn, N.W.6, is the first director. Registered office: 158, Bishopsgate, E.C.2.

Increases of Capital

Liss Accumulators, Ltd. —The nominal capital has been increased by the addition of $\pounds 24,000$ in $\pounds 1$ ordinary shares beyond the registered capital of $\pounds 1,000$.

Associated Electronic Engineers, Ltd.—The nominal capital has been increased by the addition of $\pounds 2,000$ in 2,000 5 per cent. redeemable cumulative preference shares of $\pounds 1$ each beyond the registered capital of $\pounds 1,000$.

Mortgages and Charges

Stamford Electrical, Ltd.—Legal charge and mortgage on freehold land in Barnack Road, Stamford Barm, Northants, with house thereon known as "Glen Ashdale," and capital redemption policy for £2,675, dated October 23rd, 1945, to secure £2,000. Holders: Norwich Union Life Insurance Society.

Liquidations

Heap & Digby, Ltd.—Winding up voluntarily. Claims to be sent to the liquidator, Mr. W. E. Hanson, 25-26, Tudor Chambers, Station Road, Wood Green, N.22, by January 1st, 1946.

Bankruptcies

G. C. Pinney and A. E. Miller, trading as the "Granby Service Co." at 4, Granby Street, Littleport, Cambs, wireless and electrical dealers.—Supplemental dividend of 3s. 4 & d. in the £ payable November 26th at the Official Receiver's offices, 41, Sidney Street, Cambridge.

J. F. Ludlow and R. R. Ludlow, trading as Ludlow Bros., 196, Church Road, Redfield, Bristol, electrical contractors. (Separate application of R. R. Ludlow).—Application for discharge to be heard on December 14th, at the Guildhall, Bristol.

STOCKS AND SHARES

HE declared policy of the Labour Government to nationalise one thing after another has had little effect upon the markets in Stock Exchange securities. Prices on the whole keep good. The Government's intention of directing investment into particular channels is taken to refer more especially to new issues of capital; it is considered to have no connection with existing securities and, in consequence, the prices of the latter remain firm, with few exceptions. The market in gilt-edged stocks, which theoretically should benefit from the Government's retention of cheap money, has eased off. So, also, have prices of some of the preference shares in the Home electricity supply group. A strong feature is provided by Cable & Wireless ordinary stock, on the announcement that the Government intends to take over the greater part of the Cable & Wireless (Holdings) interest. The Home Railway market has fallen into the doldrums.

Cable & Wireless

The intention of the Government to acquire Cable & Wireless, reference to which was made last week, served to stir up lively controversy, and to arouse an unusual degree of interest in the stocks of the Cable & Wireless (Holding), Ltd. It is with the stocks of the latter that investment is concerned. The name was changed eleven years ago, but the company was first registered in 1929. It was formed to merge the interests of the Eastern Telegraph, Eastern Extension, Western Telegraph and Marconi's Wireless. This was done by an exchange of shares. A number of associated companies were included.

Capital and Dividends

The issued capital of the combine is $\pounds 23\frac{1}{2}$ million, of which £162 million is in 54 per cent. preference stock, the remainder being in ordinary. Upon the latter, an annual dividend of 4 per cent. has been paid for eight years past, the dividends receiving a slight concession from income tax relief. In voting, proprietors of the ordinary stock have one vote for each £1 The preference stockholders vote ordinary. only in certain circumstances, and then one vote is given to £10 preference stock. The price of the preference rose to 120 upon the first announcement of the Govenment's intention. Later, it went back to 112, but the ordinary rose to 107, showing a gain of 84 on the week, against the fall of 4 in the preference.

Home Electricity Supply

The ordinary shares of the Home electricity companies continue to be the subject of much discussion in view of the forthcoming nationalisation of the industry. So far, nothing definite has transpired to enable shareholders to form any precise view as to what the Government's intentions are. Prices of Home electricity ordinary shares are practically unchanged. London Associated hardened to 28s. The Indian shares in the overseas list receded a little. Calcutta Electrics have lost Is. at 64s. 6d. Recent buying of Tokyo sixes having decreased, the price fell back 4 points to $47\frac{1}{2}$.

Fluctuations in Prices

Tube Investments, with a rise of 6s. 3d. to $6\frac{1}{16}$, is an outstanding feature in the industrial market. Dividend anticipations are said to be the reason for the demand that caused the advance. Thorn Electrics at 31s. are 1s. higher. General Cables at 18s. 6d. have put on 1s. 6d. At 9s. Allen Wests are up 9d. Ex dividend deductions have been recovered in the majority of cases. The radio market was enlivened by a jump of 2s. 6d. in A. C. Cossor shares to 44s. The price of Philco, which frequently moves in sympathy with that of Cossor, is 6d. up at 11s. E K. Cole at 37s. 6d. are steady and Pye deferred maintain their gain at 36s. Radio Rentals at 32s. and Sterling Electric Holdings preference at 11s. are both harder.

Miscellaneous Movements

Canadian Marconi rose to 29s. and fell back to 22s. 6d. on the same day. At 23s. the price is 4s. down since a week ago. Great Northerns at 36 have risen 10s. and International "Tel. & Tel." at 33 are a dollar better. Brazilian Tractions fell back to 28 $\frac{1}{4}$. Renewed optimism relative to the terms of acquisition, still to be announced, led to a rise of 6s. 6d. to 90s. in Calcutta Trams. British Electric Traction deferred at 1130 is ex 7 $\frac{1}{2}$ points net dividend. On the week, the stock is 12 $\frac{1}{4}$ higher.

Brush Electrical

The Brush Electrical Engineering Company is paying its interim dividend of 4 per cent. on the ordinary stock next week, and it is fair to assume that the final for the year will be not less than the 6 per cent. which, for the year ended December, 1944, brought up the dividend to 10 per cent. comparing with 9, 8 and 6 per cent. in the three previous years, in that order. Dividends were paid out of substantially larger earnings on the ordinary shares. The company's balance-sheet is in good order, and this gives the shares a sound status from the investment point of view. At the present price, 10s. 6d. the yield on the money is 41 per cent., a not unsatisfactory return from a good industrial investment.

The authorised capital is now £1,190,000, of which £798,722 is in ordinary stock of 5s. units, the balance being in $5\frac{1}{2}$ per cent. cumulative preference stock in £1 units. From time to time, Brush has acquired interests which give it a prominent position in the trade. Provision for taxation took £70,000 in the year last ended, against £25,000 in each of the two previous years, and relaxation of E.P.T. will swell the profit materially.



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MOTORS





STARTERS

SWITCHGEAR

VERITYS LTD. ASTON, BIRMINGHAM 6 Sales Headquarters : BRETTENHAM HOUSE, LANCASTER PLACE, W.C.2

November 16, 1945



As old as the electric motor industryand equipped to meet to-morrow's needs

LAURENCE, SCOTT & ELECTROMOTORS

LIMITED

MAKERS OF ELECTRIC MOTORS AND CONTROL GEAR FOR INDUSTRIAL AND MARINE SERVICE

NORWICH, MANCHESTER, LONDON AND BRANCHES

Rolling Mill Tension

Method of Control

THE tension of the strip metal in rolling mills, both entering and leaving the rolls is an important factor in rolling technique, and in large strip mills the cost of electrical drives designed to give constant tension sometimes becomes a substantial part of the mill cost. A simple and ingenious gear which produces the required result has been devised by the Baldwin Instrument Co., Ltd., Cumnor, Oxford, slow the uncoiler drum down. This has the effect of slowly raising the roller and bringing the control unit into action. An impulse is sent out periodically (usually at about 3-second intervals) from the control unit which gets no further than the switch unit so long as the roller is in mid position.

If the roller moves up or down the switch unit transmits this impulse back through the



Arrangement of Baldwin rolling mill tension control gear

in co-operation with W. H. A. Robertson & Co., Ltd., Lynton Works, Bedford. This gear has been successfully applied to the rolling of thin aluminium foil where tension control is especially important, and besides being applicable to heavy strip mills the gear is suitable for smaller mills in which the uncoiler has a friction brake and the coiler is driven through a slipping clutch.

The diagram shows the apparatus as applied to the latter case, consisting essentially of two loaded floating rollers applying back and front tension, each roller operating a switch unit. Both switch units are connected electrically to a control unit fed from the mains and operating electro-magnetic reversing motor switches on two fractional-HP motors, one controlling through reduction gearing the pressure on the friction brake, and the other similarly controlling the slipping clutch driving the coiler.

As rolling proceeds the radius of the uncoiler drum diminishes and as the pull on the strip due to the loaded roller remains constant but acts at a smaller radius the brake tends to control unit to the motor starter, at the same time determining the sense and duration of the impulse. If the roller rises the impulse will be in the direction of releasing the brake tension and vice versa. Small roller displacement from the mid position gives a short duration impulse and greater displacement a longer duration of running of the motor so that hunting is avoided. The tension on the take-up side is controlled in a similar manner. This gear is, of course, applicable to the control of tension in processes other than metal rolling.

Power Production in Spain

THE output of electric power in Spain in 1944 was 4,500 million kWh, about 90 per cent. of which was furnished by hydro-electric stations and the remainder by steam-powered plants. During the first five months of 1945 the output was substantially below that for the corresponding period of 1944, and industrial consumers are rationed to about half their 1943 consumption, while domestic supplies are cut off from 9 a.m. until 9 p.m. on at least three days a week.—Reuter's Trade Service.

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November 16, 1945



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.

W. G. ALLEN & Sons (Tipton), Ltd., and A. Weddell.—"Air diffusers of the vertical or ceiling type." Cognate applications 7303/44 and 11065/45. April 20th, 1944. (572785.)

British Thermostat Co., Ltd., and W. F. F. Martin Hurst.—" Safety means for thermo-static mechanism." Cognate applications 7628/ 43 and 5364/44. May 13th, 1943. (572807.) British Thomson-Houston Co., Ltd. (General Electric Co.)—" Fluorescent materials." 1902. February 4th, 1943. (572771.) " Electric

switches particularly alternating current con-tactors." 13643. August 20th, 1943. (572871.) British Titan Products Co., Ltd.—" Electro-lytic methods for utilising iron chloride liquors."

12858/43. August 8th, 1942. (572866.) Bruno Patents, Inc.—" Co-axial electrical transmission line." Cognate applications 13554/ 43, 13555/43 and 13556/43. August 27th, 1942. (572870.)

(572870.) Cinema-Television, Ltd., and T. C. Nuttall.— "Electrical counting circuits and similar systems." 2064. February 15th, 1941. (572884.) J. Collard.—" High frequency electric trans-mission lines and waveguides." 15089. Sep-tember 14th, 1943. (572881.) Ferranti, Ltd., S. Jackson, A. L. Chilcot, M. E. Sions and R. W. Sutton.—" Mounting of members within and without an electric dis-charge tube in desired mutual spatial relation-M. E. Slons and K. W. Sutton.—" Mounting of members within and without an electric dis-charge tube in desired mutual spatial relation-ship." 8627. May 29th, 1943. (572813.) General Electric Co., Ltd., and R. O. Row-lands.—" Electrical selective network." 11722. July 19th, 1943. (572846.) General Electric Co., Ltd., H. C. Turner and J. Chamberlain.—" Electrical dry plate recti-fiers." 11859. July 21st, 1943. (572848.) Heating Construction, Ltd., and H. G. Darby. —" Electric reflector fires." 17213/43. Nov-ember 18th, 1944. (572911.) H. Hughes & Son, Ltd., D. O. Sproule and A. J. Hughes.—" Echo sounding equipment." 6819. April 13th, 1944. (572819.) P. L. Hunting, F. C. Bowring and R. H. F. Boot.—" Arc welding electrodes." 21055. December 15th, 1943. (572782.) Igranic Electric Co., Ltd.—" Control systems for travelling machines." 11107/43. July 10th, 1942. (572901.)

for travelling machines." 11107/43. July 10th, 1942. (572901.) International Marine Radio Co., Ltd., and C. G. G. Withey.—" Combined radio trans-mitter and loud speaker installation." 3169. February 21st, 1944. (572783.) J. Lucas, Ltd., and G. D. Spencer.—" Electric storage battery cases." 5329. April 21st, 1942. (572892.) E. B. Moullin and Metropolitan-Vickers Electrical Co., Ltd.—" Electric resonant chambers." 6891. April 30th, 1943. (572781.) Ransomes, Sims & Jefferies, Ltd., and E. Baillie.—" Electric controllers." 8686. May 8th, 1944. (572786.)

8th, 1944. (572786.)

Standard Telephones & Cables, Ltd., C. M. Le G. Eyre, and D. Hamilton.—" Indicating systems for electric signals." 2540. February 11th, 1944. (572912.) A. V. Tomlinson (Union Switch & Signal Co.).

A. V. Tomlinson (Union Switch to "Railway track circuit apparatus." 14612.

October 19th, 1942. (572894.) United Ebonite & Lorival, Ltd., and B. L. Davies.—" Liquid containers such as those of electric accumulators." 1942. (572797.) 156. January 5th,

TRADE MARKS

PPLICATION has been made for the registra-A tion of the following trade marks. Objections to any of these may be made within four weeks of November 7th :-

MAGNICON. Class 7. No. 635204. Electric generators.—Macfarlane Engineering Co., Ltd.,

generators.—Macrariane Engineering Co., Etd., Netherlee Road, Cathcart, Glasgow, S.4. STROBAL. Class 8. No. 635957. Manual holders for electric welding electrodes.—J. Strong, 22, Fountaine Street, Godley, Hyde. TOASTMASTER. Class 11. No. 631747. Elec-tric water heaters, electric waffle bakers and electric ford heating containers. McGranu

electric food heating containers.—McGraw Electric Co., Chicago. Address for service:— c/o Marks & Clerk, 57-8, Lincoln's Inn Fields, W.C.2.

MEPCO. Class 11. No. 634349. Ships' lighting installations and marine safety or emer-

gency lamps.—M.E.P. Co., Ltd., London Life Building, Castle Street, Liverpool, 2. JET. Class 11. No. 635486. Electrically heated hot-water storage apparatus.—Heatrae, Ltd., St. George's Street, Norwich.

Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references :-

Belgium and Luxembourg.---Exclusive distribution rights for portable electric tools-hand drills, screwdrivers, flexible-shaft motors, highspeed bench drills, polishers, grinders, etc. (X.126).

Belgium.-Agencies for British makers of electrical equipment and appliances in Belgium, Holland and Northern France. (X.128.)

Palestine.-Supply of radio sets to the Middle East. (X.127.)

Sweden .-- Supplies of lampholders and handlamps of various kinds specified in a list obtainable from this office. (X.129.)

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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.

Bradford.-November 23rd. Town Council. 30-ton electrically-operated overhead travelling crane. T. H. Carr, electrical engineer, 27, Bolton Road, Bradford.

Bristol.—November 24th. Bristol Mental Hospital. Re-wiring of existing electric lighting and power installations. (See this issue.)

Bury.—November 19th. Electricity Depart-ment. Two 750-kVA transformers. (November 9th.)

Edinburgh. — November 23rd. Corporation. Refrigerator and two washing machines for hospitals. Specifications from city architect.

Kettering. — November 28th. Electricity Department. E.h.v. and I.v. paper-insulated lead-covered armoured cables. (November 2nd.)

Manchester.-November 26th. Electricity Department. Capstans and bollards; surge and make-up water cast-iron tanks, etc., for Stuart Street generating station. (November 2nd.)

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North West Midlands.-November 26th. Joint Electricity Authority. Outdoor type static transformers, electricity supply meters, painting of chimney stacks and spraying of cooling towers. (November 2nd.)

Scotland.—December 10th. North of Scotland Hydro-Electric Board. H.v. and l.v. over-head lines in Lochalsh area. (November 9th.)

Sheffield.—December 31st. Electricity De-partment. Two 600-kVA transformers. (Nov-ember 9th.)

Skelton and Brotton.—November 30th. Elec-tricity Department. Three three-phase transformers, with off-load tap-changing gear. (See this issue.)

Southend-on-Sea.—December 3rd. Electricity Department. L.v. cable. (November 9th.)

Orders Placed

Barrow-in-Furness.-Electricity Committee. Accepted. Four switches (£178 each) .-- Cooke & Ferguson.

Sheffield.—Electricity Committee. Recom-ended. 33-kV switchboard and neutral mended. earthing equipment for the Neepsend generating station (£75,028).-Metropolitan-Vickers.

Torquay.—Electricity Committee. Accepted. Pipe-work, steam receivers, valves, etc., for extensions at Newton Abbot power station (£32,200) .-- Aiton & Co.

Walsall.—Electricity Committee. Accepted for twelve months:—House service meters.— Sangamo Weston; Metropolitan-Vickers. Transformers.-Ferranti.

Transport Committee. Accepted. Three miles of trolley wire (£387).—British Insulated Callender's Cables.

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.—Prefabricated building at Hilton Junior Secondary School; J. A. D. Allan & Ross, architects, 10, Bon-Accord Square, Aberdeen.

Alloa.—Extensions to foundry, etc., for Harland Engineering Co., Ltd., B.E.P. Works; manager.

Bacup.—Health Centre and Clinic Hospital near the Old Corn Mill; H. Guffogg, borough surveyor, Town Hall.

Barnard Castle .- Houses (100), Station Road; U.D.C. surveyor.

Barnsley.—Extensions to motor body works, Silver Street and Foundry Street; Barnsley British Co-operative Society, Ltd. Converting Old Rectory into classrooms and erection of three huts (£4,447); V. Dunk,

Ltd., builders.

Berwick.-Houses (80), Shielfield Terrace; borough engineer.

Blackpool .--- Works additions, Clifton Road; Daintee Confectionery Co., Ltd. Houses (14), Primrose Avenue; Wm. Eaves

& Co., Ltd.

Bolton.-Houses (52), Cameron Street estate; John Dickinson & Son (Bolton), Ltd., builders, Fairclough Street.

Brandon.-Twenty houses at New Brancepeth for the U.D.C.; direct labour.

Brighton.—Houses (65), East Moulscombe (£78,830); Building & Public Works Construction Co., Ltd.

Caithness.—Houses (290) for County Council; J. M. Henderson, county architect.

Carlisle.—Airport; city engineer.

Caterham. — Development, Whyteleafe estate; S. H. Burdwood, 10, New Burlington Street, London, W.1.

Chesterfield .--- Temporary church, Newbold Road; Presbyterian trustees.

Cumberland.—Additions to Cumberland and Westmorland Mental Hospital (£90,500); county architect, 4, Alfred Street North, Carlisle.

Douglas (Isle of Man).—Development, Balla-brooke estate; Manx Real Estates, Ltd.

Houses (118), Valley estate; borough engineer.

Dundee.—Enlargement and modernisation of factory, new preserve factory, and extensions to bakery for James Keiller & Sons, Ltd.; manager.

Ealing.—Factory extensions, Manor Farm Road, for Geipel, Ltd.; Adie Button & Partners, architects, 49, Ickenham Road, Ruislip.

Elgin (Morayshire). — Houses for Town Council; J. P. M. Wright, architect, 82, High Street.

Glasgow .- Two additional basins with two graving docks and new riverside quay to cost £2,000,000 for Clyde Navigation Trust; engineer, Trust's Office, Robertson Street.

Hereford.—Factory extensions for Barromia Metals, Ltd.; Major F. J. Bullen, managing director.

Holland (Lincs.).-Scheme for ten modern secondary schools; county architect, County Hall, Boston, Lincs.

Ladybank.—First development of Roselea Terrace West for houses (electrical work); L. A. Rolland, architect, 47, High Street, Leven, Fife.

Leeds .- Bus station, Rockingham Street; city engineer.

Littlehampton. — Extensions, engineering shops, Terminus Road; Duke & Ockenden, Ltd.

. London.—Housing schemes; Minerva Street, Bethnal Green (£306,669) and Clapham Road, Lambeth (£165,000); L.C.C. architect.

Newtown .- Workshop, office, store, garage, etc. Muslin Street; Lindley & Gibson, architects, 118, Stamford Street, Ashton-under-Lyne.

Northants.—Maternity homes, Northampton, Kettering and Wellingborough (£97,500), schools at Corby and Rushden; county architect, County Offices, Guildhall Road, Northampton.

Northumberland. — Conversion of Hexham "Hydro " into county college; county architect, County Hall, Newcastle-on-Tyne.

Nottinghamshire. - Extensions, Hopwood Hall Special School (£62,500); county architect.

Pontefract.—Houses (160); E. G. Crofts, architect, Market Place.

Port Glasgow.—New factory for Thomas Black & Sons, tent and sail makers, Greenock; manager.

Retford.—Houses (108) on three sites; George Longden & Son, contractors, Parkwood Works, Sheffield.

St. Andrews.—Houses (100) for Town Council; town clerk.

St. Helens.—Additions and extensions to trolley vehicle and bus depot, Hall Street; W. Ellis, architect, Barclays Bank Buildings, St. Helens.

Sale.—Festival Theatre, Warwick Cinema Co. (£40,000); Drury & Gomersall, architects, Imperial Buildings, Manchester, 1.

Seaham.-Church, Parkside estate: Methodist authorities.

Stockport.—Works, Hempshaw Lane; A. Rush, Ltd., Progress Works, Hempshaw Brook. Extensions, Garden Dairy; Cheshire Sterilised Milk Co., Ltd., Didsbury Road, Heaton Norris.

Stoke-on-Trent. — Wedgwood Memorial College for Education Committee; A. Burton, city engineer, Town Hall.

Sunderland.—Houses (186), Springwell Farm; borough engineer.

Torquay.-Rebuilding The Rotunda; A. J. Allams.

Factory extensions, Upton Hill; Tip Top Mineral Water Co. Houses (96), Watcombe estate; borough

engineer.

Forthcoming Events

Saturday, November 17th.—London.—Con-naught Rooms, W.C.2, 2.45 p.m. Institution of Engineers-in-Charge and Association of Super-vising Electrical Engineers. Lecture: "Illuminat-Light," by R. O. Ackerley, A.M.I.E.E. The lecture will be preceded at 1 p.m. by a Victory luncheon at the invitation of the G.E.C.

Leeds.—Electricity Offices, Whitehall Road, 30 p.m. I.E.E. North Midland Students' action. Students' Lecture : "Electrical 2.30 p.m. Section. Machinery for Ship Propulsion," by W. J. Belsey.

Manchester — Engineers' Club, 3 p.m. Asso-ciation of Supervising Electrical Engineers (Manchester Branch). "Pyrotenax Cables," by R. B. Barrett.

Monday, November 19th.—Liverpool.—I.E.E. Mersey and North Wales Centre. Annual dinner.

Wednesday, November 21st.—London.—In-stitution of Electrical Engineers, 5.30 p.m. Radio Section. "Method of Increasing the Range of V.H.F. Communication Systems by Multi-Carrier Amplitude Modulation," by J. R. Brinkley.

Wolverhampton .--- Victoria Hotel, 7 p.m. Institute of Welding (Wolverhampton Branch). "Electrical Technique in Resistance Welding," by T. E. Calverley.

Thursday, November 22nd.—London.—At Chartered Surveyors' Institute, 12, Great George Street, S.W.1, 10.30 a.m. and 2.30 p.m. Iron and Steel Institute. Autumn general meeting. (Also Friday, 10 a.m.)

Friday, November 23rd.—London.—Institu-tion of Electrical Engineers, 5.30 p.m. Measure-ments Section. "Influence of Irradiation on the Measurement of Impulse Voltages with Sphere-Gaps," by Dr. J. M. Meek. London.—At 39, Victoria Street, London, S.W.I, 6.30 p.m. Junior Institution of En-gineers. Annual general meating.

Siners. Annual general meeting. Newcastle-upon-Tyne.—Neville Hall, 6.30 p.m.
 I.E.E. North-Eastern Students' Section. "Electrical Equipment in Collieries," by H. Milburn.

Saturday, November 24th.—Manchester.— College of Technology, Sackville Street, 6.45 to 10.30 p.m. I.E.E. North-Western Students' Section. Autumn dance.

Monday, November 26th.—London.—Institu-tion of Electrical Engineers, 5.30 p.m. Informal meeting. Discussion on "Standardisation of Ripple Control," to be opened by T. R. Rayner. Birmingham.—Grand Hotel, 6 p.m. I.E.E. South Midland Centre. Thirty-sixth Kelvin Lecture : "Scientific Principles of Radioloca-tion," by Sir Edward V. Appleton. Newcastle-upon-Tyne.—Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre: "Excess-Current Protection by H.R.C. Fuses on Medium-voltage Circuits," by R. T. Lythall, and "Excess-Current Protection by Over-current Relays on Medium-voltage Circuits," by A. G. Shreeve and P. J. Shipton. P. J. Shipton.

Cardiff.-At South Wales Institute of Engineers, Group. "Electrical Problems Associated with Aero Engine Testing," by A. N. Irens (repetition of talk given at Bristol on October 22nd).



What a fine fumbling job it is, messing around with dozens of tiny nuts and washers and bolts, picking up the nut, holding the bolt with one hand while the other fiddles round the back to get the nut on the thread. And drops it! You know! Spire solves the problem. Spire U Nuts slip into position over the bolt holes — no washers needed with a Spire fixing, of course. So both hands are free to put in the screws and once they're in, they're in for good. Sounds easy and it is easy!



THAT'S Fixed THAT! Here's a little chap in action Reference No. NU 531. Its uses are legion. Wherever there is blind assembly work, wherever your operatives are fumbling with nuts and washers the NU 531 will swe time and cost and a lot of bad temper. Clip it into position and it stays "put" until you are ready to drive home the screw. No washer needed of course.

***A BETTER way of fixing**

Simmonds Aerocessories Limited · Great West Road · London · A Company of the Simmonds Group

IL MARKELE

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9.E.C. ELECTRIC UNIT HEATERS

A wartime development which has come to stay



5 to 20 kW IN THIS TYPE

Numerous works and factories have been comfortably, conveniently and. economically heated with these units.

- They need no floor space, no boiler house, no fuel, no labour.
- In relation to heat output they are of the smallest size and use the least metal.

Lowest capital cost.

Low operating costs.

Each unit can be worked independently with or without thermostatic control.

Adut. of The General Electric Co. Ltd., Head Office, Magnet House, Kingsway, London, W.C.2.

November 16, 1945

ELECTRICAL REVIEW

-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,

THE CHARGE for advertisements in this section THE CHARGE for advertisements in this section is 2/- per line (approx. 7 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 instruc-tions 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, Stam-ford Street, London, S.E.I. 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.

SHEFFIELD CORPORATION ELECTRICITY DEPARTMENT

Contract No. B.M. 149

Contract No. E.M. 149 THE Electricity Committee are prepared to receive tenders for the supply and delivery of the under-mentioned transformers : TWO, 600 kVA, 11/.440 kV sphase Double Wound Self-Cooled. Contractors desiring to submit tenders may obtain specification and Form of Tender at this office on making a deposit of £2 2s. Od., which sum will be refunded on receipt of a bona fide tender. To meet the convenience of Contractors, two copies of the Specification will be furnished; additional copies may be purchased at a cost of £1 1s. 0d. per copy. May proson of firm sending in a tonder will be required to comply with the Standing Orders of the Council elating to the "Prevention of Corruption" and to the soft labout. A print of the Standing Orders may be obtained from the Department. The dender and accompanying documents, filled up as with the Specification, which shall not bear any name or mark indicating the sender, to be delivered to the Town Orderk, Town Hall, Sheffield, 1, not later than the first opto and Moday, 315 December, 1945. Tenders received after the time stipulated herein will not be considerd. The committee do not bind themselves to accept the lowest or any tender. JOHN R. STRUTHERS.

lowest or any tender.

Commercial Street. Sheffield, 1. October, 1945. JOHN R. STRUTHERS, General Manager and Engineer. 3334

CITY AND COUNTY OF BRISTOL

Bristol Mental Hospital, Fishponds, Bristol

Electrical Installations

The Visiting Committee of the Bristol Mental Hospital invite tenders from Electrical Contractors for the completion of the rewiring of the existing Electric Light-ing and Power Installations at the above Hospital. The scope of the contract will cover the removal of the existing installations, in addition to the complete new in-stallations, which will include for all wiring, fittings, etc., in accordance with the specification and drawings prepared by the Consulting Engineers, Messrs, Hoare, Lea & Part-ners, 39, Broad Street, Bristol, 1. Applications to tender must be received by the Consult-ing Engineers not later than the 24th November, 1945, and must be accompanied by a deposit of 210 10s., which will be returned on receipt of a bona fide tender. Speci-cation and drawings will be despatched to applicants as soon as possible after the above date. The successful tenderer will be required to provide in a sum of exceeding 25% of the contract sum. The Visiting Committee do not bind themselves to accept the lowest or any tender. Not Control Library.

A. PICKARD, Town Clerk.

3374

The Central Library. College Green, Bristol. 1. 3rd November, 1945.

SKELTON & BROTTON URBAN DISTRICT COUNCIL

Electricity Department

Three-phase Static Transformers

THE Council invite tenders for the supply and delivery of 8 Three-phase Static Transformers, 50 cycles, with off-load tap-changing gear. Specification and any other particulars required may be obtained from the Electrical Engineer, 147-9, High Street.

obtained from the Electrical Engineer, 147-9, High Street, Skelton-in-Cleveland. Tenders enclosed in plain scaled envelope and endorsed "Tender for Transformers," must be delivered to the undersigned not later than 10 a.m. on Friday, 30th Novem-ber, 1945. The Council do not bind themselves to accept the lowest

Council offices. F. WILKINSON. Skelton-in-Cleveland. Clerk o 7th November, 1945.

Clerk of the Council 3375

METROPOLITAN BOROUGH OF WOOLWICH

Electricity Department

Disposal of Two 500-kVA Indoor Transformers

THE above Council has for disposal two 500-kVA Indoor Type Transformers. These can be viewed by appoint-ment and a schedule obtained at the Woolwich Generating Station, Bellwater Gate, Woolwich. Tenders should be submitted to me in a plain envelope, endorsed "Tender for Transformers," and delivered not later than 12 noon on Friday, 7th December, 1945. The Council do not bind themselves to accept the highest or any forder.

Town Hall, Woolwich, S.E.18. 25th October, 1945. DAVID JENKINS. Town Clerk. 3361

SITUATIONS VACANT

None of the vacancies for women advertised in these columns relates to a woman between 18 and 40 unless such woman (a) has living with her a child of hers under the age of 14, or (b) is registered under the Bind Persons Acts, or (c) has a Ministry of Labour permit to allow her to obtain employment by individual effort.

ASSISTANT MAINS ENGINEER

A PPLICATIONS are invited from Graduate Members of A I.E.E., who must have experience in the laying, jointing, testing and maintenance of 3-phase E.H.T. and L.T. cables and overhead lines, maintenance and operation of static substations (indoor and outdoor types), and keepof static substations (indoor and outdoor types), and keep-ing the necessary records in connection with the above. This is a small Urban and Rural Undertaking in South-West England, where the housing problem is acute, and preference will be an advantage. Salary £360 per annum. Apply, giving full details of age, technical and practical training, whether married or single, to Southern Areas Electric Corporation Limited, 37, Alexandra Read, Epsom.

Surrey. The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy. 3379

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COUNTY BOROUGH OF BARNSLEY

Appointment of Borough Electrical Engineer and Manager

A PPLICATIONS are invited for the appointment of Engineer and Manager of the Council's Electricity Undertaking, incorporating the Public Lighting Department, from Corporate Members of the Institution of Electrical Engineers experienced in the management and administration of an electricity undertaking. The starty for the position will be in accordance with the Agreement dated 9th July, 1941, made by the National Joint Committee of Local Authorities and Chief Electricity or the first year 85% of the full salary and for the second variant sector of the Electricity Supply Industry, namely, for the first year 85% of the full salary and for the second variant year ending Alst March, 1946, will be \$1.157.
The appointment will be determinable by three months' notice in writing on either side and will be subject for het, 1937, and to the successful applicant passing astistatorily a medical examination to be conducted by the Council's Medical Officer of Healt.

Council's Medical Officer of Health. Applications, on forms to be obtained from the under-signed, must be accompanied by copies of three recent testimonials, and delivered to my office not later than the 24th November, 1945, in envelopes endorsed "Elec-trical Engineer and Manager." Canvassing, directly or indirectly, will be deemed a discupition

disgualification.

The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

A. E. GILFILLAN. Town Clerk

Town Hall, Barnsley. • October, 1945. 3311

BATTERSEA BOROUGH COUNCIL

Electricity Department

A PPLICATIONS are invited for the position of SHIFT CHARGE ENGINEER at the Council's Generating Station, the present capacity of which is 50,000 kW, and is a "Selected" Station.

Applicants must have had a sound training in mechanical and electrical engineering and experience in the operation of a modern generating station equipped with large turbines and boilers

and boilers. The salary will be on the National Joint Board Scale. Class G, Grade 8, at present £441 per annum, subject to deduction for superannuation. The successful applicant will be required to pass a medical examination. Applications in writing, giving full particulars of age, training, experience, present appointment and position under the National Service Acts, should be accompanied by copies of three recent testimonials, and sent not later than Monday, 3rd December, 1945, to Mr. H. F. J. Thomp-son. M. I. E., General Manager and Engineer, Electric House, 204, Lavender Hill, Battersea, London, S.W. 11. The Ministry of Labour and National Service, Technical and Scientific Register, have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

of this vacancy.

R. G. BERRY, Town Clerk. 3362

BOROUGH OF SALE

5th November, 1945.

Electricity Department

Plumber Jointer

THIS advertisement is published by permission of the Ministry of Labour and National Service Ministry of Labour and National Service.
 Applications are invited for the appointment of Plumber

Applications are invited for the vacancies. Applicants are required to be experienced in the jointing of paper insulated lead sheathed cables (Extra High Ten-sion up to 6,600 volts and Low Tension) in streets and substations.

The rate of pay will be in accordance with the Schedule for the District Council No. 3, North-Western Area, Elec-tricity Supply Industry, "A" Zone, at present 26.45d. hour per

Applications, giving age, whether married or single, and details of experience, to be forwarded to the Borough Electrical Engineer, Town Hall, Sale, Manchester. 3393

CITY OF NOTTINGHAM

Electricity Department

Appointment of Three Assistant Shift Control Engineers

A PPLICATIONS are invited from suitable candidates for the position of ASSISTANT SHIFT CONTROL ENGINEER for North Willard Generating Station (Plant Capacity 88.500 kW). Applicants must have experience in the control of large Electric Supply Systems and Parallel Operation of Turbo-Alternator Plant with the Grid System. They must be technically qualified up to at least Ordinary National Certificate in Electrical Engineering and have had a good general engineering experience.

Certificate in Electrical Engineering and have had a good general engineering experience. The salaries for each of the three positions will be in accordance with the N.J.B. Schedule, Class H. Grade 10. Extensions are in progress which will increase the capacity of the Generating Station by 60.000 kW, and which should be in operation by September. 1946. Further extensions scheduled are 53,000 kW for 1947 and 52,500 kW for 1949.

The appointments will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidates will be required to pass a medical examination.

Applications, giving full details of training and experi-ence, and including not more than three testimonials, must be delivered to the undersigned by Friday. November 30th, 1945, and must be endorsed "Assistant Shift Control Perminner"

Engineer.' The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945. for the advertisement of these vacancies.

J. E. RICHARDS, Town Clerk November 7th, 1945.

HAMMERSMITH METROPOLITAN BOROUGH COUNCIL

Appointment of Chief Electrical Engineer

A PELICATIONS are invited for the appointment of CHIEF ELECTRICAL ENGINEER. Salary (which will be inclusive) in accordance with the agreement respect-ing salaries of Chief Electrical Engineers made by the National Joint Council of Local Authorities and Chief Electrical Engineers for the Electricity Supply Industry. commencing at 85% of scheduled salary for first year. 92% for second year, rising to full salary in third year. (Present full scale salary £1,780 p.s.) Candidates must be fully qualified Electrical Engineers and have had practical experience in the administration

and have had practical experience in the administration and management of an Electricity Supply Undertaking, particularly its commercial side.

Particulars of duties and conditions attaching to the appointment are obtainable from the undersigned upon receipt of a stamped addressed foolscap envelope. Closing date for receipt of applications, 30th November.

1945

W. H. WARHURST.

Hammersmith, W.6. October, 1945.

Town Hall.

Town Clerk.

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LINCOLN CORPORATION

Electricity Department

Appointment of Senior Demonstrator

BY permission of the Ministry of Labour and National Service, under the Control of Engagement Order, 1945. Applications are invited for the position of FEMALE SENIOR DEMONSTRATOR for the above Department. Applicants must have a good knowledge of cookery and having co-operated with the Winistry of Food will receive special consideration. Salary in accordance with the Corporation's scale, \$150-\$200 + bonus at present 548 22. Applications, giving full particulars, stating age, whether married or single, should be addressed to the undersigned not later than the 1st December, 1945. F. NEWERY, M.I.E.E.,

Electricity Department, Brayford Side North, Lincoln.

F. NEWEY, M.I.E.E., Engineer and Manager.

3380

BOROUGH OF ACCRINGTON

Electricity Department

Appointment of Technical Assistant

A PPLICATIONS are invited for the appointment of Technical Assistant at the Corporation's Electricity Works, at a salary in accordance with Grade 8, Class F, of the Schedule of Salaries of the National Joint Board for imployers and Members of Staff for the Electricity Supply Industry (commencing salary £397 per annum, rising to a maximum of 4412 per annum in four years). Candidates must be experienced in draughtsmanship, cherrating costs, and main and substation layouts, and must possess the Higher Grade National Electrical Engi-neering Certificate. The appointment is designated as an established post-under the Local Government Superannuation Act, 1937, and the successful cerandiate will be required to pass a medical examination. Applications, stating age, qualifications and particulars

Applications, stating age, qualifications and particulars of experience, and accompanied by copies of two recent testimonials, must be forwarded so as to be received by the under-named not later than Friday, 30th November,

The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

P. D. WADSWORTH. Town Clerk.

Town Clerk's Office. Town Hall, Accrington, Lancs. 10th November, 1945.

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BOROUGH OF LEYTON

Electricity Department

Appointment of Mains Superintendent

A PPLICATIONS are invited for the above appointment from electrical engineers who have had considerable layout, operation and maintenance of H.T. and L.T. systems, including static and rectifier substations from 6.000-voit bulk supply. Also administrative experience and knowledge of street lighting. Corporate Membership of the Institution of Electrical Engineers is desirable. Salary in accordance with Grade 3, Class F, of the National Joint Board Schedule, at present £612 3s. per annum.

annum.

annum. The appointment will be subject to the Local Govern-ment Officers Superannuation Act. 1937, and the successful applicant will be required to pass a medical examination. Applications, endorsed "Mains Superintendent." stating are, qualifications and experience, accompanied by copies of three recent testimonials, should be delivered to the Borough Electrical Engineer and Manager, Electricity Offices, Cathall Road, Leytonstone, E.11, not later than Monday, 3rd December, 1945. If the successful candidate is serving with H.M. Forces application for his release will be made immediately. Canvassing, directly or indirectly, will disqualify. D to DECORDE

ctly, with disc. D. J. OSBORNE, Town Clerk, 3348

Town Hall. Leyton, E.10.

COUNTY MENTAL HOSPITAL, CHESTER

A PPLICATIONS invited for post of DEPUTY to the presence of th

BOROUGH OF WATFORD

Electricity Department

Appointment of Control Engineer

A PPLICATIONS are invited for the above position, which comprises operation of the main 3-phase switchboard at the Generating Station on a regular rota

switchboard at the Generating station on a regular rola of shifts. Applicants should possess a sound technical training and have had experience in the operation of large E.H.T. switchgear, preferably connected to the Grid system. The salary payable will be in accordance with the N.J.B. Schedule, plus 5% London Area, at present £342 6s. per annum.

annum. The successful candidate must pass a medical examina-tion and contribute to the Council's Superannuation Scheme under the provisions of the Local Government and Other Officers Superannuation Act, 1937. Applications, stating age, full particulars of training and positions held, together with copies of three testi-monials, endorsed "Control Engineer," must be addressed to the undersigned so as to be received not later than Monday. 26th November, 1945. Published by permission of the Ministry of Labour and National Service under the Control of Engagement Order.

A. W. BARHAM. Chief Engineer and General Manager.

Electricity House. The Parade, Watford. 6th November, 1945.

3359

DRAUGHTSMAN DESIGNER, who has been through the shops, required to take charge and develop the Drawing Office and Design Department of a Light Engineering and Electrical Manufacturing Works situated on the South Coast. Electrical know-ledge an advantage, and education up to Higher National Certificate or Degree standard. About 150 operatives are employed. The job offers scope and prospects to a man who is not afraid to work in a small firm. Age preferably between 25 and 40. Com-mencing salary £416 p.a. Applications from Class A ex-Servicemen and others exempt from M.O.L. con-trol only.—Box 7965, c/o The Electrical Review.

RAWLINGS BROS. LIMITED (Established 1887)

 $R_{\rm Class}^{\rm EQUIRE}$ Radio Service Engineers and Electricians. Class A ex-Servicemen and those not subject to Control of Engagement Order invited to apply to—

H. J. Rickman, RAWLINGS BROS. LIMITED, 85, Gloucester Road, S.W.7 (opposite Gloucester Road Station). 3302

AN experienced Estimating and Supervising Engineer required all branches lighting and power distribu-tion schemes, preparation of specifications. Permanency, good prospects. Applications only from those exempt from the provisions of the Control of Engagement Order. 1945.—B. French Limited, 79, Broad Street (entrance Sheepcote Street), Eimingham. 3408 AN old-established company in the London area, manu-facturing telephone cables, requires an engineer with control of personnel, in the capacity of Assistant Works and the first requisite, as the company will arrange facilities for a period of special training. The prospects are excellent and a salary commensurate with the experience and qualifications of the selected applicant will be paid. The appointment is permanent and pension-able.—Box 3349, c/o The Electrical Review. AMATURE Winders, experience of all classes A.C. and D.C. jobs. Class A ex-Servicemen or otherwise exempt M.O.L. control. Permanentics for suitable men-service Electric Co. Ltd., Abbey Mig. Estate, Alperton. Telephone, Wembley O184. ASISTANT Works Engineer required for industrial in mechanical and electrical engineering. Builders' experi-ence an asset. Applications from Class A ex-Servicemen ad undertaking Outer London area. Experience essential modenical and electrical engineering. Builders' experi-ence an asset. Applications from Class A ex-Servicemen ad salary required. to—Box 7904, A.K. Advg. 212x. Shaftesbury Avenue, W.C.2.

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ELECTRICAL REVIEW

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