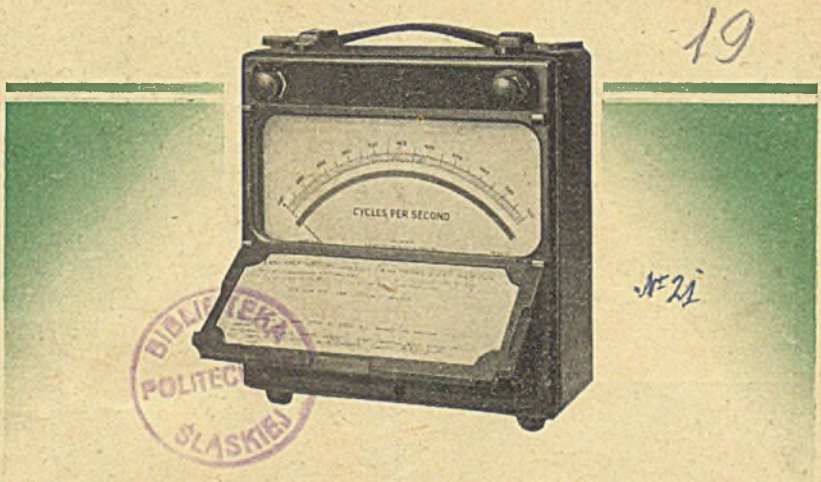
THE

ELECTRICIAN

THE TECHNICAL NEWSPAPER OF THE ELECTRICAL INDUSTRY



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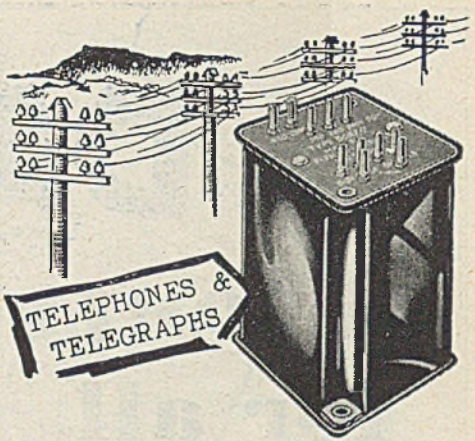

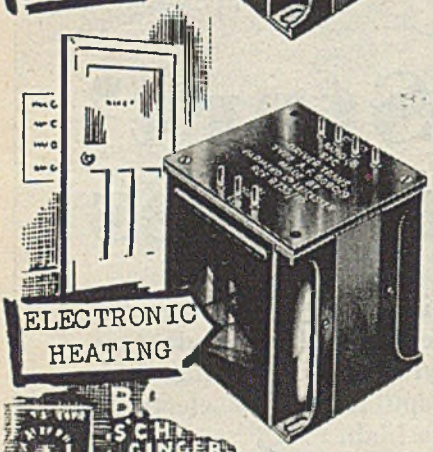

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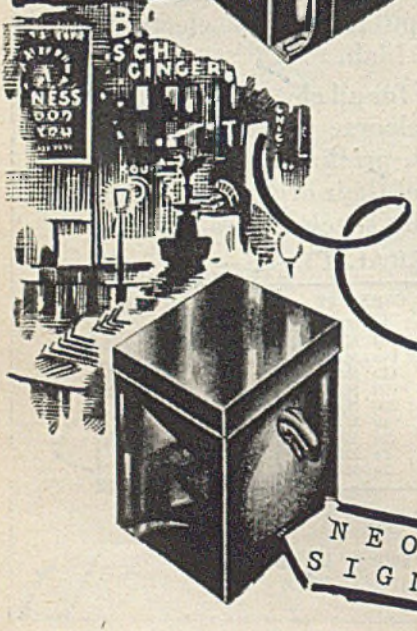

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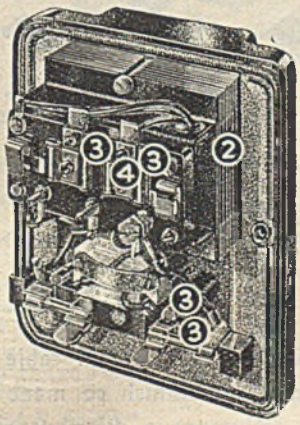

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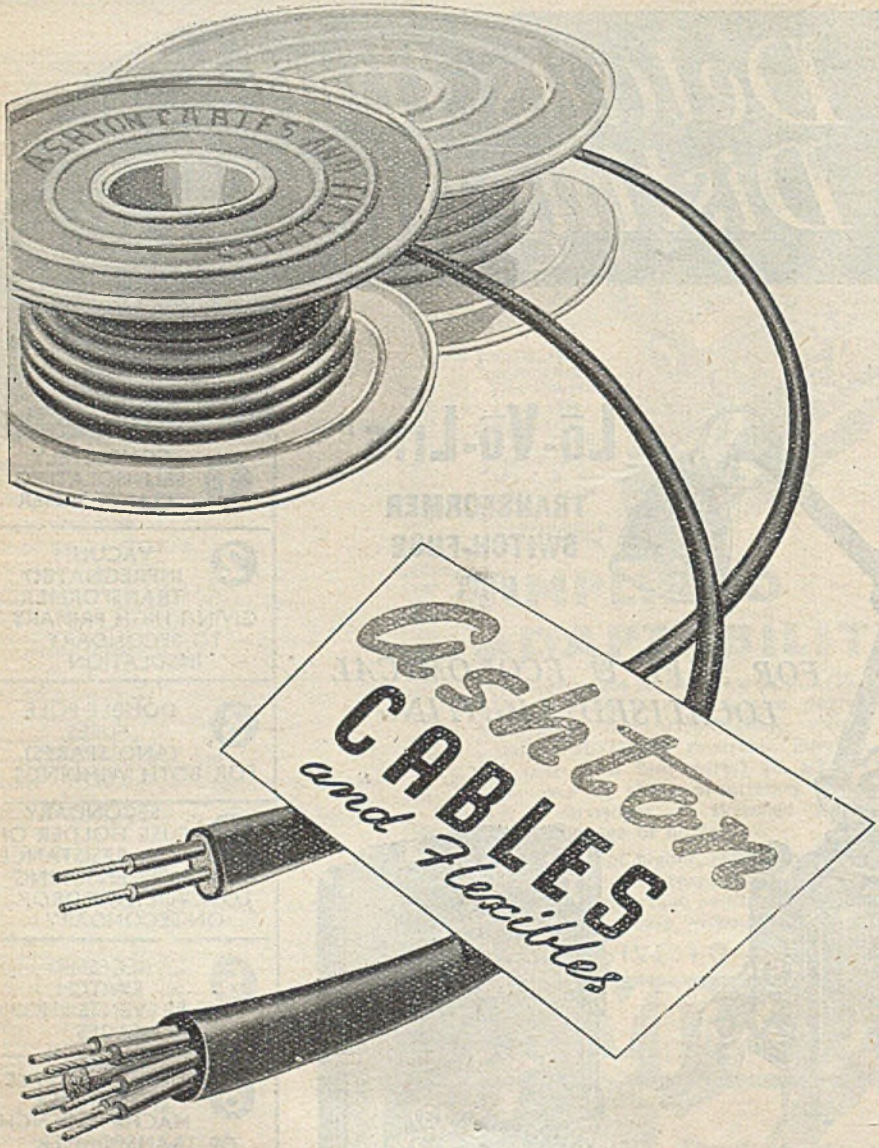

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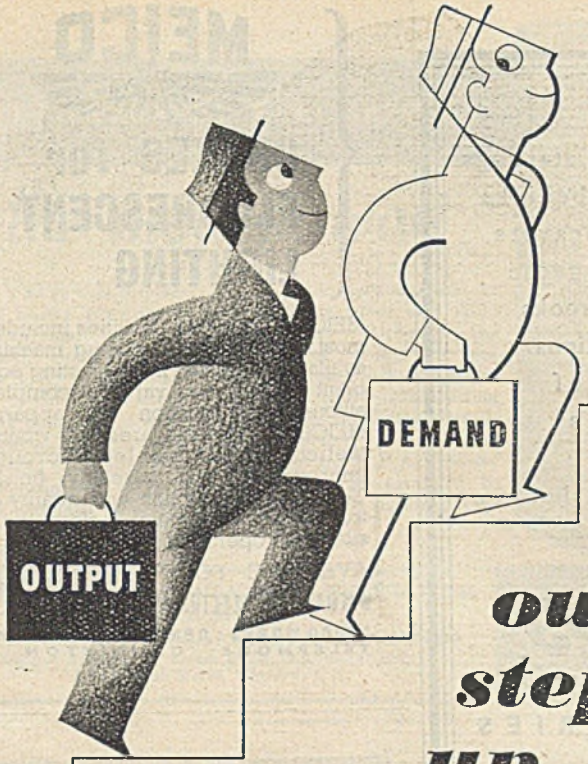

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Salary in accordance with Class "M," Grade 8, of the N.J.B. Schedule, commencing at £635 per annum. Applicants must possess an engineering degree or equivalent technical qualifications admitting to corporate membership of the Institution of Electrical Engineers, and have had experience in the administration of the Consumers' Department of a large electricity supply undertaking, including correspondence office, installation inspectors, consumers' fault service, appliance repair workshop and stores.

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Salary in accordance with Class "M," Grade 9a, of the N.J.B. Schedule commencing at £478 per annum. Applicants must have had experience in the installation and maintenance of electrical installations for lighting, heating and power in the Electrical Contracting or Supply Industry and be able to prepare specifications and estimates for all classes of installation work, to supervise the carrying out of such work and to efficiently control staff. Experience of development work in the domestic, commercial and industrial applications of electricity will be an advantage.

Assistant Mains Engineer.

Salary in accordance with Class "M," Grade 9a, of the N.J.B. Schedule commencing at £478 per annum. Applicants must have had a sound technical training and experience in the control and supervision of navvy gangs and cable jointers engaged in laying and jointing high and low voltage main and service cables.

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The appointments will be subject to the provisions of the Local Government Superannuation Act, 1937. Applicants must preferably be not more than 40 years of age or have had previous Local Authority Service carrying transfer value within the meaning of the Act. The selected applicants will be required to pass a medical examination.

Applications, on forms to be obtained from the undersigned, are to be returned to me not later than the 30th June, 1947, accompanied by copies of not more than three recent testimonials. When applying for Application Forms, state for which appointment a form is required.

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General Manager and Engineer
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APPLICATIONS are invited for the post of Lecturer in the Electrical Engineering Department. Salary £450 - £15 - £700.

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Further particulars and form of application obtainable from Secretary.

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Applications stating age and giving full details of education, technical and practical training and experience should be sent to the undersigned not later than the 2nd July, 1947.

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Salary will be in accordance with the Burnham Technical Scale (£300 - £15 - £525) with additional graduate and training allowances. Commencing salary depends upon previous industrial and teaching experience.

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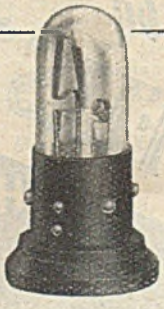

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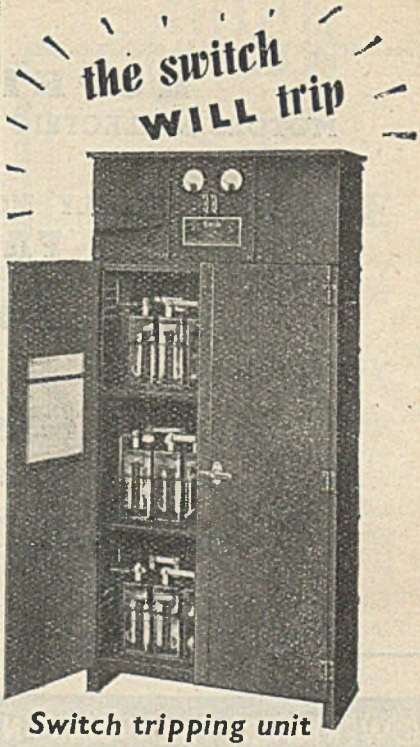

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Angle iron and sheet steel construction, designed for floor mounting or wall fixing. The cabinet consists of a main battery compartment enclosed by steel doors with three shelves and a trickle charge rectifier compartment located at the top. Wood cabinets can be supplied if preferred.

Trouble develops somewhere on the network: the fault-finding relay locates the trouble: a battery trips the switch. That is the system. An infallible system—if battery and equipment are infallibly reliable.

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THE

ELECTRICIAN

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Quality of Coal

THAT the rising figures of coal production should be accepted with reserve has already been voiced by the electrical industry, and disguised reference to this fact was made last week by no less an authority than Lord HYNDLEY, chairman of the Coal Board.

The supply industry has long complained that the coal distributed for consumption in power stations is of poor quality, while in these columns attention has been drawn on many occasions to the fact that the official coal output figures are invariably inclusive of dirt released with the coal, and do not, therefore, represent as true a picture of production as they ought. When speaking at the annual luncheon of the Coal Merchants' Federation last week, Lord HYNDLEY referred to this dirt and admitted that so great is the room for improvement that the Board has taken measures to reduce its volume by installing new cleaning plants.

Such a statement, coming from so high an authority as the Chairman of the National Coal Board, gives confirmation of the fact that the official figures issued by the Ministry of Fuel with respect to coal output cannot, as we surmised, be regarded as an indication of the true position, neither can they be accepted as such until the amount of dirt included with the coal is so low in percentage that the supply industry is no more aware of it than was the case pre-war.

Where coal is concerned, quality is almost as important as quantity, and in that connection the supply industry has on many occasions been embarrassed

by the effect of present standards and their high ash content upon boiler operation. The average ash content to-day is probably 5 per cent. higher than in 1939, and boilers at some stations have because of it, been shut down for cleaning after less than 1 000 hours duty on account of the deposition of solid matter on the heating surfaces. This reduction in boiler availability due to unsuitable coal has during the last two winters, had a most marked effect upon the generating capacity of the supply industry, despite the fact that the boiler plant installed in recent years has been designed to operate on a wider range of coal qualities than was previously customary. In 1945 the total loss of output capacity due to inferior and unsuitable coal was about 350 000 kW, last year the figure of 380 000 kW was reached on occasion and unless there is a substantial improvement in coal quality by next winter, future load shedding will be such that by comparison, that already experienced will be relatively small.

Engineering and Research

THE announcement that there is to be set up a special organisation to conduct scientific research in mechanical engineering at an expenditure reaching eventually £250 000 a year will have been read with interest. Explaining the purposes of the new undertaking, Sir EDWARD APPLETON, secretary of the D.S.I.R., under whose guidance it will operate, said that the organisation is intended to supplement the work of other research bodies in the country and its work will largely be confined to the fundamental problems underlying all mechanical engineering. The location of the research station has not yet been decided, but much of the work will meanwhile be carried out at the N.P.L. Dr. G. A. HAWKINS, superintendent of the engineering division of the latter laboratory, has been appointed director of the new organisation and he will be advised by a board presided over by Dr. H. L. GUY, secretary of the Institution of Mechanical Engineers. The members of the board will give their services free. Many of the problems concerned with mechanical engineering are common to electrical progress, particularly in power station design, heat transfer, thermo-dynamics, and so on, and the work of the new body will be followed with brotherly interest.

An Overseas Complaint

A NUMBER of overseas subscribers to THE ELECTRICIAN have complained in recent weeks of the fact that letters addressed to some British firms and containing trade inquiries have not always received acknowledgment. Those familiar with conditions obtaining in this country to-day, and firms whose order books are full for some months ahead, will appreciate any reluctance to enter into fresh commitments, but even so, acknowledgment of receipt of an inquiry is a courtesy which, though costing little in effort, may do much to preserve goodwill. Some well-known organisations have, in the circumstances, had circular replies printed, explaining briefly the present supply difficulties and advising the inquirer that his interest has been noted for attention at the earliest opportunity. Such a "form" letter presents very little trouble and the wisdom of its employment is dictated by every consideration of courtesy and business prudence. As several of our overseas friends have remarked, the present "sellers' market" is highly artificial and to prejudice goodwill by failing to give inquiries the attention normally expected, is not in the best interests of British industry in general.

Diesel Sets for Export

IT will be recalled that in THE ELECTRICIAN of May 16 details were given of a scheme whereby certain manufacturers of Diesel-electric generating plant agreed to accept official guidance in the sale and placing of their products, in the hope that by so doing a substantial percentage of the industrial load now carried by the grid might be transferred to privately-owned plants and the national generating capacity be relieved by a like amount. It now appears that some of the manufacturers of Diesel-electric sets whose business is outside the scope of this official arrangement are in doubt as to the effect which the scheme may have upon export trade, for while the prospects of bigger sales abroad are excellent, the position with respect to raw materials is not clear.

Manufacturers of plant for working under the Government arrangement have been told by the Ministry of Supply that their requirements for raw materials rank next in priority to those of the heavy plant makers and the manufacturers of Diesel-electric sets for shipment abroad are, therefore, wondering where about in the queue they now stand. The position is, we understand, under review by the Ministry and an early decision is hoped for.

Demonstration of Atomic Energy

AT the conversazione of the Royal Society at Burlington House last week, visitors were treated to a number of interesting scientific exhibits and demonstrations, but perhaps the most spectacular was that prepared by the Science Museum, South Kensington, which, by means of a model, illustrated the release of atomic energy by uranium chain reaction. The model was made up of 30 units, each representing the nucleus of a uranium atom. When a nucleus is hit directly by a neutron, the result is to split the nucleus in two and to release three fresh neutrons, one at least of which is likely to strike another nucleus. In the model, three table-tennis balls represented these three neutrons in each unit. A single ball was dropped on to the first unit, which broke in two and released its three balls, and these served to release, in turn, the balls in other units. When the model was worked all but two units were so affected within 10 seconds.

"Operation Plant"

THE production of heavy electrical plant, which has been given first priority by the Government, is, it was stated at a Press Conference in London on Tuesday, being treated as a war operation by the Ministry of Supply, and a new organisation has been set up, with Mr. V. A. G. LAMBERT, now Director General of Armament Production, at its head, to ensure, among other things, that manufacturers obtain all necessary materials and components, and to assist in the solution of labour and other problems. Included in the structure of the organisation are the Directorate of Power Station Equipment, the Directorate of Mining Equipment and the Directorate of Royal Engineer Equipment (including coal/oil conversion plant). The directorates have commenced operations and a report on the progress made is promised in a few months' time. Shortage of steel, particularly of electric sheet steel, provides a major problem. The current output of such metal covers little more than half the total demands of all users, and as the prospect of a material increase in supplies is remote, the amounts hitherto available for less essential manufactures will be reduced, so that the full requirements of the heavy electrical industry may be met. There are reasonable grounds, the Ministry state, for hoping that the position may be eased to some extent in the last quarter of the year.

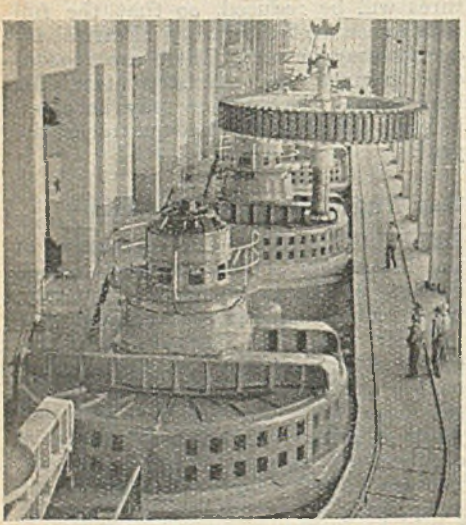
Gas Engineers and Electricity

DELEGATES to the annual meeting of the Institution of Gas Engineers which opened in Birmingham on Tuesday, were treated to a highly interesting paper by Mr. G. M. RIMMER, electrical engineer, Birmingham Gas Department, on the applications of electricity in the gas industry. During the past few years, a great deal has been heard of electrical development, but, in general, the gas industry has been rather tardy in applying its advantages, and has not kept abreast of recent electrical practice. The motor as a prime mover, for instance, is gradually superseding the steam and gas engine in most walks of industrial life, but not all gas engineers are yet convinced that electric power can be as realiable as steam. Where electrification has been carried out it is usually done in so haphazard a manner that the service has little semblance of efficiency or reliability, and many vital drives are still powered by relatively inefficient, but reliable, steam or gas engines in consequence. The paper explains to gas engineers how electricity will assist them in their search for increased, all-round, thermal efficiency, and at the same time points out that the design, application and maintenance of electrical plant and its associated equipment demand the services of a qualified electrical engineer, working alongside his gas counterpart. Any prejudice against such a liaison should, in the view of Mr. RIMMER, be completely forgotten.

The Winnipeg Hydro-System

Demand Outstripping Plant Capacity

FEARS that the demand for electric power in Canada will increase at a rate greater than new plant can be installed to meet it are expressed in the annual report on the City of Winnipeg Hydro-Electric System, covering the year's working to December 31, 1946. A critical problem of unusual national and local importance now faces the electrical industry throughout Canada, the report states. Canadian manufacturers of power plant equipment are already loaded with contracts, and can only accept new business on a basis of excessive delivery times. These conditions are held to emphasise the necessity for long-term planning and making commitments for major constructions projects considerably in advance of that which has previously been the practice.



The interior of the Slave Falls power house, showing a rotor ready to be lowered into position in one of the four new 12 000 H.P. *units.*

During the year, although the demand established a record for the Winnipeg undertaking, all power requirements of the city were supplied. Extensions to the Slave Falls hydro-electric power plant, however, were affected by delay in the delivery of switching equipment, and two new 12 000 H.P. turbine-generator units were, as a result, only temporarily connected.

Two further generators, for which the draft tubes have already been constructed, are scheduled for delivery this year, and it is expected that by the end of 1947 the four new 12 000 H.P. units will be permanently in service and the entire development plan completed.

While these extensions have been in progress, the operating voltage of half the Slave Falls transmission circuits has been raised from 66 kV to 132 kV; the remainder of the circuits will be changed over this year.

Recording an increase of 5 per cent. in units generated, from 683 084 680 kWh to 717 320 823 kWh, the report states that the 1946 operating profit of $1 001 041 was the largest in the history of the undertaking. A sum of $267 850 was contributed to the general tax fund of the city, bringing the total of such contributions to $2 727 950.

An analysis of units sold shows that, although commercial and industrial sales made substantial gains during the year, the main increase in consumption was in domestic premises. The units used per annum in the average home increased by 293 to 5 942 kWh, bringing an average revenue of .785 cents per kWh. Other average revenue per kWh ranged from .083 cents for off-peak steam heating by electric boilers, to 2.174 cents for lighting on commercial premises. The overall average revenue per unit, for all classes of consumers, less electric boilers, was .852 cents, and, including boilers, .661 cents.

Among the other revenue-producing activities of the undertaking, sales of electrical merchandise made a profit of $69 012, as compared with $4 611 in 1945. The supply of cookers, refrigerators and other domestic appliances, however, fell short of demand, especially in the smaller sizes, but it is hoped to remedy this condition during the present year.

With a city population of 231 203, the undertaking had, at the year's end, a total of 119 671 services connected, this representing an increase of 4 500 during the year. The peak system load was 141 957 H.P.

The city's steam heating system, serving 306 consumers, showed a net profit on the year's working of $62 201, compared with $50 472. Total steam production was 536 804 222 lbs., of which nearly 60 per cent. was generated from off-peak electricity. The fuel used by the steam-heating system was 14 387 tons of coal and 105 831 000 kWh of electricity.

Electricity and the Farmer

Composite Equipment Displays at Belfast and Bath

AT the show organised by the Royal Ulster Agricultural Society and held last week in Belfast, the Electricity Board for Northern Ireland arranged a large composite display entitled "Electricity for the Farmer and His Wife." Most of the Ulster farmers have not yet an electricity supply available and they may have to wait some years before they can take advantage of the equipment now being produced. But in the meantime, the Board looks upon the work of educating the farmer in the advantages of electricity, as a sound investment and, certainly few farmers can have visited the show without being deeply impressed by what the equipment manufacturers have achieved and how well they have understood their problems.

Electric boilers, sterilisers, milk coolers, milking machines, including a two-unit milk recorder made by Gascoignes (Reading) Ltd., showed the milk producer what he could gain by the full use of electric power. For the poultry farmer there were incubators, brooders and houses. A grinding mill made by Lipton Products Ltd., for the preparation of stock food was shown, while for the market gardener the G.E.C. have produced a soil warmer, which was exhibited.

For the farmer's wife there were space heaters, irons, lighting fittings, cookers, dish washers and washing machines. Two different types of fully-equipped electrical kitchens were also shown. The British Electrical Development Association were associated with the Board in preparing the exhibition and the Belfast electricity department, the Londonderry electricity department, and the Antrim Electricity Supply Co., were represented on an information stand.

A number of manufacturers of electrical equipment had stands in the industrial section of the show, organised by the Ulster Industries Development Association, and in other show stands. These included Air Conditioning and Engineering (N.I.) Ltd. They had on exhibition a large range of domestic and industrial fans, a heat distributor for the home with two 1 kW open-wound elements, a unit heater designed for factory work, and a hot-air hand drier. R. A. Lister and Co., Ltd., showed an electrically-driven cattle-clipping machine, a domestic electric pump and two generating sets suitable for farm powering. Hoover Ltd., had a new cylinder cleaner of pleasant design and a new fractional horse power motor. Vaccar, Ltd., displayed electrical milking machines.

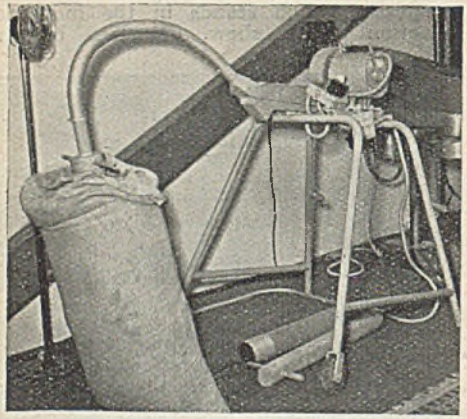
The DUKE OF GLOUCESTER *and* MR. G. E. TAYLOR, *of the Wessex Electricity Co., at the Bath and West Show*

On the Electricity Board stand a cooker manufactured by Moffats Ltd., incorporated a new type thermostatic control new to this country, although already established in Canada and the U.S.A.

Another show at which the electrical services available to the farmer and his wife were admirably illustrated, was that held by the Bath and West and Southern Counties Society at Cheltenham last week.

The E.D.A. stand at the Bath and West Agricultural Show, Cheltenham

In the first two days more than 50 000 people attended the show, and among the visitors on the second day were the Duke and Duchess of Gloucester, who walked through the large marquee of the British Electrical Development Association accommodating what was judged to be the best and most comprehensive display of electrical equipment and appliances for the farm and home staged at any show since 1939. It was a joint exhibit by the electricity supply authorities in the South-West England and South Wales (Southern) area of the association, and much interest was aroused by practical demonstrations of many applications of electricity. These included repairs to farm machinery by means of a portable welding plant, the conditioning of cereals and seeds by a portable dryer, egg testing, milk bottling, fruit bottling by an electric steriliser, clothes washing, dish washing, and the use of vacuum cleaners and other domestic labour-saving devices.



A grain conditioner seen at Cheltenham

The operation of the Jeans Spear immersion seed conditioner was watched with particular interest by many farmers. The machine consists of an electrically-driven blower which forces hot or cold air through bags of seeds from which moisture is to be removed. The blower outfit, heating unit and the flexible connection to the spear through which the air is forced, are mounted on a portable frame which can be wheeled over rows of sacks filled with seed or grain. A perforated metal sheath is driven from the top, through the centre of each sack of seed and the air-circulating spear can be dropped into each in turn along a whole row. The blower is operated by a ¼ H.P. electric motor and the air passes over two sets of 2½ kW heating elements, which can be switched on singly or together. A thermostat can be set to give heat control from 70° to 190° F. The machine is provided with a 30 A plug for a 230 V single-phase supply, and the cost of running at 1d. per unit is given as 1½d. an hour. It is claimed that it will reduce the moisture content of a cwt. sack of seed from 18 to 14 per cent. in half an hour.

Also for the farm were shown electrically-operated pumps, with automatic control, for water supply; an 18 kW electric steam boiler with fully automatic heater feed arrangement, 230 V single-phase; a wet and dry food mixing machine; a 16 ft. portable Michigan conveyor elevator; a 5 cwt. "Minor" electric chain pulley block-hook suspension hoist, with push-button control; a Teles "Economil" portable electric chain saw; an Essex hammer mill, complete with bin and hopper; and in the dairy section a milk cooler capable of dealing with 25 gal. per hour; a 100 cu. ft. model dairy cold room; two bucket-type demonstration milking units, 1 H.P., 230 V, single-phase; a 27 cu. ft., 6 kW, sterilising chest; a 20 kW floating electrode steam raiser; and a milk bottling machine.

In the horticultural section were to be seen an "Electrocult" soil steriliser; a "Loheat" electric soil warming frame; and an electric hedge trimmer.

Another popular section was that arranged for the benefit of the poultry farmer. This included the "Glevim" 150-egg incubator; a 150 type "B" hover; a conversion hover and a 400 battery brooder; a "Dulrae" poultry board; a 200-chick size all-metal thermostatically-controlled electric brooder, and other apparatus for poultry rearing.

From the interest shown and the many inquiries made it was obvious that there is a large potential market for electrical equipment among the farming community of the West Country.

The Cheltenham, Gloucester, Bath, Taunton, and Bristol electricity departments, and the North Somerset, Wessex, S.W.S., West Gloucester, and Exe Valley electricity companies co-operated in staffing the stand.

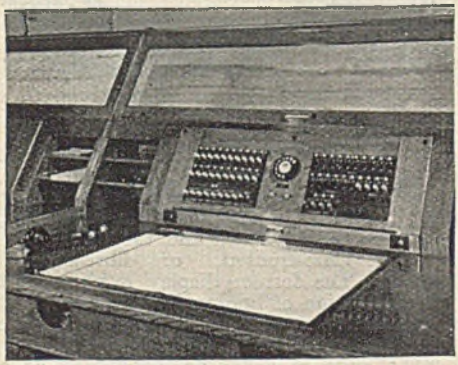
Among other exhibitors were the following: The British Vacuum Cleaner and Engineering Co., Ltd., Goblin Works, Leatherhead, Surrey, showing sack cleaning plant, a full range of portable vacuum cleaners and heavy duty vacuum cleaners for industry. Workman Reed and Co., Ltd., Bristol: Petrol engines for electrical generation, compressors, etc. R. A. Lister and Co., Ltd., Gloucester: electrically driven "Domestic" pumping set, an electric dairy boiler, electrically-driven bottle washing machine and domestic electric appliances.

Railway Traffic Control

L.N.E.R. Installation in the Edinburgh District

A MODERN traffic control telephone system put into operation by the L.N.E.R. on October 13, 1946, at the Edinburgh District Control Office, and situated in the office of the District Superintendent, Waverley Station, serves the area from Berwick and Carlisle in the south, all the intermediate branch lines and goods yards, the Edinburgh area, and to Ratho and Forth Bridge in the west.

The new system replaced one that had been in operation since May, 1916, in which all the circuits were operated on a code calling basis and, in addition to being used for control purposes, were also used for inter-communication working; discrimination being achieved by using magnetically polarised calling relays on the way-station instruments as well as at the control. As the majority of these circuits were in the



Control office; chief controller's position

southern part of the area, a manual exchange was located at Portobello on which were terminated the omnibus circuits, and an operator completed the connection to the control over five junction lines. Although the junction lines were multipled over all the keyboards at the control, each junction was allocated to a particular controller, the flow of work being regulated by the Portobello operator.

To meet modern requirements both from a control operating and a telephonic point of view, it was decided to adopt a system of selective calling together with a reorganisation of controllers' sections, improved graphing methods and other administrative changes, and as additional cir-

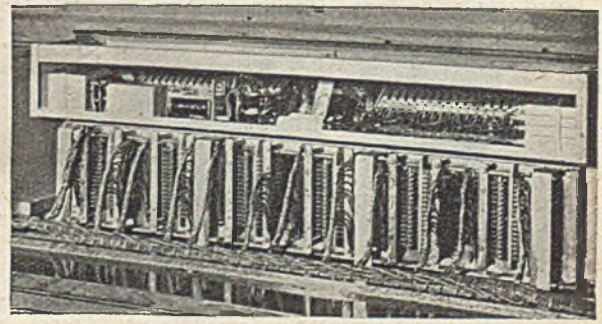
Section controller's position

cuits were being provided, the manual exchange at Portobello was abolished.

The total number of circuits connected to the new control system is: selective calling lines, 19 working and 1 spare; battery calling lines, 17 working and 3 spare; automatic extension lines, 4 working and 2 spare; from local railway P.A.B.X.

The selective calling circuits are arranged for control purposes only and are not used for intercommunication between stations. Most of the old battery-calling circuits have been retained for this purpose and those connected to the new system are used for less important work and in some cases form duplicate circuits for emergency. A telephone concentrator keyboard has been provided at Portobello on which most of the above-mentioned battery calling omnibus circuits are terminated for telegraph and commercial purposes.

It was apparent when deciding upon the equipment to be provided that while 20 selective lines were required, it would only be necessary to signal on a relatively small



Back view of jack field of control

number of circuits at any one time, and consequently only a small number of transmitter units would be required. It was finally decided to

View of the plant section

provide five such units associated with line finders, all being universally available for use on any selective circuit. This has the advantage that the failure of one transmitter will not render any line inoperative since the faulty transmitter can be moved leaving the remaining four to share the traffic.

The line finder principle employed differs from the normal in that sixteen keyboards are required to connect a transmitter with any one of twenty lines. Apart from the reduction in the number of transmitters and the employment of line finders, the system operates on the constant total impulse method already in use in many places: Great Britain, U.S.A., Europe, Australasia, India and China, etc.

The main control room is furnished with desks erected in the centre of the room, placed back to back, accommodating the section and specialist controllers. At the end of the main suite are two desk positions, one for the deputy chief controller and the other for his clerk. The plant section which is in an adjoining room is equipped with two further desks.

Each position is equipped with a keyboard employing lamp signalling and each circuit is provided with a connecting key a calling lamp and a busy lamp, and as all keyboards are multipled, the operation of any connecting key lights the busy lamp on all positions for that particular circuit. In addition, a dial is provided for selecting way-stations on the selective circuits and for dialling on the local railway and public automatic exchanges. Push-keys are also provided for code calling on the battery-call omnibus lines and the handles of the connect keys are coloured to indicate the various types of circuits.

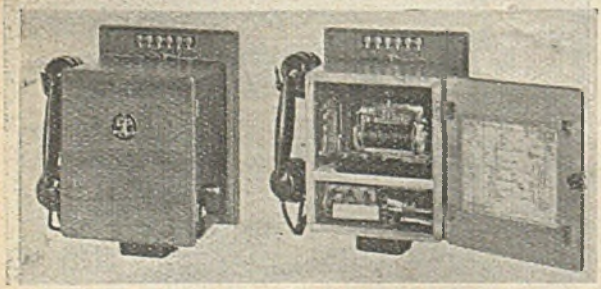
The keyboards are placed at the back of the desk assemblies, forming an integral

Specialist controllers' and assistant controllers' positions

part of the desk. A continuous turret runs the whole length of the main suite, sloping backwards on each side at an angle of 60°; the lower part, at desk level, contains the keyboard and the upper part carries glass-fronted, or fibre-backed, panels. The former display a photoprint of the section of line under supervision of each section controller and the others are used for instructions, notices, etc.

The suite of desks are assembled as a compact unit and as all keyboards are jacked in, a jack field frame was erected prior to the setting up of the desks, to which the permanent cabling is attached. Access to the jack fields is obtained by withdrawing the keyboards.

The section controller's keyboards are only equipped with the circuits covering their respective sections but all other keyboards are fully equipped and all jack fields are so arranged that keyboards are interchangeable. A spare keyboard is fitted in the equipment room and is normally used by the maintenance linemaa for test purposes and in the event of a major repair to any of the keyboards, it is a simple matter to withdraw



Example of way-station instruments

the faulty keyboard and jack-in the spare one. Each section controller's position is also fitted with a glass covered well incorporating a graph holder upon which the position and progress of all traffic is recorded.

Among other operating features introduced into the working of the new system is the principle that all incoming calls to the control are answered by the section controller who, when the calls are for any of the specialist controllers must have means of intimating this to the controller concerned. Several methods were considered to achieve this purpose and it was ultimately decided to incorporate an intercommunication system connected to all keyboards. At the bottom of each keyboard there is a row of double-throw lever type keys with a double lamp indication embracing the group of keys; each position of each key is designated with another keyboard and when a key is thrown it lights the intercommunication group's lamps on the corresponding keyboard and the call is completed by throwing the key on the called keyboard to the required position.

SELECTIVE CIRCUIT CALLING

For setting up a call on the selective circuits the required connect key is depressed, followed by the dial key. Dial tone must be received before dialling is commenced, i.e., until a line finder associates the line with a transmitter. On receipt of dial tone, two digits are dialled corresponding to the called station. These digits being the first and third digits of the constant total, are stored until the dial key is restored to normal. On the restoration of the dial key, the transmitter automatically transmits the three trains of impulses at a constant speed which is independent of dial speeds, and when the way station bell rings a ring back tone is received and is an assurance that the call has been correctly sent. Provision is made on the keyboards for sending out either a general call or a long ring. The general call is not normally used but the long ring is useful when calling stations who may be slow in giving attention.

The way-station instruments of this well-known system are fitted with a high impedance selector in which a ratchet-driven wheel is positioned to ring a particular station under the action of reversed battery impulses at a frequency of 3½ c.p.s. The selector is a polarised relay with a centrally pivoted armature, a negative pulse attracting the armature to one pole face, and a positive pulse to the opposite pole face. The armature movement advances a ratchet wheel, tooth by tooth, against a spring as each successive positive and negative impulse is received. The ratchet wheel has on the same spindle, a code wheel with holes corresponding to the ratchet wheel teeth. The selector is set up to the code required by inserting code pins in the appropriate holes. The selector relay is wound to a resistance of 21 000 ohms and is tuned to 3½ c.p.s. by a condenser resulting in a combination practically immune from false operation. The speech loss due to selectors is, in most cases, considerably less than the loss due to line leakage, enabling a large number of way stations to be connected across a pair of wires.

The code transmitted includes a final period during which the way-station bell rings, after this a final impulse restores the selector to its normal position.

To call the control, all that is necessary is to remove the hand-micro-telephone and after ascertaining that the line is disengaged, the calling key is depressed and if the call is effectively received, a tone signal is sent back from the control.

The battery call omnibus instruments are fitted with 5 000 ohms polarised relays with two calling buttons, one coloured red to call control and one coloured black for interwaystation working.

The telephone equipment room it situated in a basement room two floors below the control room. The apparatus is fitted on two single-sided open type racks of standard pattern, and the batteries in use are for, main signalling 65, lead-acid, 30 Ah cells; apparatus 24, lead-acid, 30 Ah cells; code ringing battery 12, lead-acid, 60 Ah cells; and calling lamp battery 3, lead-acid, 60 Ah cells.

The apparatus was supplied by the Standard Telephones and Cables Ltd., who also installed the apparatus and desks at the control.

Swedish Water Power

SINCE 1939, the output of water-generated power in Sweden has increased from 9 054 kWh to 14 000 kWh and an extensive building programme is in progress. The biggest of the new plants will be the Harspranget station, of 255 000 kW, situated on the Lule River in the Arctic Circle. This station, which is expected to be ready in 1951, will be connected to Central and South Sweden by a transmission line, 970 km. in length.

Power stations are also being constructed on the Indal River, in North Sweden, and the stations, Krangede and Gammelänge, are being extended.

The steam-operated power plant at Västeras is being extended by 65 000 kW.

Electrical Personalities

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

MR. COLIN G. SCOTT was the producer of the light comedy "Nothing but the Truth," successfully staged by the Music and Drama Section of Siemens' Sports Club at their club hall on May 16 and 17. A capable cast comprised R. F. Chapman,

A scene in the play "Nothing but the Truth" produced by the Music and Drama Section of Siemens' Sports Club

R. F. Luff, D. G. Skinner, C. W. Nearn, W. D. Cornwell, G. Millard, Margaret Coffey, Marjorie Killick, Irene Loveless, Irene Hayes, and Doreen Kenchington. The stage manager was W. Womack, with Nancy Cockburn as his assistant. Amongst the audience were Mr. S. W. Lumb, secretary of Siemens Brothers and Co., Ltd.,; Mr. Baker, labour manager; with Mr. Shaw, chairman of the Sports Club, and Mrs. Shaw.

MR. R. D. GLASS has been elected president of the North of England branch of the Association of Mining Electrical and Mechanical Engineers in succession to Mr. J. H. Foster.

MR. G. E. WARDLE, resident engineer of the Mid-Cumberland Electricity Co., has been elected president of the Cockermouth, Cumberland, Rotary Club. He is a founder member, and was secretary in its early years.

COUN. P. H. RENWICK has been elected vice-chairman of the Transport and Electricity Committee of Newcastle-on-Tyne City Council in succession to Coun. H. Simm, who has succeeded the late Coun. R. H. Scott as chairman.

DR. G. A. HANKINS, superintendent of the engineering division of the National Physical Laboratory, D.S.I.R., has been appointed Director of Mechanical Engineering Research. He will be advised by a board of 14 under the chairmanship of Dr. H. L. Guy, F.R.S., a member of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research. Among the members of the board are Sir Claude Gibb (C. A. Parsons and Co., Ltd.) and Mr. M. B. Hoseason (Brush Electrical Co., Ltd.).

MR. E. C. COOPER, of the Sheffield electricity undertaking, has been appointed mains assistant with the Bedford undertaking.

MR. W. GLASS, for several years director and general manager of Johnson and Phillips, Ltd., has been appointed joint managing director of the company, with Mr. G. Leslie Wates, chairman and joint managing director.

MR. T. H. WATSON, meter superintendent with Kettering electricity department since 1938, has been appointed meter and test superintendent with Ipswich electricity department. His new duties will commence on July 1.

MR. F. W. MOCKETT, power station superintendent with the Lancaster Corporation, is to retire at the end of the year. He will be succeeded by Mr. E. H. Scholes, the present assistant superintendent.

MR. EMIL S. CONRADI, chairman and managing director of the British Central Electrical Co., Ltd., whose death on May 27 was briefly announced in our last issue, commenced his electrical training in 1897 at the London, City and Guilds Technical College, whence he proceeded to the Finsbury Technical College where he gained a mechanical engineering diploma. In 1899 he went to the power station of the electric light department of the General Post Office, and from there in 1900 to the British Thomson-Houston Co., Ltd., Rugby, where he remained for five years. His next appointment was with Bruce Peebles and Co., Ltd., in Edinburgh, where he was engineer-

MR. E. S. CONRADI

in-charge of the Falkirk district tramways contract, and then chief engineer of the outside erection department. In 1908 he founded the British Central Electrical Co., Ltd. Mr. Conradi was the inventor of the Gripper handlamp and numerous other patents.

Obituary

MR. LEON CHARLES DESOUTTER, chairman of Desoutter Brothers, Ltd., on May 20, aged 52 years. An eminent engineer and craftsman, he designed artificial limbs and small portable tools that achieved world-wide reputations.

MR. SYDNEY DAWSON BEGBIE, a director of K.L.G. Sparking Plugs, Ltd., on May 23, aged 83 years.

Enterprise Scotland Exhibition

NEARLY 1 000 firms have expressed their intention to submit goods for selection for the "Enterprise Scotland, 1947," Exhibition, organised by the Scottish Committee of the Government's Council of Industrial Design, which will be held concurrently with the Festival of Music and Drama in the Royal Scottish Museum, Edinburgh, from August 25 to September 30. The exhibition is a selective one and selection committees have been appointed for each industry.

This was announced by Sir Stafford Cripps, President of the Board of Trade, in London, on Wednesday. He said the exhibition had the particular purpose of bringing together all that was best in Scottish design and manufacture. It would be divided into four sections, namely: Scotland Yesterday, dealing with tradition and ancient crafts; The Country, showing what Scotland has to offer to tourists and sportsmen; Scotland To-day, with sub-sections for shipbuilding, printing, the textile industry and general consumer goods, and a cinema in which will be screened pictures of various phases of modern Scottish life; and Scotland To-morrow, which is intended to show how the planning of industrial estates and community centres has as its aim the benefit of the individual as well as that of the country as a whole.

The exhibition will display many products (including electrical equipment and appliances) of the lighter industries.

Materials and Supplies

THE Electricity Commissioners announce that it has been decided that the authorisation or the issuing of licences to acquire controlled materials and supplies for all the fuel industries, and all priority questions relating thereto, will as from Monday, June 2 last, be the responsibiilty of the Ministry of Fuel and Power. Applications already made to the Commissioners for iron or steel authorisations or timber licences will be issued on behalf of the Minister of Fuel and no renewed application in respect of them need be made to the Minister. The Commissioners will continue to be responsible for the authorisation of any building and civil engineering works for which any of the controlled materials may be required, and applications for authorisation of such works under Regulation 56A of the Defence (General) Regulations should continue to be addressed to the Commissioners. To facilitate early consideration of applications made to the Ministry, electricity undertakers should quote the date of any prior authorisation under Regulation 56A and also the reference number on the letter or instrument conveying that authorisation.

E.D.A. Activities

ACCORDING to the current issue of the E.D.A. Bulletin, the question of the training of chefs is receiving the attention of the association, and the Council have called on the General Manager to submit a report on the matter. The subject arose when a resolution at a Council meeting submitted by the South-West England and South Wales (Southern) Area Committee, suggested, among other things, that an endeavour should be made to train the male youth of the country.

It was agreed at the meeting that the Macao Electric Lighting Co., Ltd., be enrolled as a foreign contributor. It was also agreed to make a grant towards the organisation of an electrical display at the four-day Royal Lancashire Agricultural Show.

The Council has decided to re-establish the Exhibition Advisory Committee, and the membership for the current year is as follows: Chairman of Council ex-officio, Captain J. M. Donaldson, Messrs. A. W. Bonell, County of London E.S. Co.; G. E. Barrett, Northmet; W. E. Davies, Central London Electricity; J. R. Jones, Battersea; C. W. Hughes, London and Home Counties J.E.A.; and R. H. Rawll, Shoreditch.

It has been agreed that the association shall have an information bureau in the Electrical Section of the International Building Trades Exhibition to be held at Olympia from November 29 to December 4 next, and to have a display at the Hotel, Restaurant and Catering Exhibition at Olympia from January 16 to 24, 1948.

Book Reviews

End Wages Conflict.—By A. GRANT MCGREGOR.—(London: Pitman.) Pp. 11. Price 9d. net.

The "disputes" method of making wages adjustments is ineffective: attempts to meet rising prices with higher wages are based on a fallacy and can at best give a transient advantage to certain sections of organised labour. From these arguments, the author states a case for a wages policy in which wages rise only with expanding production, thus ensuring purchasing power, but are held stationary during periods of rising prices. By reference to a national price level, consuming power would be kept in step with ever-rising national productivity, and prosperity result. This booklet sketches the outlines of an argument which the author has elaborated in a larger work. While not likely to meet with general approval, it deserves some attention, because the system put forward is intended to offer a method of correcting maldistribution of labour, to provide adequate incentives and to give some safeguard against recession. It may be objected that the author, in pre-supposing an expanding economy for the working of his scheme and in saying little about the status of his "prosperity wages" within the framework of international trade, is guilty of over-simplification, but his book does not claim to be a detailed exposition.

Direct and Alternating Currents. (3rd Edition). By Prof. E. A. LOEW. (London: McGraw-Hill.) Pp. 748, illustrated. Price 25s. net.

In this, the third edition of a text-book already popular in the U.S., Prof. Loew has brought the subject matter up to date with brief discussions of such topics as permanent magnet materials, thermal and rectifier type instruments, silicone resins and alternator voltage regulation. His general treatment is, wisely, to elaborate on the fundamentals, while describing afterwards the way in which the theories developed may be applied in practice. As a result, almost each chapter will be found, at its end, to include an account of the electrical machines which utilise the principles just described. On the arrangement of the material, no special comment is needed. The book contains approximately equal amounts of d.c. and a.c. theory, opening with an account of the fundamental units employed and passing on to resistive network calculations and transformations, magnetism, electric fields and so to the d.c. motor and generator. It is in the latter subject, and later when dealing with a.c. machines, that Prof. Loew's gift of explanation is particularly striking, and the treatment is further helped by his very generous use of illustrations, both theoretical and photographic. A short chapter on vector representation and j notation precedes the a.c. section of the book, which is developed largely in terms of vectors. Transformer theory, polyphase connections and power measurements are thoroughly treated, as are the common types of a.c. machines, and after short chapters on switchgear and distribution systems, Prof. Loew closes the work with a brief introduction to thermionics. A number of worked examples are given throughout the book, and each chapter includes a selection of problems to which, however, no answers are given. Perhaps the closest equivalent to this book is Prof. Cotton's "Electrical Technology," which, of course, comes closer to British examination requirements and is rather more elaborate in its theoretical treatment, but to an extent both books are complementary. Instructors, no doubt, will gain from this American work some new approaches, and students may find in Prof. Loew's explanations a useful auxiliary to their own textbooks.

Imperial Preference. By RONALD S. RUSSELL (Empire Economic Union). Pp. 168. Price 5s.

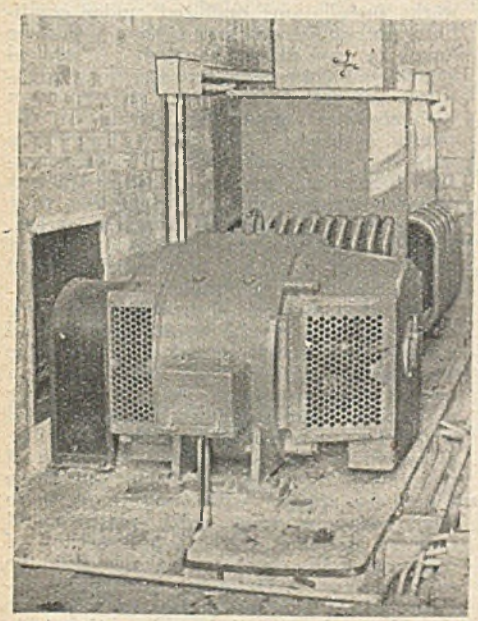
In view of the International Trade Conference, now sitting, at which the U.S.A. is making a determined effort to induce Great Britain to abandon or modify Imperial Preference, thus permitting American exports to enter Dominion and Colonial markets in competition with British manufactures, the appearance of this volume is particularly opportune. In a factual statement of the development of Imperial Preference and its effect on the trade between the United Kingdom and the constituent members of the British Commonwealth of Nations, the author puts forward considered argument for extension of the policy of Imperial Preference. As a "warning" to those who would be inclined to accede to American demands, he recalls what happened when a century ago we abandoned the first system of colonial preference for Free Trade. A survey is given of the Empire resources in many commodities that we need, there is a chapter on exports of British manufactures into the Dominions and Colonies, an analysis of the Most-Favoured-Nation Clause, and an account of the treaty restrictions which prevent an unqualified extension of Imperial Preference.

Electricity in the Gas Industry

A WIDE FIELD FOR ELECTRICAL DEVELOPMENT

GAS engineers, meeting at Birmingham for the 84th annual general meeting of the Institution of Gas Engineers this week, heard many arguments advanced in favour of an increased use of electric power in the gas industry. This was in a paper delivered by Mr. G. M. Rimmer, electrical engineer of the City of Birmingham gas department.

In general, the paper began, the gas industry had been rather tardy in applying electricity to its works, and had not kept abreast of recent electrical practice. If the benefits of electric drive were fully appreciated and if gas engineers could be convinced that electric power could be as reliable as steam, the change to electric motors would be greatly accelerated.



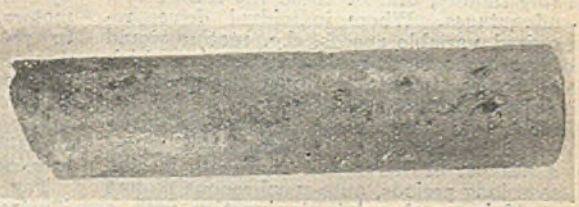
Flameproof installation showing sealed wall bearing

Concerning the choice of a public supply, a high tension supply offered great advantages both from the viewpoint of reliability and where motors were concerned, but it was in any case essential that at least a duplicate service should be provided. One solution was to employ both public and private supplies in such a manner as would enable automatic changeover from one system to another without any interruption. This could be achieved by parallel operation.

Where this method was used, the main items of equipment required were synchronising and protective gear. It gave complete unity and flexibility of supply, as the speed of generators was kept constant because of synchronisation with the grid and any additional load requirement was automatically met by the public supply. Furthermore, if a surplus of steam were available at the gas works, power could be exported to the grid, thus reducing overall electricity charges. The electricity supply authorities were, of course, at some disadvantage with this scheme from a financial point of view, inasmuch as their load factor was very low; but the national interest should predominate in this respect, and the contribution which the gas industry as a whole could make, both by reduced demand and export of surplus energy, was worth their consideration.

An a.c. drive offered such outstanding advantages over d.c. that prime consideration should be given to a three-phase 50-cycles supply for the gas works generating plant, d.c. requirement being met individually. The most suitable voltage for a works load up to 750 kW was 415 across phases, but where the works covered a large area and the capacity exceeded that figure, h.t. generation should be considered on account of the economies which could be effected on main distribution cables.

Reviewing the relative efficiencies of various types of steam prime-mover for the works generating plant, the paper went on to say that in the present fuel shortage it was impossible to generate steam, except with coke dust, at an efficiency which could compete with public supply. Since gas works possessed a liberal supply of coke dust, however, modern boiler plant employing chain-grate stokers and water-cooled walls could



Gas main damaged by leakage current

be used to burn this fuel. It was without question the only installation which could be fully justified in present circumstances. Waste heat was at present being used on inefficient drives in the gas industry. If used in a proper manner, the waste heat of the British gas industry would produce 70 000 kWh of energy daily. This was equivalent to an annual fuel saving of approximately 385 000 tons.

OPERATION EFFICIENCY

The operating load factors of mechanical drives in the gas industry were liable to considerable variation over a 24-hour period, and the operating efficiency would be very low unless the motive machine had a wide power range in the neighbourhood of maximum efficiency. The electric drive was superior to every form of drive in this respect. Furthermore, electric motors had maximum efficiencies which varied very little with rating. Transmission losses for steam were considerably higher than for electricity, and in first cost, electric drive was most favourable.

To the question of how far electrification could be pursued with advantage in an existing station, no general rule could be given. The policy would bear much fruit, however, if applied to existing drives which were extravagant steam users. In the case of a new station, all mechanical considerations would have at the outset to be made subordinate to the electrical installation, whence the idea of running a whole works on waste heat alone could be achieved.

Distribution systems demanded special attention in the case of gas works, where conditions were so severe and drives so diverse. The bus-bar trunking system was suitable, the bus-bars themselves taking the form of non-bleed cables, lead-covered, steel-wire armoured, served with hessian tapes and compounded overall. The various drives would be fed by solid "tees." In the case of vital drives, such as exhausters and boosters, separate cables from the main distributing centre should be provided for each item, to prevent interruptions.

The choice of motors for constant-speed drives lay between squirrel-cage and slip-ring motors, and of these the former had advantages. Where individual drives required variable speeds, d.c. motors would have to be used, preferably fed from high efficiency mercury-arc rectifiers. Among possible methods of speed control for d.c. machines were those employing grid-controlled rectifiers. Alternatively, where a number of drives had to be run in step over long periods, auto-synchronous motors could be employed in conjunction with a variable-frequency generator. Contactor equipment operated either automatically or by push-button, if robust and totally enclosed, was an excellent method of motor control.

For the functional control of the whole gas-making plant, various types of supervisory equipment were available. An interesting new method of instrumentation was the balanced electronic bridge recorder, which was capable of measuring with accuracy and speed all the industrial variables. Gas flow, with temperature and pressure corrections, had already been metered by this instrument, and its adaptability would appear to be limitless.

Too much emphasis could not be laid on the subject of safety precautions, as gas works installations operated under conditions probably more severe than would be found in any other industry. Chemical attack and coke-dust were the main problems. All metal work used in connection with electrical apparatus had to be efficiently earthed. Gas mains themselves were very often found to be of lower resistance than a normal and otherwise efficient earthing system, with the result that they were frequently used as electrical earths. Leakage currents then became apparent which, with d.c., led to electrolysis and perforation of the gas mains.

The ideal method of preventing electrolytic corrosion would be to insulate all underground metal structures, but this was impracticable in most cases, although normal pipe-wrappings gave some little protection. Earthing of underground metal structures by means of "earth" plates or pipes would generally reduce corrosion if maintained in good condition, but these should be applied with caution, as there were occasions when earth plates could increase leakage. No better method of overcoming the effects of leakage could be adopted than to make the installation all-insulated. Continuous leakage recorders should also be installed, and routine tests of plant insulation made regularly.

FLAMEPROOF EQUIPMENT

The use of flameproof equipment did not of itself provide a safe installation, and it was far better to move electrical apparatus completely away from dangerous gases whenever possible. This could be achieved by constructing separate rooms for electric motors, and by providing extended shafts to pass through sealed wall bearings. Again, when flameproof apparatus might not be fully justified, consideration should be given to pressurised equipment.

The author's paper concluded with references to routine maintenance and the keeping of records.

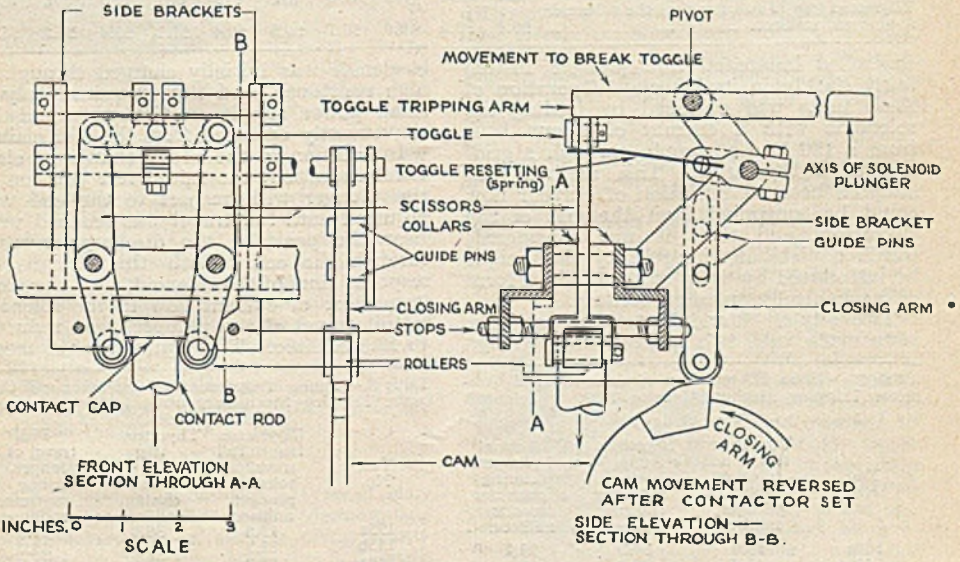
For permission to reproduce the two illustrations in these pages we are indebted to the Institution of Gas Engineers.

Switchgear Developments

The Regularity and Time of Operation of Electro-Mechanical Control Gear used in Circuit Breaking Research Work. By F. O. Mason, B.Sc.(Eng.), A.M.I.E.E., and L. H. Orton, Ph.D., F.Inst.P.*

Summary.—A high degree of precision and invariability in repeat performance is required on certain types of apparatus called on at random intervals to perform a single sequence of operations.

The methods described below of meeting these requirements in connection with a specific problem—namely, that of the closing of a contactor used in circuit breaker research at high power—are



Contactor scissors and toggle setting and tripping mechanism

voltage wave, so that the current symmetry in the test circuit was identical for repeat tests.

A contactor for operating up to 5 000 A with insulation adequate for 11 kV was specially designed for the purpose, which, in its basic form consisted simply of a lower butt contact mounted on a dashpot, and an upper (movable) butt contact mounted on a spring loaded rod operating vertically downwards. The whole mechanism was housed in a metal tank with sufficient oil to cover both top and bottom contacts. With such an arrangement the rod could move in guides giving the minimum amount of friction.

The releasing of the upper contact was effected through a toggle and scissors mechanism in which, in the open position, a cap on top of the contact rod rests on rollers carried by the lower arms of the scissors. The scissors are kept in their "closed" position by a toggle, which latter is broken to release the contact rod.

For resetting, a cam, which is linked to the lifting mechanism of the contact rod is made to operate through a link and resetting spring to hold the toggle in its set

thought to be of interest in a wider field, and the data given show the results of timing tests made during the development of a contactor and its tripping mechanism to the required standard of operational precision.

(1) **Introduction.**—In researches on high power circuit breakers it became apparent that a high degree of *consistency* in operation was required of certain electro-mechanical apparatus. For instance, it was found essential to control the operation of a contactor to close accurately on a predetermined point on the

* Official Communication, Ref. G/XT88a of the British Electrical and Allied Industries Research Association.

position, whilst the contact rod cap takes up its position on the rollers of the scissors.

The lever which breaks the toggle is actuated by the plunger of a solenoid, and the results given here are timing of the operation of the mechanism when the solenoid is excited under different conditions.

(2) **Test Data.** (2.1) *Time of Operation of Low (120 V) and High Voltage (1 000 V) Solenoids.*

Tests were first carried out on standard low voltage units which were of a conventional commercial type with a gravity controlled laminated iron plunger resting fairly slackly in its housing. Operation of these units was obtained by feeding the solenoids with a current of about 1 A from a 120 V d.c. supply through a grid-controlled thyratron. This method was adopted because initiation of current flow could be controlled from the grid of the thyratron, and this, it was considered, would obviate any irregularity that might be introduced by using some standard form of mechanically operated contact.

Two sets of 40 and 19 tests respectively were made with two separate low voltage coils operating in the manner above described, the time recording being carried out using the ordinary rotating drum camera and Duddell type electromagnetic oscillograph. These tests gave mean response times† of 55.4 millisec. and 50.0 millisec. with standard deviations of 1.8 and 0.7 millisec. for the 40 and 19 tests respectively. The results of the latter series of tests are given in Table 1, since it was the solenoid, used for these tests, which was used in the further work described below.

† For the solenoid.

It was considered that greater regularity would be obtained if the solenoid response time was shortened, and further, that the need of a 120 V d.c. power supply was an unnecessary limitation on its flexibility. It was therefore decided to energise the solenoid by a pulse of current and to provide the necessary ampere turns for this, the solenoid coil was rewound with 12 000 turns of 34 s.w.g. copper wire. The current pulse was obtained by discharging an 8 μ F condenser (charged to 1 000 V) through a grid-controlled thyratron. The condenser was initially charged through a high resistance, and thus required only a small power supply unit which could be conveniently operated from the a.c. mains.

In addition to the above change in electrical operation, the initial rest position of the plunger with respect to the coil was adjusted until full travel was reached very near the peak of the discharge current through the coil. With this design the response time of the solenoid, i.e., the time from start of current flow in the solenoid to full travel of the plunger, was reduced to 13.8 millisec. This figure was the mean of a group of 34 tests, the standard deviation being 0.12 millisec. with a maximum deviation from the mean of ± 0.25 millisec.

Table 1.—Times of Operation of 120 V Solenoid and Plunger Mechanism.

Test No.	56	57	58	59	60	61	62	64a	64b	
Thyratron trip to full travel of the solenoid plunger, millisec.	488	49.2	49.3	49.2	49.2	49.4	49.5	50.1	50.6	
Test No	65a	65b	66a	66b	67a	67b	68a	68b	69a	69b
Thyratron trip of full travel of the solenoid plunger, millisec.	50.4	50.2	49.9	50.1	50.5	50.4	51.1	50.4	51.2	51.1

Table 2.—Times of Operation of Contactor and Contactor Tripping Mechanism using 1 000 V Solenoid.

(First Series.)

Test No.	Thyratron trip to full travel of of solenoid plunger, millisec.	Thyratron trip to contactor closing, millisec.	Full travel of plunger to closing of contactor contacts, millisec.
149a	13.8	39.0	25.2
149b	13.7	38.8	25.1
150a	13.7	39.0	25.3
150b	13.7	39.0	25.3
151a	13.9	39.4	25.5
151b	13.9	39.1	25.2
152a	13.7	39.2	25.5
152b	13.8	39.2	25.4

These tests were made with the contactor mechanism out of its housing.

Table 3.—Times of Operation of Contactor and Contactor Tripping Mechanism using 1 000 V Solenoid.

(Second Series.)

Test No.	Thyratron trip to full travel of solenoid plunger, millisec.	Thyratron trip to contactor closing, millisec.	Full travel of plunger to closing of contactor millisec.
153a	13.8	38.8	25.0
153b	13.7	38.7	25.0
154a	13.8	38.6	24.8
154b	14.0	38.9	25.0
155a	13.7	38.7	25.0
155b	13.6	38.7	25.1
156a	14.0	38.8	24.8
156b	13.7	38.5	24.8
157a	13.8	38.7	24.9
157b	14.1	38.9	24.8

These tests were made after slight readjustment and after the contactor had been replaced in its housing.

(2.2) *Time of Operation of Contactor and Tripping Mechanism.*

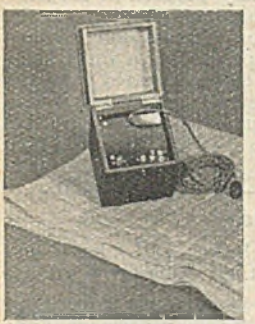
The 1 000 V type of solenoid and plunger mentioned above was utilised to trip the contactor through the toggle and scissors mechanism shown in the figure on the previous page. The first series of tests (made with the contactor contacts closing

(*Continued on p.* 1532)

Equipment and Appliances

Low Voltage Electric Blanket

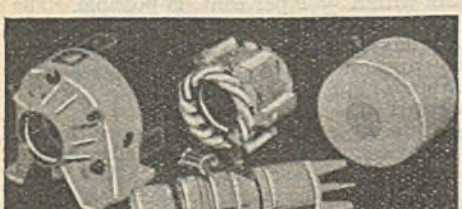
An electric blanket large enough to warm a full-size double bed and working from a voltage not greater than 18 V is being made by "Minipot" Appliances, Ltd., of Birmingham. The heating element itself is threaded between two thicknesses of blanket material and consists of extremely flexible copper wire (96/.0032) and is therefore not likely to be damaged in normal use. Two models are made, one for medical and the other for domestic use. In both cases, the blankets are identical, but the feed transformers differ, the medical version having a pilot light and polished wooden case, and supplying on its three tappings 150, 85 and 50 W, and the domestic model transformer being in a Bakelite case with no pilot light, with tappings at 65, 45 and 30 W. Both models are supplied with 12 ft. of mains flexible cable, and are available for 230 V a.c. only.



The "Minipot" electric blanket, with the transformer and control box used for medical purposes

Dismountable Motor

A new and unconventional type of electric motor which allows for dismounting and replacements in situ is being manufactured in large quantities by a Spanish firm, Bomba Prat S.A., of Badalona. The motor has been designed with the object of avoiding the loss of production which may result from having to strip down conventional motors when a fault occurs. Component parts of the machine can be withdrawn and replaced by a substitute within a few minutes. The stator, for instance, can be changed without dismounting either rotor or bearings; similarly, if any fault occurs on the rotor or bearings, these can be withdrawn without affecting either the stator or frame. The essential elements of the motor are the frame, which is fixed to the seating and houses the other parts; a fixed group consisting of the stator, which is fitted to the frame in such a manner as to permit of its easy removal; and a rotating group comprising bearing assembly, shaft, pulley and rotor, so arranged that by slackening off two nuts the whole can be withdrawn. The electrical connections consist of suitable flexible leads projecting through a hole in the frame, but which can be readily pushed back when the stator has been withdrawn. Fan blades are provided on the rotor. In size, the new design of dismountable motor is a little longer than a conventional motor of equivalent rating.



One of the Spanish dismountable motors, stripped down to its four major components

Instantaneous Water Heater

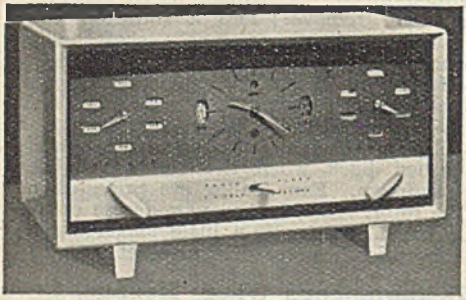
Some interest has recently been shown by export markets in a new water-heater, made by Hotap Waterheaters, of 29, Fouberts Place, London, W.1. The apparatus is made to be connected to the cold water pipe in the place of the normal tap, and is claimed to provide, under average conditions, between four and five pints of very hot water per minute. Inside a cylinder, which can be seen in the accompanying photograph, are two electrodes, one connected to the a.c. line and the other to neutral, and each consisting of a series of stainless steel plates. Continuity is made between the plates by the flow of water, which thus rises in temperature. Since the heater is automatically inoperative when no water is flowing, there is no likelihood of burning out, and similarly if the flow of water is reduced below a certain limit, the device will shut itself down. Although

The cylinder on this "Hotap" water-heater contains the electrodes. Behind the tap, the unit is threaded for attachment to the cold water pipe

the heating effect will vary from district to district, depending on the hardness of the water, the makers state that adjustments can be made to the gap between the plates partially to compensate for this. Initially, the loading of the heater under average conditions is 3 kW: this may be reduced if furring of the electrodes takes place, and a solvent is supplied for periodic cleaning of the plates which, however, will not normally be necessary unless the water is allowed to boil.

Radio Alarm Clock

Shown at the Olympia section of the B.I.F. on the stand of Smith's English



The three dials on this Ekco "Radiotime" receiver show, from left to right, volume, time and the selected station

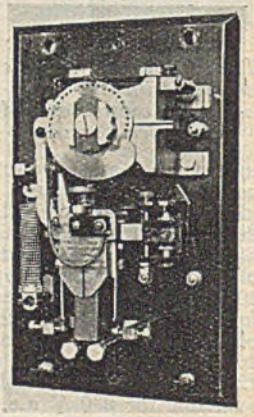
Clocks, Ltd., was the "Radiotime" domestic radio receiver, a recent Ekco production. It combines a radio receiver with a self-starting "Sectric" electric alarm clock, enabling the user automatically to switch a selected programme on or off at a pre-arranged time. When the set is used as an alarm clock, the sleeper will be awakened either by a selected programme or, if no programme is available, by an alarm note. The switch-setting mechanism is so arranged that both "on" and "off" times can be pre-set in advance and remain set permanently, if necessary, at these times. The receiver itself, which is a three-valve-plus-rectifier superhet. with permability tuned I.F. stages, has a built-in frame aerial and a 5 in. dia. speaker. The rotary selector switch is pre-set to five medium-wave and one long-wave stations, and there is also a six-position pointer on the volume control/on-off switch. Built only for 200/250 V a.c., the set, including the clock, has a power consumption of 37.5 W.

Midget Grinder and Polisher

Particularly applicable to the small workshop is the "Midget" electric grinder and polisher, made by Runbaken Electrical Products, of Manchester. A universal a.c./d.c. 200/250 V motor, running at 15 000 r.p.m. per minute, carries on one end of the shaft a buffing mop and on the other a 2 in. diameter grinding wheel. A tool rest is provided. Attachments are available for fitting a small chuck through a flexible driving shaft, and other accessories which may be used in conjunction with the machine are sanding wheels, scratch brushes or three-speed driving pulleys, the latter permitting a small lathe or similar machine to be operated from the motor. A variable speed foot switch is also available. The grinder is made in five sizes, ranging from 1/20th H.P. to 1/5th H.P. The smallest model is 5¼ in. wide by 8 in. long and the weight is 4½ lb.

Cone-Pivot Relay

Brookhirst Switchgear, Ltd., have sent us particulars of their cone-pivot voltage relay, developed primarily for the control of transformer on-load tap changing equipment and the control of output of mercury-arc rectifiers. It is, however, also suitable for controlling any medium which has to be held accurately within prescribed limits, "raise" and "lower" impulses being sent out by the relay during operation. Listing some of the features of the instrument, the manufacturers point out that voltage control within ± 1 per cent. is possible. The movement is supported by hardened, self-aligning cone-pivets, is sufficiently damped to prevent hunting, and is shock and vibration proof. Contact chatter is prevented by a hold-on magnet and the voltage range is adjustable by operation of a single control knob without disconnecting or disturbing the relay. This relay is also available in a modified form as a load-limiting device. As such it may be used to work with the voltage control relay. In this event, should a short-circuit occur, the load-limiting relay overrides the "raise" impulse of the voltage relay due to the collapse of the voltage and automatically returns the controlled apparatus to the minimum voltage position.



A Brookhirst cone-pivot relay. The large knob at the top is for voltage adjustment

PLUGS AND SOCKETS

by "SUPERVISOR"

A STATEMENT appears in the B.E.A.M.A. annual report for 1946-7, to the effect that "during the past year this Committee (Accessories Technical) completed its proposals for a detailed specification to implement the decision of the B.S.I. that a new 3 kW plug-and-socket, non-interchangeable with any existing designs, be established."

It is understood that the new specification, No. 1363/1947, is now in the printer's hands, and that a prototype of the new plug-and-socket has been exhibited at the B.I.F. It is further understood that the specification provides for unswitched sockets only, and that another for switched sockets has yet to be hatched.

It is claimed that the draft specification has been circulated to "interested parties," and has received general approval. One wonders who these parties may be, as at the recent I.E.E. Installations Section luncheon the present writer attempted to ascertain the general reaction to the draft, but was unable to find a single person who had even seen it. Some of those questioned were very influential on the installation side of the industry, and one's immediate neighbours on that occasion were vocally and actively hostile to the mere idea of any new standard being prepared and imposed.

DETAILS OF DRAFT

Following a series of rearguard and under-counter actions the present writer managed to obtain a sight of the draft, and although it is not permissible to reveal details, it is generally known that the new socket-and-plug will have flat pins. It is claimed that the supply side of the industry is in favour of flat pins, and although the shape of its pins is quite unimportant, a query must be raised in view of the statement appearing in this journal (page 254, March 1, 1946) to the same effect. What has happened to the decision made following the circulation of a questionnaire, and in which the following voting results were tabulated? Do you favour a 3 kW rating?—Yes, 78 per cent.; should the fuse be in the plug?—Yes, 91 per cent.; do you favour round pins?—Yes, 72 per cent.

It would be reasonably safe to wager that, amongst the "interested parties" to whom the draft specification was circulated, no representative of the consumer was to be found. It is only fair that this unvocal partner in the industry should have some say in a matter that affects him more than considerably, as he may have quite rational views as to whether he wants his wife to take a plug to pieces before renewing a fuse, or whether he is quite satisfied with an existing accessory that eliminates this necessity.

GROUNDS FOR CRITICISM

There are two main grounds for criticism of the industry by the consumer, and these are, one, the multiplicity of voltages, and, two, the multiplicity of plug sizes. Steps are now being taken to eliminate the first of these, but our present actions are resulting in the addition of yet more plug sizes and shapes for the plaguing of the industry and the consumer. For it cannot be gainsaid that an existing "standard" socket and plug is now being installed in hundreds of thousands, and will continue to be used in ever increasing numbers, so that instead of providing us with the one universal socket so long desired by the industry, the new standard will be just one more plug and socket.

This is all very regrettable, as it is bringing the valued B.S.I. standard of accessories into disrepute. The I.E.E. and other regulations, as well as the new Codes of Practice, require the use of B.S.I. standards as an essential feature of compliance with such rules and regulations, and hitherto no serious objection has been raised to this requirement. We now find some active opposition, however, and all because of this wretched plug and socket business, the main features of which are now well known to all sections of the industry. Instead of the full agreement of all in connection with the new codes and what-not, it seems clear that installation men are dividing into two camps over the plug and socket standard, depending upon whether the existing socket and plug has been used in any great quantity or not. For the sake of continuity and standardisation in the best sense, housing authorities who have installed an existing accessory in very large numbers are determined to continue in its use, and who can blame them?

The present writer has no desire to exaggerate these wide differences in the industry, and would appeal even at this late hour for an abandonment of further

attempts to impose a standard which seems likely to introduce divisions and bad feeling amongst us. It would seem that the best interests of the industry would be served thereby, and although we may not have secured more than 95 per cent. of what we require in the standard plug and socket let us live with the devil we know rather than with the devil we don't.

It has to be remembered that British Standard Specifications have no legal force, except as alternatives, as may be found from Explanatory Notes on the Electricity Supply Regulations, 1937, Reg. 12, page 7—" While this regulation does not preclude the Undertakers from installing electric lines which do not conform in all respects to B.S.S.'s, the standard of construction of the said electric lines must not be lower than that prescribed in such specifications unless the Electricity Commissioners otherwise allow in any particular case." The definition of " electric line " is given as—" a wire or wires . . . or any apparatus connected therewith for the purpose of conveying, transmitting or distributing electricity or electric currents," which would appear to include our sockets and plugs.

The industry would be glad to be rid of this plug and socket controversy, since it is foreign to the whole basis of the structure which we have built up over so many years, that of mutual agreement and compromise.

Heavy Electrical Plant Production

THE manner in which the Ministry of Supply is tackling the responsibilities accorded to it in relation to the production of heavy electrical plant, mining machinery and equipment and coal/oil conversion plant was explained at a Press conference in London on Tuesday afternoon. Mr. V. A. G. Lambert, formerly Director General of Housing Supplies, and now Director General of Armament Production, has been made head of the organisation dealing with the matter, and is assisted by three directors, with Mr. E. S. Jones as Director of Power Station Equipment. In addition to the establishment of the Directorate of Power Station Equipment, the Heavy Electrical Plant Committee, as previously announced in our columns, has been reconstituted under the chairmanship of the Minister of Supply.

Whilst the Ministry of Supply will be responsible for programming and progressing orders, including raw materials, and the clearing house work associated with the Heavy Electrical Plant Committee, the Central Electricity Board will continue to deal with the preparation of planned programmes, specification, design, ordering of plant and specifying commissioning dates.

The new organisation will be responsible for the manufacture of both thermal and hydro-electric generating plant for use in power stations, i.e., boilers, steam and water turbines, condensers and alternators, together with all the associated equipment on both the mechanical and electrical sides.

In order to implement the Government's instructions that the highest priority shall be given to the provision of raw materials and skilled labour for the production of heavy electrical plant, responsibility for obtaining supplies of electrical steel, the shortage of which is one of the main causes of delay, has been centralised in one branch of the Ministry and agreement has been reached with the Iron and Steel Board on machinery for identifying and progressing priority orders. Close contact is being maintained with the Ministry of Labour on the question of the supply of additional skilled workers, and steps are being taken to secure housing accommodation for them.

A yearly growth of maximum demand for electricity between 1934 and 1937 was in the region of 610 000 kW, and if that were taken as a rough guide to the rate of increased demand for the next few years, the new plant required would be about 732 000 kW per annum. The actual growth is likely to be in excess of that figure. It is estimated that, on the average, in the period 1947/54, the new plant required annually to meet the growth of loading and replacements will be of the order of 1 400 000 kW per annum.

The manufacturers have agreed to consult the Ministry of Supply before they accept any further export orders for plant in the following categories:—(I) Steam turbo-alternators of 10 000 kW capacity or over; (II) Hydraulic turbines costing £100 000 or more; (III) Water-tube boilers of 100 000 lbs./hr. capacity and over.

The Ministry of Supply is recommending that new orders should, as far as possible, be repeat orders, eliminating non-essential features, so that manufacturers can utilise existing designs.

Mention was made to the Government scheme, referred to in our issue of May 16, for the use in factories of small-output Diesel electric generators for easing the power supply problem.

"BUSINESS AS USUAL"

by SIR ERNEST BENN

THE old-fashioned signwriter and show-card maker must be out of business. He, or his son, is probably dispensing official security from some new fangled Ministry, or earning a salary by declining to issue licences to people who would formerly have employed his craft for purposes that have now ceased to be practical. "Lowest Summer Prices," to tempt us to buy coal; "Eggs Are Cheap To-day," think of it; "Try Our Celebrated Shilling Ordinary," joint, two veg., sweet, cheese and coffee; which to the elderly still recalls the exact cut, near the knuckle, underdone or overdone as desired, real custard to cover the sweet, cheese in half-a-dozen varieties, with a bowl of butter-balls, just as much a matter of fact as the salt and mustard, and a basin of sugar to flavour the coffee to taste. Recollections of the commonplaces of those spacious days, have now a value which ought to be more thoroughly exploited.

"Business as Usual," as a slogan, has had its ups and downs. On the outbreak of the 1914-18 war the Government pressed us to carry on with business as usual as a patriotic duty, and the Prince of Wales opened a relief fund to provide for the unemployment thought by the planners to be unavoidable. So great was the anxiety that all records in charity were beaten by the Prince's fund and £1 000 000 subscribed within a few days. Local authorities were directed to place orders beyond their needs to keep business going as usual, but as the planners of those days were just as fallible as their successors, a short experience of their plans necessitated the usual renunciation, and "Business as Usual" was propagandised into a capitalistic trick to stop the war, for which the self-same capitalists were previously said to be responsible.

And now we have lived to the point where, if any one of us allowed our imagination to soar to the very height of perfect bliss, he would murmur with a heartfelt sigh—"Business as Usual."

WHAT IS BUSINESS?

Leaving aside all the troublesome details of our current distresses, what is this process that used to be known as business? The word itself is a synonym for progress, for no material advance can be made without it; indeed since we gave up business, advance has been officially abandoned in favour of retreat. There is nothing in the nature of advance in reducing carefully graded and selected coal to unclassified dirt, even if the miner has more money and the dirt is rationed with mathematical equality. So, in the light of present experience, it is more easily understood that business was progress; that the business man was the practical researcher, producing every day something new, cheaper, more plentiful, and better suited to purpose than the article which was thus put out of fashion and favour.

NATIONALISATION AND CONTROLS

At their very best, nationalisation and control can do no more than distribute what was; they arrest the natural striving of legions of business brains after the new and the better; they standardise mediocrity and perpetuate obsolescence. A catalogue of the daily doings of the ordinary citizen a few years ago shows how he enjoyed much that was not available to his father and more remarkable, that practically nothing he used or enjoyed was even known to his grandfather. "Business as usual" means new business every day, the maintenance of a steady stream of improvement so that, in a couple of generations, everything alters to the advantage of everybody. It means a million shop windows with a brain behind each continuously striving after the new and the better.

A simple way of approaching the subject is to jot down the doings of the normal man, say a bank clerk, in a normal day. On waking, he finds his head on a feather pillow. He is covered with a cotton sheet spread over a wool and hair mattress, supported by springs. He steps out of bed on to a piece of carpet, looks at his watch, takes a cup of hot water or hot tea which was prepared with the heat from an electric kettle. He washes himself with soap and a sponge, brushes his teeth and goes down to breakfast. He drinks coffee, tea, cocoa, as he fancies, sweetened with sugar. He puts on a mackintosh and, armed with an umbrella in one hand and gloves in the other, sets out for the City. On the way he buys a newspaper, tobacco and matches. He makes the journey in a train, tram, or omnibus, on a road paved and drained, and then he begins to do a day's work that in almost every detail was not thought of by his grandfather.

A careful study of this simple story will disclose the fact that there is scarcely a thought, or action, or thing in the whole of it that would have passed through the

mind or been done or existed a couple of generations previously. To begin with, of course, bank clerks, in any numbers, were not then wanted. Trade has not only produced the bank clerk himself, but it has produced everything that he does and touches and thinks, and all the material things to make up life for him; from which it follows that without trade life itself would be impossible.

Having nationalised or forbidden a large part of our former business, and loaded what is left with taxation deliberately designed to be punitive, we are on the road back. The price of everything goes up and, worst of all, nothing new appears. And the acceptances of all that is implied in the old cry "Business as Usual" offers what little hope there is of a return to the better ways of other times.

The Batti-Wallahs' Society

THE need to develop the agricultural industry of this country to the fullest extent was emphasised by Mr. E. H. Gardener, vice-president of the National Farmers' Union, who was the guest-speaker at the monthly luncheon of the Batti-Wallahs' Society in London on May 29.

Col. H. J. Wellingham, president, was in the chair, and he invested Mr. P. V. Hunter, the immediate past-president, with a past-president's badge, and thanked him on behalf of the members for reconstituting the society after the war.

Mr. Gardener, in the course of his address, said the greater part of our needs were supplied from this country and not from overseas. He thought our policy should be to expand our home production so that we need not be dependent on food imports. If such a policy could possibly be carried out he believed that economic argument would swing in favour of it. There was a time when economic arguments were all against such a policy, but he believed that the wheel had gone the full circle and that we were back where we were 100 years ago, before the industrial revolution.

In 1946 out of a total personal expenditure on consumer goods and services amounting to £6 584 000 000, food accounted for £1 650 000 000. The contribution of British agriculture to that figure, in value of food at the farm gate, before all the expenses of distribution were added, came to about £600 000 000. In 1936 the output of British agriculture was estimated to be £283 000 000. Last year the agricultural industry employed 950 000 people, as against 700 000 in the coal mining industry. Agriculture was not only the country's major industry, but it provided an immense market for urban industries in the way of machinery and other goods, and, in addition, there were a hundred and one ancillary industries whose well-being and prosperity were dependent on the prosperity of the farmer and the agricultural industry.

It was said that we lived by exports. He sometimes wondered whether we were concentrating upon the right type of exports and the right set-up. He thought we might be barking up a dead tree in adopting a policy of exporting our manufactures to other countries in return for food. He agreed that we must export some goods and that we could never hope to grow in this country all the food we needed, but what we could do was to so develop the agricultural industry of this country that it would supply us with the greatest possible amount of food and thus reduce the need for foreign currency that was so pressing at this moment.

A vote of thanks was accorded Mr. Gardener on the proposition of Mr. J. W. Perkins.

Mr. M. Whitgift, "mate" and hon. secretary, announced that the speaker at the luncheon on June 26 would be Mr. R. H. Matthews, of the L.C.C., who will take as his subject "The London Plan."

Engineering Exhibition

THE Engineering and Marine Exhibition which opens at Olympia, London, on August 28 to September 13, will embrace the whole of the Main Hall and National Halls, together with their galleries—an increase of over 45 per cent. on the 1937 exhibition. In the Foundry Section—a feature started some years before the war—the contrast between the production methods of pre- and post-war eras will be demonstrated by the exhibits. The Welding Section will reflect the advances made, and the influence of both the electrical engineer and the machine tool designer on welding and cutting plants will be noted.

Among new sections will be one devoted to electricity—embracing generation, transformation, distribution and utilisation of power in engineering, on shipboard and in signalling. In all, electrical interests will be represented by over 100 firms associated with the industry.

Electricity Supply

Brighton.—Five new sub-stations to serve the Lower Bevendean estate are proposed.

St. Marylebone.—Expenditure of £100 000 for mains, switchgear and services has been recommended.

Tynemouth.—The electricity estimates include £17 645 for electric mains, services and sub-station equipment.

Middlesbrough. — Sites have been approved for the erection of two electric sub-stations on the Thorntree estate.

Leicester.—The Electricity Committee plan an expenditure of approximately £50 000 during the year on mains and services.

Darlington.—The Town Council has received sanction to borrow £11 620 for supplies to the Haughton-le-Skerne housing site.

Peterborough.—The Ministry of Health has given sanction to borrowing of £4 700 for street lighting on the Dogsthorpe-Newark estate.

Manchester.—The Metropolitan-Vickers Electrical Co., Ltd., are to carry out modifications to a turbo-alternator at the Stuart Street power station.

Grimsby.—A 15 per cent. surcharge on electricity accounts is to be reduced to 7½ per cent. The electricity undertaking at present has a reserve of £62 000.

Glasgow.—Proposals have been made to increase the salary of the City Electrical Engineer to a new consolidated rate of £2 200 per annum. The present rate is £1 700.

Tynemouth.—Sanction has been obtained to borrow £20 000 for mains, services and sub-station equipment, and £1 500 for a sub-station on the Broadway "A" Estate.

Lewisham.—Existing high pressure gas street lighting is to be replaced by Osira electric lighting to a standard to be approved by the Council, at an estimated cost of £15 000.

Stockton-on-Tees.—During the twelve months ended March, 1946, the electricity undertaking purchased 33 811 335 units of electricity, an increase of 4 500 340 units (15.4 per cent.) on the previous year.

Brighton.—The plans for extensions to the power station at Southwick, at an estimated cost of £14 000 000, have been approved. The consulting engineers are Sir Wm. Halcrow and Partners, and Messrs. L. G. Mouchel and Partners.

Northumberland.—The electrification of collieries in the Backworth (Northumberland) unit of the Northern Coal Board is expected to be completed shortly. East Holywell Pit is one of the latest collieries in the area to be changed to electricity.

Australia.—The Victoria State Electricity Commission have placed an order with Messrs. C. A. Parsons and Co., Ltd., for two 50 000 kW turbo-alternators, at a cost of £547 965. The plant will be installed in the Yallourn power station in 1951.

Bredbury and Romiley.—To dispose of accumulated profits, the U.D.C. is offering consumers 25 per cent. discount on promptly paid accounts. Apart from industrial users, the Council has more than 5 000 domestic consumers, who will benefit to the extent of about 15s. each.

Wellingborough.—The conversion of the street lighting system from gas to electricity is now under consideration. The work will be carried out as soon as conditions permit, but in the meantime arrangements are being made for members of the Urban Council to inspect the fluorescent street lighting in Rugby.

Liverpool.—The Water Committee has decided that, provided the scheme for supplying electricity to Abertridwr does not come within the terms of the Electricity Bill, it be approved and that all supplies be metered and charged at the rate of 3d. per unit. Application is being made for permission to erect an overhead line.

Scarborough.—The Corporation has under consideration the appointment of a "housecraft adviser and demonstrator" in the electricity department. Application is to be made for sanction to borrow £30 000 for mains and services and sub-station equipment, etc. Altogether, five new sub-stations are planned, and tenders are to be invited for erection of the necessary buildings.

Monmouthshire.—After inspecting a suggested site for the Usk power station between Givilon and Gilwern, the Planning Officer has told the East Monmouthshire Joint Planning Committee that he had found it unsuitable because of levels, water supply and inaccessibility. The Committee decided that as nationalisation of the electricity industry was now imminent they would not search for an alternative site.

Menai Straits.—Further opposition to the tidal scheme were expressed recently, when the Menai Bridge Urban Council supported a resolution of protest from Beaumaris Town Council. "This scheme would put Menai Bridge completely off the

map," a Councillor declared, "and to generate a comparatively small amount of electricity. There are many other places where such a scheme could be located without causing such a tremendous disturbance."

Llandudno.—A suggestion has been made to the Llandudno Electricity Committee that tenants of prefabricated houses should be offered a tariff comprising a fixed charge of £3, plus a unit charge of ¾d. for all units consumed. A tariff on these lines is to be considered for adoption throughout the town, as the Commissioners have drawn attention to the fact that preferential treatment must not be given to any one section of the community.

Stockton-on-Tees.—The Town Council has applied for sanction to borrow £3 985 for the erection of a sub-station in Northbourne Road on the Eastbourne estate. Sanction has been received to borrow £7 816 for supplying electricity to the Durham Road area and £4 846 for the purchase of cables. Sanction has also been received to borrow £5 739 for supplying electricity to the Phœnix Works industrial site and £5 942 to meet increased demands in the Station Road area of Norton.

Grimsby.—By 20 votes to 16 it was decided at the meeting of the T.C. on May 28 that further consideration should be given by the Electricity Committee to the recommendation that the existing 15 per cent. surcharge on accounts should be reduced to 7½ per cent., and the matter was referred back. The suggestion of the opposers of the reference back was that the reserve fund of £62 000 had been built up by the consumers and they ought to benefit before the industry was nationalised.

Cannich.—A blasting charge fired at Cannich on Friday, May 30, by Mrs. Thomas Johnston, wife of the chairman of the North of Scotland Hydro-Electric Board, started the work on the Board's Mullardoch-Fasnakyle-Glen Affric hydro-electric scheme. Mr. A. E. M'Coll, deputy chairman of the Board, said that the project, one of the largest and most important hydro-electric schemes in the Highlands, would cost not less than £5 000 000. It would deliver 250 000 000 units a year.

Electricity in Sweden.—The Swedish Government Fuel Commission has announced that rationing of electricity seems unavoidable owing to the serious water supply situation in the country's lakes and rivers, combined with the scarcity of coal and the growing requirements for power on the part of industry. As a first step in the efforts to save load, the use of electric heating is to be prohibited. There will also be restrictions on display-window and publicity illumination. The allotment of electric energy to private households is expected to be controlled in the same way as the rationing of gas, which was in force until recently.

Switchgear Developments.—(*concluded from p.* 1524)

on a 110 V circuit) showed irregularity of operation. Apparently the flat butt contacts of the contactor held a film of oil between them and the initial "give" in the dash-pot tended to prevent this film from being squeezed out.

In an attempt at providing sufficient surface irregularities to pierce any residual oil film, criss-cross cuts (about 1/100 in. deep and spaced approximately ⅛ in. apart) were made on the surfaces of the contacts. A series of 18 tests was then made. The first eight of these (see Table 2) were made with the mechanism in an observation tank, and as these showed a satisfactory reduction in irregularity, the remainder (see Table 3) were made with the mechanism in its own tank. Slight adjustment to the mechanism was made between the series of tests in Table 2 and the series in Table 3.

These results show the total time of trip operation from instant of thyratron trip to contactor closing to be 39.1 millisec. for the first series and 38.7 millisec. for the second series, with satisfactory standard deviations of 0.17 and 0.12 millisec. respectively. It is worth while pointing out that the maximum variation from the mean recorded in the series of tests in Tables 2 and 3 approaches the limits of accurate measurement imposed by the method of recording in use, since it corresponds to a length on the electro-magnetic oscillograph film of the same order as the thickness of the record trace.

(3) **Conclusions.**—(3-1) By selection of suitable methods of tripping and by careful attention to details of design, eliminating as far as possible arbitrary frictional forces, electro-mechanically operated control gear has been made to work consistently in time to within approximately plus and minus 0.25 millisec. in a total operating time of approximately 40 millisec.

(3-2) The complete tripping and closing mechanism of the contactor referred to above (designed for 5 000 A at 11 kV), including the solenoid plunger and toggle mechanism, operates consistently to close the contacts on a 50 c/s voltage wave to within ±4° (i.e., 0.25 millisec.), thus allowing accurate selection to be made on the point on the wave at which short circuit is to be started. If duration of solenoid operation is excluded, the operation of the remaining mechanism is constant within ±2°.

Industrial Information

E.W.F. New Members

The following firms have been elected members of the Electrical Wholesalers' Federation, Ltd.:—Beacon Electrical Co., Ltd., 42, Richmond Road, Kingston-on-Thames; H. J. Golding and Co., Ltd., 138-138a, Plough Road, Clapham Junction, S.W.11; the Wallace Electrical Co., 3-4, Barrett Street, Oxford Street, London, W.1; the Yevrah Electric Co., 37, Union Street, Borough, London, S.E.1.

Mechanical Engineering Research

The Government, through the Department of Scientific and Industrial Research, is setting up a special organisation to carry out scientific research in mechanical engineering to meet and, still more, to anticipate the needs of industry and Government departments. The eventual annual expenditure will be in the region of £250 000 to £350 000. The research is intended mainly to supplement that carried on in other research organisations in this country, and will largely be confined to those fundamental problems which underlie all mechanical engineering.

Catering Exhibition

The Hotel, Restaurant and Catering Exhibition, last held in 1937, will take place at Olympia, London, from January 16 to 24. Bookings so far include many firms supplying electrical appliances.

Lighting a Bond Street Salon

The photograph reproduced on this page illustrates a fluorescent lighting installation by Thorn Electrical Industries, Ltd., 105-109, Judd Street, London, W.C., in the ladies' hairdressing salon at the premises of Truefitt and Hill, Old Bond Street, London. The Atlas 80 W fluorescent tubes in Perspex fittings give a general illumination of 10 to 12 f.c., and

Fluorescent lighting in the ladies' salon at a Bond Street hairdressing establishment

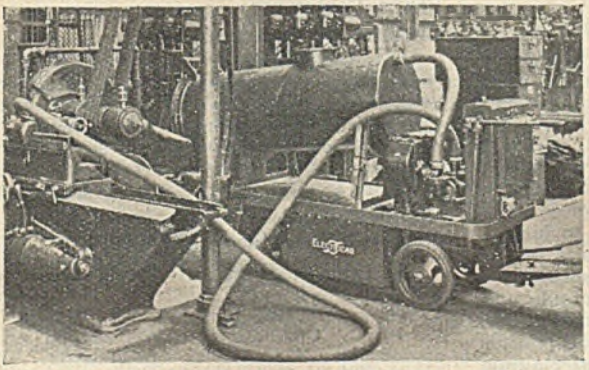
the design of the units conforms to the ultra-modern style of the salon. The gentlemen's saloon is similarly lighted.

Telephone Exchange Lighting

In order to determine the best lighting arrangements in Post Office telephone exchanges, it has been decided to carry out a series of experiments with fluorescent tubes.

Machine Tool Maintenance

To reduce labour wastage in the operation of cleaning out and refitting machine tool cutting coolant sumps, a self-contained pumping equipment is available from St. George's Engineers, Ltd., Ordsall Lane, Manchester, 5. This consists of a tank, and an electric motor-driven pump mounted on a Crompton Parkinson standard TU.20 "Electricar" industrial truck. The truck-driving motor and the pump motor are supplied from one battery. This arrangement gives all the advantages of electric trucking, and avoids having to connect up the motor to the normal mains supply. The truck is easily driven by the unskilled labour employed for sump servicing and requires little maintenance. The D.4 "Mono" pump is driven by a 1½ B.H.P. 30 V Crompton



"Electricar" industrial truck fitted with equipment for servicing machine tool sumps

Parkinson motor. At 1 450 r.p.m. the performance of the pump is: 1 125, 990 and 855 gal. per hour, against 50, 100 and 150 ft. heads, respectively. In practice, the pump will empty an average tank of 10/15 gal. in five minutes. The tank capacity is about 100 gal. For cleaning out, a hinged door is fitted. An inspection port allows for checking the quantity of coolant contained. A length of 2 in. diameter hose, armoured with steel wire built into the wall, is provided.

Change of Address

It is announced that the London sales depôt of the Chloride Electrical Storage Co., Ltd., which was evacuated from its Shaftesbury Avenue premises to Richmond in the early days of the war, will, as from June 2, be established at Whitfield House, 6-10, Whitfield Street, Tottenham Court Road, London, W.1 (Telephone: Museum 1616).

Aluminium Development Association

The Aluminium Development Association has issued a directory giving a complete list to date of the member companies, with the addresses of their main, branch and sales offices, particulars of associated companies, information relating to the main activities of the members, and an index of products.

European Engineers at Birmingham

Eight electrical engineers from Belgium, Czechoslovakia, Denmark and Italy are taking part in a course arranged by the British Council at Birmingham and which will conclude on June 13. Visits are to be made to the Birmingham electric supply department; Hams Hall power station; the Central England area of the Central Board; the G.E.C. Witton works; the English Electric Co., Ltd., at Stafford; and the B.T-H. Co., at Rugby.

Introduction to Electronics

Those readers who may wish to amplify their knowledge of the application of electronics will find in a new publication bearing the above title, and prepared by the General Electric Co., Ltd., much which is useful. The publication was brought out in time for distribution at the British Industries Fair, and its treatment of so technical a subject as electronics in so lucid a manner will be welcome to many. While still conveying essential information relative to the subject, many of the complicated technicalities with which electronics are often associated, are explained in simple language put together in an entertaining manner.

Insulating Varnishes and Compounds

"The Hy-Meg Handbook of Insulating Varnishes and Compounds," published by Lewis Berger and Sons, Ltd., 35, Berkeley Square, London, W.1, is arranged in a form planned to be of the greatest use to those concerned with the insulation of radio and electrical equipment. The first part deals with the choice of an insulating varnish, methods of impregnation, baking and drying, and special methods for accelerating drying. Various kinds of Hy-Meg varnishes, insulating enamels, lacquers, sealing compounds, etc., and their characteristics and applications are described and useful charts and scales are given.

Radio and Measurements

An article on "Applications of Radio Technique to General Measurements," by Mr. G. R. Polgreen (Salford Electrical Instruments, Ltd.), appears in the current issue of the G.E.C. Journal. It is the substance of an address given by the author before the Radio Group of the I.E.E. in Manchester recently.

Emergency Lighting Equipment

The Chloride Electrical Storage Co., Ltd., of Clifton Junction, near Manchester, announce the receipt of orders for their "Keepalite" automatic emergency lighting equipment, as a precaution against mains interruptions, from the Regal Cinema, Abingdon-on-Thames, Amersham Theatre, Central Pier, Morecambe, and the Concert Hall, Bournemouth.

World Power Conference

The first annual report of the World Power Conference to be published since the first year of the late war has just been issued, and copies can be obtained from the secretary of the International Executive Council, Mr. C. H. Gray, at 201-2, Grand Buildings, Trafalgar Square, London. The Economic and Social Council of the United Nations has adopted a resolution granting consultative status to the World Power Conference.

Charter for Foremen

The Association of Supervisory Staffs, Executives and Technicians has published a pamphlet under the title of "A National Charter for Supervisors and Technicians." The charter demands that all supervisors employed in industrial undertakings should be paid a minimum salary of £500 per annum.

Electrical Machinery Traders

The next meeting of the Council of the Association of Electrical Machinery Traders will be held towards the end of July. Complaints have reached the association that after notification of acceptances of tenders for surplus electrical equipment had been given, periods of a month and upwards invariably elapsed before clearance notes were issued by the authority concerned. The attention of the Ministry of Supply has been

called to this circumstance and the strongest representations made to expedite the clearance of disposals of electrical machinery. At the annual meeting there was raised the matter of the relationship between some of the members and the National Coal Board. The opinion was expressed that possibly the Board might have under consideration the setting-up of its own electrical machinery repair organisation on a national scale in which case it was requested that due consideration would be given to the efficient service of electrical machinery repair firms represented in the membership of the association. The matter has been referred to the Production Department of the National Coal Board and is receiving attention.

Lamp Tender

The tender of Thorn Electrical Industries, Ltd., for the supply of Atlas lamps to the Southern Railway has again been accepted for 12 months from March 1, 1947.

Erratum

In connection with the article "Some Mathematical Difficulties Explained," which appeared in THE ELECTRICIAN of May 23, the expression in line 7, col. 2, should have read:

$$(-1)^2 = (1\tfrac{1}{2})^2 = 1^1 = +1, \text{ etc.}$$

Nickel Cast Iron

A reprint of their publication, "Nickel Cast Iron for Engineers," has been issued by the Mond Nickel Co., Ltd., Grosvenor House, Park Lane, London. It describes the various types of alloy cast iron obtainable by the use of nickel, and their mechanical properties.

Experimental Science

Under the title, "Experimental Science: A Career for the Practical Boy or Girl," a booklet has been published by the Institute of Physics with the object of making clear to students, employers and others the purpose, scope and value of the courses leading to the award of National Certificates in Applied Physics.

E.R.A. Technical Reports

The under-mentioned technical reports have been published by the British Electrical and Allied Industries Research Association: L/T170, "Experimental Low-Temperature Co-efficient Ceramics, Variation of Capacitance and Power-Factor with Temperature," by A. Morris Thomas (7s.). This report gives an account of measurements made on some experimental low-temperature-coefficient ceramics which were prepared by the British Pottery Research Association and submitted to the E.R.A. for electrical tests. M/T88, "Interference from Industrial R.F. Heating Equipment," by A. Turney (3s. 6d.) In this report are described experiments which have been carried out with the assistance of the manufacturers of the equipment to determine the magnitude and extent of the radio frequency fields produced. M/T89, "Radio Interference in Ship Tests on R.M.S. Aquitania," by S. F. Pearce (2s.). Evidence that the interfering fields are predominantly electric is given by the lower susceptibility of the D.F. aerials. The standard of suppression proposed for marine installations has been found adequate even for the most adverse conditions obtaining on this vessel.

Control Equipment

In order that their customers may take advantage of "short-delivery" batch-produced control equipment, as it becomes available, Brookhirst Switchgear, Ltd., are issuing a monthly list of items held in stock. An illustrated catalogue of the complete range of "short-delivery" standard equipment is now in preparation, and will be published shortly.

Ekco Players' Summer Show

Rehearsals are now well under way for the Ekco Players' latest production, "Ekco-on-Sea," a summer revue, which will be performed in the work's canteen on June 9 and 10. It illustrates, in sketches, singing and dancing, a London family's holiday at an imaginary seaside resort which may not be unfamiliar to Southenders.

Welding Research

The following reports of the British Welding Research Association will be published, in association with the transactions of the Institute of Welding for April, in the first issue of "Welding Research," the new official organ of the British Welding Research Association: F.R. 1/9. "The Relationship Between Welding Conditions and the Strength and Quality of Single Spot Welds in Deep Drawing Quality Mild Steel Sheet in Thicknesses from 20 to 14 s.w.g.," by A. J. Hipperson; T.17 "Arc-Welded Structural Steelwork.—1. Stanchion Bases, Caps and Joints."

Trade Publications Received

An illustrated leaflet issued by Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, Watford By-Pass, Watford, Herts, describing their latest models of "Hairpin Minor" furnaces—a range of general purpose furnaces of moderate output.

From Ferranti, Ltd., Hollinwood, Lancashire, recently printed list IN.17D, describing the Ferranti dual range clip-on ammeter. (This supersedes list IN.11), and list IN.18c, giving the ranges, prices and dimensions of the company's 3½ in. instruments.

Contracts Open

WE give below the latest information regarding contracts for which tenders are invited. In the case of overseas contracts, particulars are to be had from the Board of Trade, Millbank, London, S.W.1 (corner Horseferry Road), unless otherwise stated:—

Southport, June 7.—Supply to gas department of one new or second-hand fiveton electrically-driven lifting unit to be attached to an existing hand-operated travelling beam (220 V d.c.). Particulars from General Manager, Gas Offices, 91, Eastbank Street, Southport.

Plymouth, June 7.—Supply and delivery of alkaline batteries for switchgear closing and tripping, and interlocking warning tiles for underground cable protection. Specifications from City Electrical Engineer, Armada Street, Plymouth.

Brighouse, June 9.—Supply and delivery of two 11 000 V switchboards. Specification from Borough Electrical Engineer, Huddersfield Road, Brighouse.

West Hartlepool, June 10.—Supply and delivery of eight 500 kVA, single-phase, 50 cycles, 5 760/490/245 V transformers. Specification from Borough Electrical Engineer, Electra House, Church Street, West Hartlepool.

Littleborough, June 11.—Supply and delivery of two 1 000 kVA transformers and e.h.t. underground cables. Specifications from Electrical Engineer and Manager, Council Offices, Littleborough.

Middlesbrough, June 11.—Supply and installation of public address system in the Town Hall. Specification from Town Clerk, Middlesbrough.

Plympton St. Mary, June 14.—Supply, testing and delivery of one 500 kVA, 6 600/415/240 V outdoor transformer, with on-load tap changing equipment. Specification from Clerk to the Council, Council Offices, Plympton.

Stoke Newington, June 18.—Supply and delivery of: (a) six 750 kVA transformers; (b) four l.t. switchboards; (c) four e.h.t. switchboards. Specifications from Borough Electrical Engineer, Electricity Offices, Edward's Lane, London, N.16.

Madras, June 19.—Supply, delivery, erection and commissioning of switchgear, reactors and auxiliary equipment for the Basin Bridge "B" power station. Specifications from Messrs. Merz and McLellan, Milburn, Esher, Surrey: deposit £5 5s. for first copy and £2 2s. for subsequent copies.

Middlesbrough, June 21.—Supply and delivery of street-lighting equipment. Specification from Borough Electrical Engineer, Corporation Electricity Works, Snowdon Road, Middlesbrough; deposit, £1 1s.

Manchester, June 27.—Supply, delivery and supervision of erection at the waterworks hydraulic power station of one electrically-driven submersible borehole pump with starting and control gear, etc. Specification from the Secretary, Waterworks Offices, Town Hall, Manchester, 2; deposit, £1 1s.

Warrington, June 30.—Supply of transformers. Specifications from Borough Electrical Engineer, Electricity Works, Warrington; deposit, £1 1s.

Birmingham, July 1.—Supply and delivery of one 20 MVA, 32/11 kV, outdoor O.N. type three-phase transformer. Specification from Chief Engineer and Manager, Electric Supply Department, 14, Dale End, Birmingham, 4; deposit, £2.

Pretoria, July 1.—Supply, delivery and erection of one 180 000-lb. and one 27 000-lb. overhead electric travelling crane. Specifications from City Electrical Engineer in Pretoria or from Messrs. Merz and McLellan, Carliol House, Newcastle-on-Tyne, 1; deposit, £2 2s.

Birmingham, July 1.—Supply, delivery, erection, testing and putting to work of cast iron water pipework (up to 8 in. diameter) and associated valves, hydrants, fittings, etc., required at Hams Hall "B" station. Specification from Chief Engineer and Manager, Electric Supply Department, 14, Dale End, Birmingham; deposit £2

Burnley, July 1.—Work and equipment in connection with new electrical laboratory at the Municipal College: (a) Supply and installation of bus-bar assemblies in suitable trunking system; (b) supply and installation of wiring, conduit, switchgear, panels, etc., between machine sets, bus-bars and test benches; (c) supply of transformer equipment; (d) supply of various measuring instruments. Specifications from Director of Education, Education Offices, Burnley.

The Cromptonian Association

MORE than 200 members of the Cromptonian Association (formerly the Association of "Old Cromptonians") met at the Café Royal for the annual dinner on Friday, May 30. Among the guests were Lord Brabazon of Tara, Sir Robert Renwick, Sir Charles Bartlett, Messrs. H. D. MacLaren, G. L. Wates, A. H. L. Gibson, J. C. A. Sutherland, and P. H. Bolland.

Company News

EDMUNDSONS ELECTRICITY CORPORATION, LTD.—The company has declared a final dividend of 3 per cent. on the £6 750 000 ordinary, against 3½ per cent., making, with the increased interim, 6 per cent. for the ninth consecutive year. Net profit for the year to March 31, 1947, was £647 362, compared with £572 397.

CROMPTON PARKINSON, LTD.—The following interim dividends have been declared: 4 per cent. on the First Pref. Stock and 3 per cent. on the Second Pref. Stock, for the six months ended March 31, 1947, and an interim dividend on the Ordinary and "A" stock of 7½ per cent. actual. All the above will be paid, less income tax, on June 30.

B.E.T. ELECTRICITY SUPPLY CO., LTD.—Rev. to Mar. 1, £92 717 (£81 785). Net prft. £45 804 (£35 376). To res. £22 694 (£14 689); div. 5% (same) £20 598 net; fwd. £34 489 (£31 978). Dirs. have transferred from res. to cap. prfts. acct. £68 215 being surplus on sales of Wisbech and Penarth undertakings in 1936 and Birkdale undertaking in 1940, together with prfts. to date on sales and redemptions of invests. after deducting prem. written off in prev. accts. following redemption of £175 000 4% deb. stk. on Mar. 1, 1946.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—Addressing shareholders at the annual general meeting in London recently, Sir James Donald (chairman) said that the company, which was now in its jubilee year, had started with a nominal capital of £1 000 and was now worth nearly £5 000 000. It now had three generating stations with a capacity of 270 000 kW and an output of over 610 million kWh per annum. They had anticipated that a new power station at Cossipore would be in commission in the latter half of 1948, but this was not now expected until 1949. An extension at Mulajore would be in operation in 1949, but as regarded a proposed new station in the southern area, which should be in operation by 1952, matters were practically at a standstill as a result of the local government's power to take over the undertaking on January 1, 1950. The company had slowed down their schemes for e.h.t. distribution in that area, and had pointed out to the local government authorities in July last the necessity for this new station, and had asked them to state whether it was their intention to exercise the option of purchase. The government had also been requested to take over the construction of the station, in view of the company's inability to find the necessary finance. So far there had been no answer as to the government's intentions, but it was understood that in the local assembly it had been intimated that they would exercise their option and were examining the financial obligations.

LONDON ASSOCIATED ELECTRICITY UNDERTAKINGS, LTD.—Speaking at the annual general meeting, the Earl of Lytton (chairman) devoted a large part of his address to criticisms of the terms of the Electricity Bill. The result of the war, he pointed out, had been that the operating company's revenue and costs had been seriously affected, with the result that ordinary dividends during the years 1939 to 1944, were drastically reduced. The effect of this was to reduce the Stock Exchange value of the ordinary stock, and it was on this value that compensation was to be paid. It was particularly unfair that their company, which suffered more than any electricity supply undertaking during the war, should also be made to suffer more than any other by the provisions of the Bill as they stood at present. Representations, the Chairman declared, had been made to the Minister, and amendments had been submitted to the Standing Committee, but both had been without avail. He hoped to deal with the political aspects of the Electricity Bill when it came up before the House of Lords. Turning to the affairs of the operating company, Central London Electricity, Ltd., the Chairman stated that they had had a very successful year. The number of consumers now exceeded by 4 600 the number existing at the end of 1938, the previous highest year. Units sold exceeded 450 millions, an increase of 67½ millions over 1945 and 18 millions more than 1938.

Coming Events

Friday, June 6 (To-day)

I.E.E., TRANSMISSION SECTION.—At the Connaught Rooms. Section Dinner. *6 p.m.*

I.E.E., WESTERN CENTRE.—St. Austell. Commencement of Summer Meeting.

Monday, June 9

UNIVERSITY COLLEGE.—London. At the I.E.E. "The Presentation of Technical Information," the second in a series of lectures by Prof. R. O. Kapp. *5.30 p.m.*

Thursday, June 12

I.E.E., N. MIDLAND CENTRE.—Leeds. At the Sandmoor Golf Club. Golf Competition in aid of the I.E.E. Benevolent Fund.

Commercial Information

County Court Judgments

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

THAME, Vivian E. W., Kisani, Bracken Road, Maidenhead, electrician and plumber. £10 18s. 8d. March 11.

REID, Wm. Geo., Devon Radio Repair Depôt, Embankment Road, Plymouth, radio engineer. £13 16s. 10d. February 11.

WATSON, H. M. (male), 3, Portland Place East, Plymouth, wireless dealer. £26 4s. 3d. March 17.

STANSONS (a firm), 103, Wood Street, Walthamstow, electrical dealers. £20 9s.2d. March 26.

EDGCOMB, Alex. Ivor, 7c, Market Place, Margate, electrical engineer. £60 5s. 3d. March 26.

DICKENS, Stephen Walter, 48, Heather Park Drive, Wembley, electric cable maker. £21 5s. 1d. March 19.

FLINTHAM, Mr. G. R., 20, Melmont Circle, Harrow, electrical contractor. £33 2s. 9d. March 26.

GOOCH, Joseph Robert, 2, Magnolia Green, Shrublands Estate, Gorleston-on-Sea, electrician. £71 8s. 8d. March 21.

SCARFF, J. B. (male), Norwich House, High Street, Saxmundham, radio and electric engineer. £45 14s. 6d. March 15.

KENYON, Norman R. (trading as Joe Kenyon and Son), Lane End Works, Holmfirth, Yorks, heating, sanitary and electrical engineers. £18 14s. 3d. March 26.

VACTRO ELECTRIC (a firm), 9, Peel Street, Barnsley, radio dealers. £16 8s. 4d. March 20.

Mortgages and Charges

NOTE.—*The Companies Act of 1908 provides that every mortgage or charge shall be registered within 21 days after its creation, and that every company shall, in its annual summary, specify the total amount of debt due from it in respect of mortgages or charges. The following mortgages and charges have been registered. The total debt prior to the present creation, as shown in the annual summary, is given—marked with an *—followed by the date of the summary, but such total may have been reduced.*

F. T. LOVELL AND CO., LTD. Olney, electrical engrs.—Apr. 18, £300 deb., to G. Thorne, Bletchley; general charge.

MEADOWS RADIO SERVICE, LTD., Alton.—April 15, £500 deb., to Branch Nominees, Ltd.; general charge.

STERLING INDUSTRIES, LTD., London, W.—April 19, £4 000 deb., to T. W. Vernon, London, and another; charged on 237 and 239, Sydenham Road, land in Grenaby Avenue, with buildings thereon known as Exactor Works, and 12, Tavistock Green, all Croydon, and general charge (subject to etc.). *£7 500. January 13, 1947.

EASTWOOD RADIO, LTD., Southend-on-Sea.—April 16, mort., and charge, to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Eastwood House (formerly The Glen), Southchurch Avenue, Southend-on-Sea, with machinery, fixtures, etc., and general charge.

ARDOR INSULATION CO., LTD. (formerly ARDOR ENGINEERING CO., LTD.), London, W.C.—April 16, Land Registry charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on land at Belvedere, Crabtree Manor Way, Erith. *Nil. April 2, 1946.

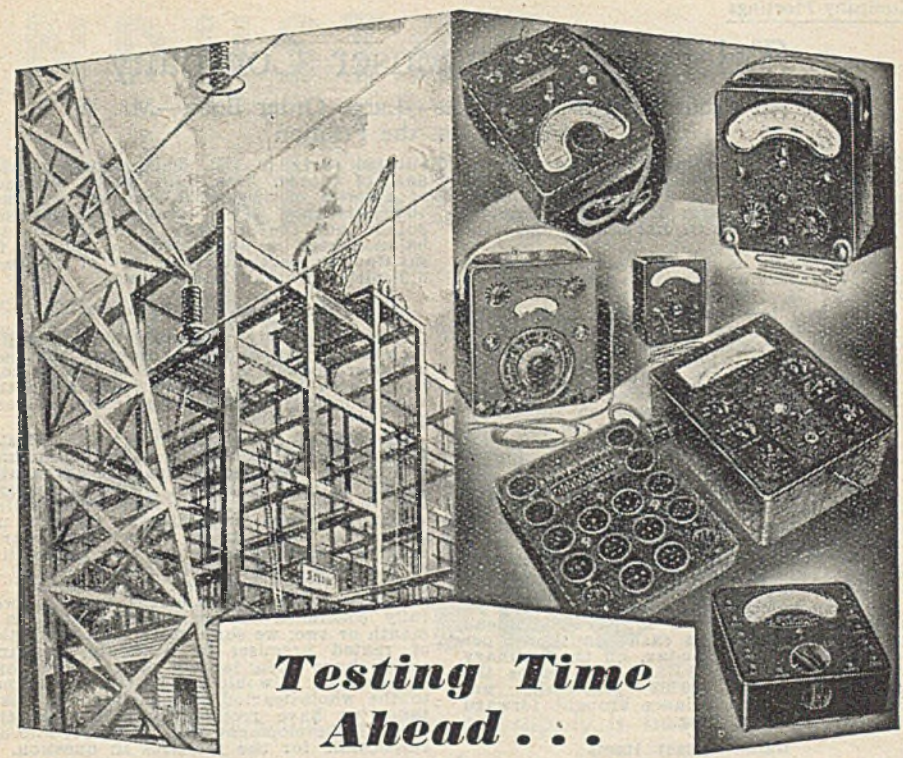
Receiving Orders

FARRINGTON, James A., trading as The Radio Services, at 8, Upton Lea Parade, Wexham Road, Slough, Bucks, and residing at 62, Lake Avenue, Slough. Radio dealer. Court—Windsor. Date of filing petition.—April 18, 1947. Date of receiving order—May 21, 1947.

Metal Prices

		Monday, Price	Inc.	June 2 Dec.
Copper—				
Best Selected (nom.)	per ton	£135 10 0	—	—
Electro Wire bars	„	£137 0 0	—	—
H.C. Wires, basis	„	£155 0 0	—	—
Sheet	„	£178 10 0	—	—
Bronze Electrical quality 1% *Tin*—				
Wire (Telephone) basis	per ton	£177 15 0	—	—
Brass (60/40)—				
Rod basis	„	1s. 2½d.	—	—
Wire	„	1s. 6½d.	—	—
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)	per ton	£8 19 0	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in.	„	£34 5 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in.	„	£21 15 0	—	—
Lead Pig—				
English	„	£91 10 0	—	—
Foreign and Colonial	„	£90 0 0	—	—
Tin—				
Ingot (minimum of 99.9% purity)	„	£440 10 0	—	—
Wire, basis	per lb.	5s. 6¾d.	—	—
Aluminium Ingots	per ton	£80 0 0	—	—
Spelter		£70 0 0	—	—
Mercury (spot)	per bott.	£17 3 6	—	—

Prices of galvanised steel wire and steel tape supplied by C.M.A. Other metal prices supplied by B.I. Callender's Cables, Ltd. The latter prices are nominal only, and do not include any allowances for tariff charges.



Testing Time Ahead . . .

RECONSTRUCTION, as we now know too well, means something other than enjoyment of the non-existent fruits of victory. The amenities of a world at well-earned peace are not for us until we have replaced the ravages of war with the necessities of life and the realities of universal peaceful intent for victors, victims and vanquished alike.

That is speaking collectively . . . For ourselves, we learned much and progressed far in the six years of ceaseless toil, urged on by dire necessity and peril. We are not resting now. We are still pressing on, pressing into the service of those engaged in rebuilding the body and soul of a whole world the knowledge gained, the advancements perfected, the skill and craftsmanship that outmatched the efforts of our enemies.

"Avo" Electrical Testing Instruments set a standard by which other instruments are judged,

THE UNIVERSAL AVOMETER
THE "AVO" ALL-WAVE OSCILLATOR
"AVO" VALVE TESTER
"AVO" TEST BRIDGE
UNIVERSAL AVOMINOR
THE D.C. AVOMINOR
"AVO" LIGHT METER
"AVO" EXPOSURE METER,
Etc. Etc,

Catalogues on application.

PRECISION ELECTRICAL MEASURING INSTRUMENTS

egd. Trade Mark.

Sole Proprietors and Manufacturers:
The AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT Co. Ltd.
Winder House, Douglas Street, London, S.W.1 'Phone : VICtoria 3404-9

Telegraph Condenser Company

Increased Profit Despite Difficulties—Large Order Book—Mr. W. H. McFadzean on the Position

The fourteenth ordinary general meeting of the Telegraph Condenser Company, Ltd., was held on May 29 at the offices of the company, Wales Farm Road, North Acton, London, W., Mr. W. H. McFadzean, C.A., the chairman, presiding.

The following is his statement circulated with the report and accounts for the year to December 31, 1946:—

Profit and loss account.—For each of the years 1942-45 it has been my pleasure to record an increase in output, but during 1946, for reasons which I will explain later, turnover decreased. The adverse effect of this was, however, more than offset by the lower E.P.T. requirements following on the reduction in the rate of E.P.T. from 100 per cent. to 60 per cent., and by a decrease in expenditure, leaving the profits £15 232 higher at £98 708.

After taking credit for sundry income and debiting depreciation and directors' fees, the net profit from the year is £84 495, which added to the balance brought forward gives a total available of £124 897. Provision for income-tax on the 1946 profits absorbs £43 000; preference dividends already paid £4 290; and it is now proposed to transfer £25 000 to general reserve and to pay a dividend of 10 per cent. and a cash bonus of 5 per cent., both less income-tax, on the ordinary capital, absorbing £12 375. This leaves the carry-forward of £40 232 practically unchanged from the balance brought forward from the previous year.

Balance-Sheet Items

The expenditure during the year of £8 524 on fixed assets compares with a depreciation provided of £12 281, leaving the book value on balance £3 757 lower. It is appropriate here to draw attention to the item of "E.P.T. Post-War Refund" shown on the other side of the balance-sheet; £48 131 has already been received under this head, and it is estimated that a further £13 584 is receivable, thus bringing our total E.P.T. post-war refund up to some £61 715. This must continue to be shown in our balance-sheet as a reserve, but the cash actually received can be utilised for certain specified purposes. It will interest shareholders to know that £15 550 of the cash received to date has been used to finance our expenditure on new plant, etc., both during the full year 1946 and for the previous nine months to December 31, 1945—the E.P.T. refund being available for its specified uses as from April 1, 1945. The substantial cash balance still unexpended will be used to finance other capital expenditure and developments which your board have already agreed.

Net current assets at £294 076 compare with £208 517 at December 31, 1945, an improvement of £85 559, largely due to the cash received from the "E.P.T. post-war refund" and still unexpended, and to the retention of profits in the business. This improvement is wholly reflected in the increased cash at bank and in hand, as the changes, following on the lower turnover, in the other main items—namely, in stocks and debtors on the one hand and creditors on the other—cancel each other out.

To sum up, the balance-sheet is now a strong one, the cash resources being adequate for immediate requirements and the reserves totalling some £206 000 as compared with some £25 000 when the board was reconstituted early in 1942. This strong position has, of course, been built up as a result of a series of successful trading years and the pursuance of a conservative dividend policy, but the present strength of the balance-sheet is undoubtedly a matter for satisfaction, particularly in view of the many difficulties of the present time.

Labour and Premises

I have already remarked when dealing with the profit and loss account that our turnover showed a decrease in 1946 as compared with 1945. The main reasons for this were shortages of female labour and of essential raw materials.

The first of these difficulties was and still is, a difficulty common to many companies, but in our case the position was aggravated by our having to give up, with a consequent loss of the local labour, certain premises which had been requisitioned for our use during the war. In my speech last year I told you that to overcome this latter difficulty, negotiations were then in hand to acquire further premises. I am pleased to advise you such negotiations were successfully concluded during 1946 and that in a month or two, we shall enter into occupation of rented premises in Bathgate, Scotland, which have been largely built to our own specification. I would like here to pay tribute to the whole-hearted co-operation and assistance we have received from the Scottish Council (Development and Industry), who are responsible for the premises in question.

The opening of the Bathgate factory, in addition to providing a desirable dispersal of our activities, should also help in overcoming our labour shortages and provide employment in a development area. We are also actively pursuing the mechanisation of many of our processes and have already achieved considerable success. Progress here must, however, be slow, as there is an inevitable time-lag between the birth of an idea and its translation into a complicated piece of machinery. And the men capable of such translation are, unfortunately, relatively few in number.

Shortage of Raw Materials

With regard to the second of our main difficulties, the shortage of essential raw materials, the position was bad enough in 1946, but has certainly become worse in 1947. When the recent fuel cuts were imposed, we managed by various means to maintain production at fairly satisfactory levels, but only as a result of depleting, and in some cases virtually exhausting our stocks. The replenishment of the latter is causing your board great concern, and for some important items we have had to place orders abroad at high and, indeed, almost uneconomic prices. The very considerable gap between available supplies of essential raw materials and the minimum requirements to permit of our factories operating on a really efficient basis is indeed the greatest difficulty of your board to-day, and no immediate relief of the position is as yet visible. Unfortunately, under existing conditions, it is not a problem which any individual company can of itself solve, and we are to a large degree dependent on Government action with all the elaborate and

slow procedure involved. Certain Government controls are undoubtedly still necessary, but I am convinced their operation could be considerably simplified while others could be abolished altogether, and thus business men be left to deal with business matters in a business-like way.

Our order book remains very large, but, until the raw material position is corrected, deliveries must of necessity in many cases be protracted. We are, however, doing our best to deal equitably with all our customers, while at the same time making our contribution to the export drive, the success of which is so vital to the future of this country. In this latter connection several of your directors have been abroad during the last year and have made valuable personal contacts with overseas buyers.

Tribute to Executive and Staff

Your board are confident all shareholders would wish to join with them in expressing thanks to our executive directors—Mr. P. A. Sporing and Mr. W. F. Taylor—and to all our personnel for the satisfactory results achieved during 1946 in spite of many difficulties. A tremendous amount of work has been entailed, but it has been undertaken willingly and with that spirit of co-operation which is so essential to the success of all concerned in an industrial undertaking such as T.C.C.

The report and accounts were adopted; the proposed dividend and bonus were approved; the retiring directors, Mr. W. H. McFadzean and Mr. P. A. Sporing, were re-elected and the auditors, Messrs. Chalmers Wade and Co., reappointed.

London Associated Electricity

Lord Lytton on Nationalisation Proposals

The ordinary general meeting of London Associated Electricity Undertakings, Limited, was held on May 28 in London.

The Rt. Hon. Earl of Lytton, K.G., P.C., G.C.S.I., G.C.I.E. (chairman), presided, and, dealing with the Electricity Bill, said: As the Bill is at present drafted, British electricity stock is to be issued in place of the debenture stock of Central London Electricity and the preference and ordinary stocks of this company, based on the respective highest Stock Exchange prices prevailing on certain days from February to July, 1945, and November, 1946. In theory this is a just and reasonable proposal, since Stock Exchange prices may be said to represent the value of the stock as between a willing seller and a willing buyer. In practice it is not so in the case of the ordinary stock of your company.

As you know so well, the war seriously affected your operating company's revenues and costs, with the result that ordinary dividends of that company during the years 1939 to 1944 were drastically reduced, and the small dividends paid by it could be met only by drawing on the reserves created out of the stockholders' benefits earned but not paid in pre-war years. As a result, the dividends paid on the ordinary stock of this company were also considerably reduced and were made possible only by drawing on the stockholders' reserve account which was similarly accumulated in pre-war years.

Compensation Terms

The effect of this, of course, was to reduce the Stock Exchange value of the ordinary stock for the time being, and it is on that value that compensation is to be paid. In other words, the ordinary members are having to lose twice over as a result of the war—once in the form of income and again when they receive compensation in the form of capital.

The average prices ruling for the stocks of your company on the dates selected—namely, November 1, 4, 5, 6, 7, and 8, 1946—were as follows:—

C.L.E. Limited 3½ per cent. debenture stock	101½
L.A.E.U. Limited 4½ per cent. preference stock	25s. 11d.
L.A.E.U. Limited 6 per cent. preference stock	28s. 7d.
L.A.E.U. Limited ordinary stock ...	29s. 6d.

In the case of the ordinary stock of your company the reduction in income will amount to 38½ per cent. based on the current dividend of 6 per cent.

That is not the only hardship inflicted upon the holders of the ordinary stock. They are also penalised in respect of the dividend which may be paid for the year 1946 and for the subsequent period up to the vesting date.

Dividend Proposals

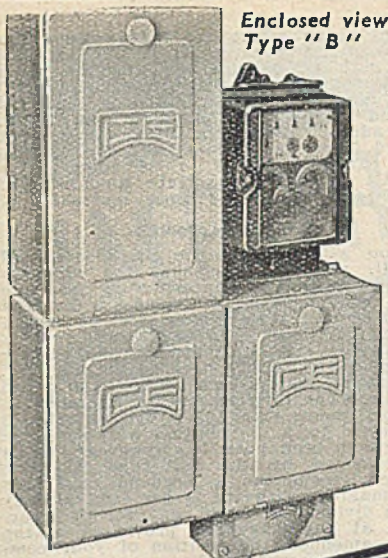
As I have already mentioned, the profits during the war did not permit the payment by Central London Electricity to your company of the standard dividend until 1945. In respect of that year your company did receive the full standard dividend of 7 per cent. from Central London Electricity, but as the stockholders' reserve, which is used for the equalisation of dividends, had been severely depleted it was thought provident to restrict the ordinary dividend to 6 per cent. and to add the remaining 1 per cent. to that reserve.

If we had known then that the Government would so soon not only make a proportionate reduction of the earning value of your capital but take the whole of your reserve fund and standardise your dividend till the vesting date at the 1945 figure, we should have acted differently. You would have received your full 7 per cent. then and you would be receiving it again now for 1946.

It is argued, I know, that the existence of the stockholders' reserve fund is represented in the market price of your stock, which is the basis of the compensation proposed in the Bill, and that therefore there is no injustice in transferring that fund, together with all the other assets of the company, to the new British electricity authority. But, as I have explained, in the case of your particular company the injustice consists in the fact that the years chosen to determine the market value of your stock are those in which the effect of war losses was still being felt, while time for the complete post-war recovery to take effect is not allowed.

I realise that it is difficult for those responsible for the drafting of Bills of this nature to know the circumstances of all the undertakings which will be affected, and, indeed, it may not be possible to provide for every case. But it is particularly unfair that your company, which suffered more damage than any other electricity supply company in the war, should also be made to suffer more than any other by the provisions of the Government Bill as they stand at present.

Representations on behalf of all the London companies have been made to the Minister, drawing his attention to their special position under the London Electricity Acts of 1925, and amendments have been submitted to the Standing Committee which were designed to maintain the *status quo* up to the vesting



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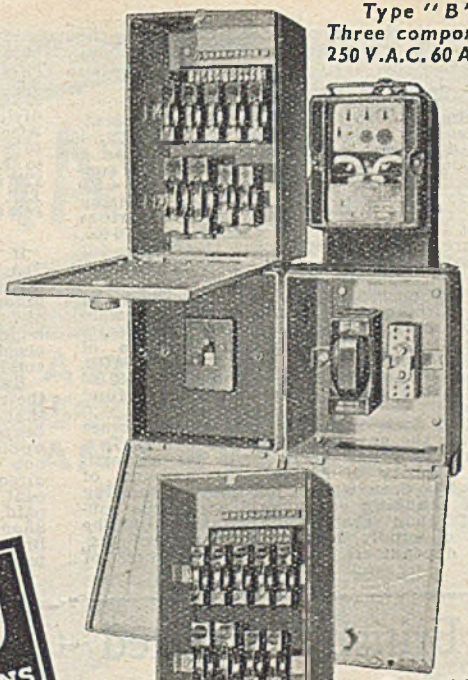

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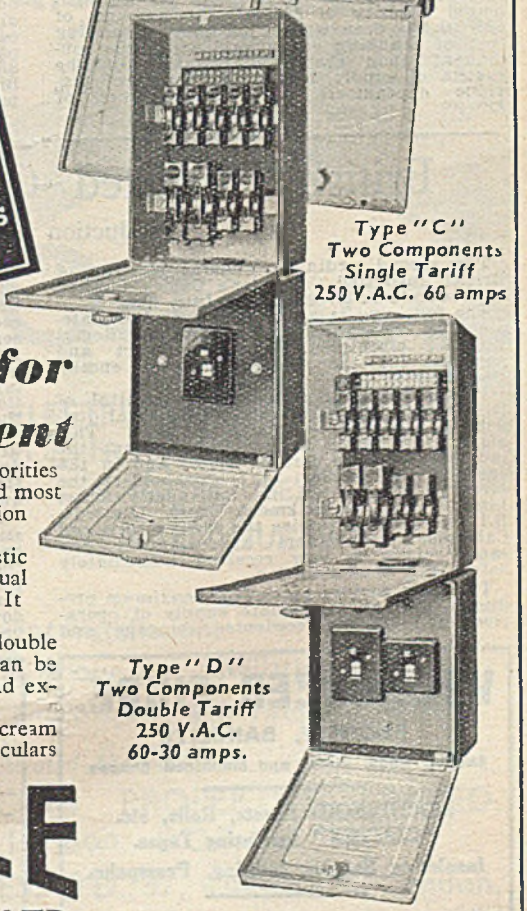

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date, but both our representations and the amendments proposed have been without avail.

Operating Company's Results

Turning now to the affairs of your operating company, Central London Electricity, I am glad to be able to report that it had a very successful year. The number of consumers increased during the year by 6 800 and now exceeds by 4 600 the number existing at the end of 1938, which was the previous highest figure. Units sold exceeded 450 000 000, an increase of 67 750 000 over the figure for 1945 and 18 000 000 more than were sold in 1938.

Cost of current purchased declined by £22 000, although the units purchased were 75 000 000 more. Distribution and other costs increased by £121 000 and the balance of revenue account was higher by £394 000. Sinking fund charges were lower by £160 000 owing to the expiry of certain sinking fund periods.

For the first time the company becomes liable for the payment of Excess Profits Tax, and provision has been made for an estimated liability of £250 000. An amount of £264 000 has been written off the outstanding cost of changing consumers' apparatus consequent upon the standardisation of the system of supply, leaving a balance of previous expenditure still to be met of £100 000.

After giving effect to these items the balance of net revenue was £587 000, as compared with £423 000 for the previous year. The payment of preference dividends absorbed £75 000, and the payment of the standard dividend to your company a further £327 000. After adding to the sum of £23 000 brought forward from the previous year, the balance to be carried forward to 1947 amounts to £208 000. Capital expenditure amounted to £331 000 and liquid resources increased by £480 000.

L.A.E.U. Accounts

If you will now turn to the accounts of L.A.E.U. you will see that the company received dividends of approximately the same amount as for 1945. This includes a dividend of 7 per cent. on the ordinary stock of Central London Electricity. The small difference is accounted for by the acquisition of a further small amount of C.L.E. stock during the year.

Had your directors been permitted to retain their discretion to recommend to the meeting that the pre-war standard of dividend should be reverted to, a distribution of 7 per cent. would have been possible. However, this is not permitted by the Bill, and so your directors recommend a dividend of 3½ per cent., making, with the 2½ per cent. already paid, a dividend of 6 per cent. for the year. Should at any stage the provisions of the Bill be amended, the position of your company can be reconsidered.

The report and accounts were adopted.

British Insulated Callender's Cables

Production Difficulties

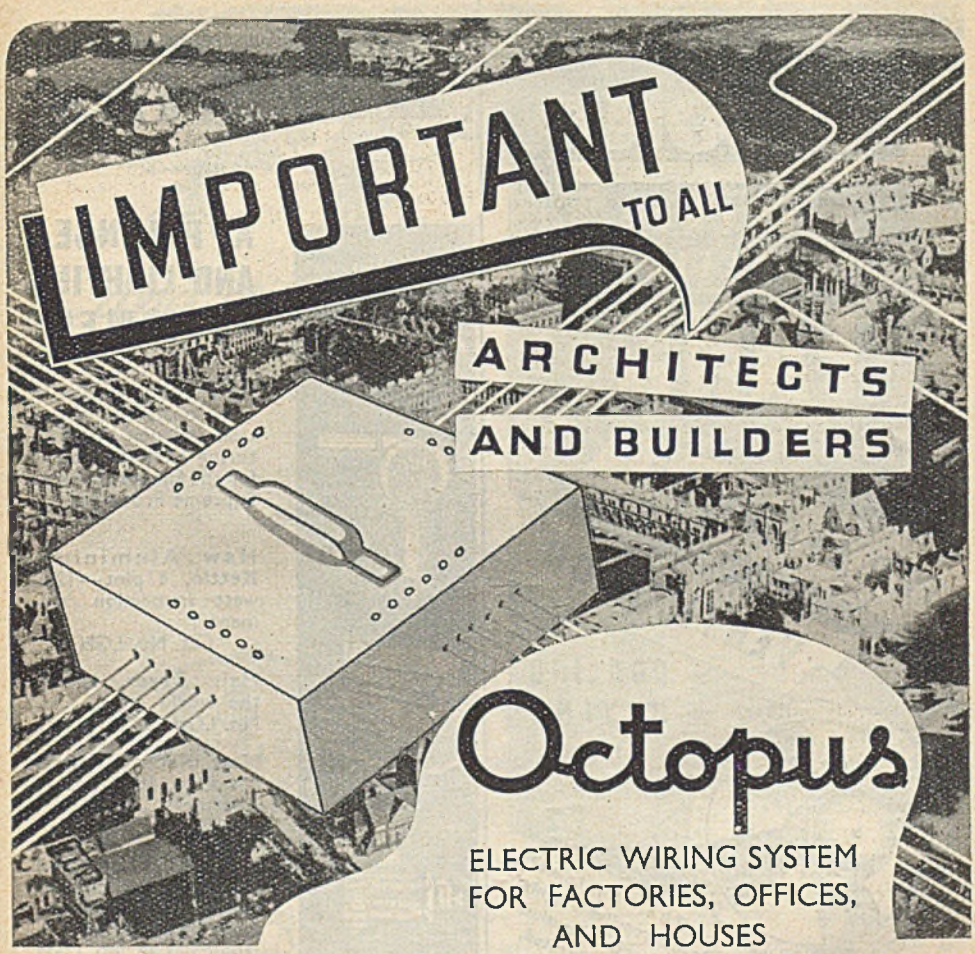
The second ordinary general meeting of British Insulated Callender's Cables Limited will be held in Liverpool on June 12.

The following is an extract from the statement by the chairman, Sir Alexander Roger, K.C.I.E., circulated with the report and accounts for the eighteen months ending December 31, 1946:—

The dividend on the ordinary capital of 10 per cent. is equivalent to an annual dividend of six and two-thirds per cent. This means that after taking into account the increase made in issued capital and in the case of the former "C" stockholders the scrip they received in Callender's Trust Limited—now Embankment Trust, Limited—B.I. stockholders receive the same return and Callender stockholders approximately the same return as they received immediately before the amalgamation.

The main factors preventing maximum production are an inadequate supply of operatives and an unprecedented shortage and irregular flow of raw materials and component parts. The labour difficulty has simply arisen from the demand considerably exceeding the supply and, although a very serious matter, has been less devastating in its effect than the difficulty of raw materials and component parts which, in my view, is the main bottleneck in the situation. I would again urgently suggest that the Government pause in their doctrinaire policies and instead guide and sympathetically help all industry to maximum production in the ways which industries understand and which in the past have, beyond question, proved successful.

I realise and admit that some controls are still necessary in these unbalanced times, but I plead for a substantial reduction of their number and the simplification and improvement of efficiency of those retained. Business must be speeded up and not slowed down and more and more autonomy must be given to industry, not less.



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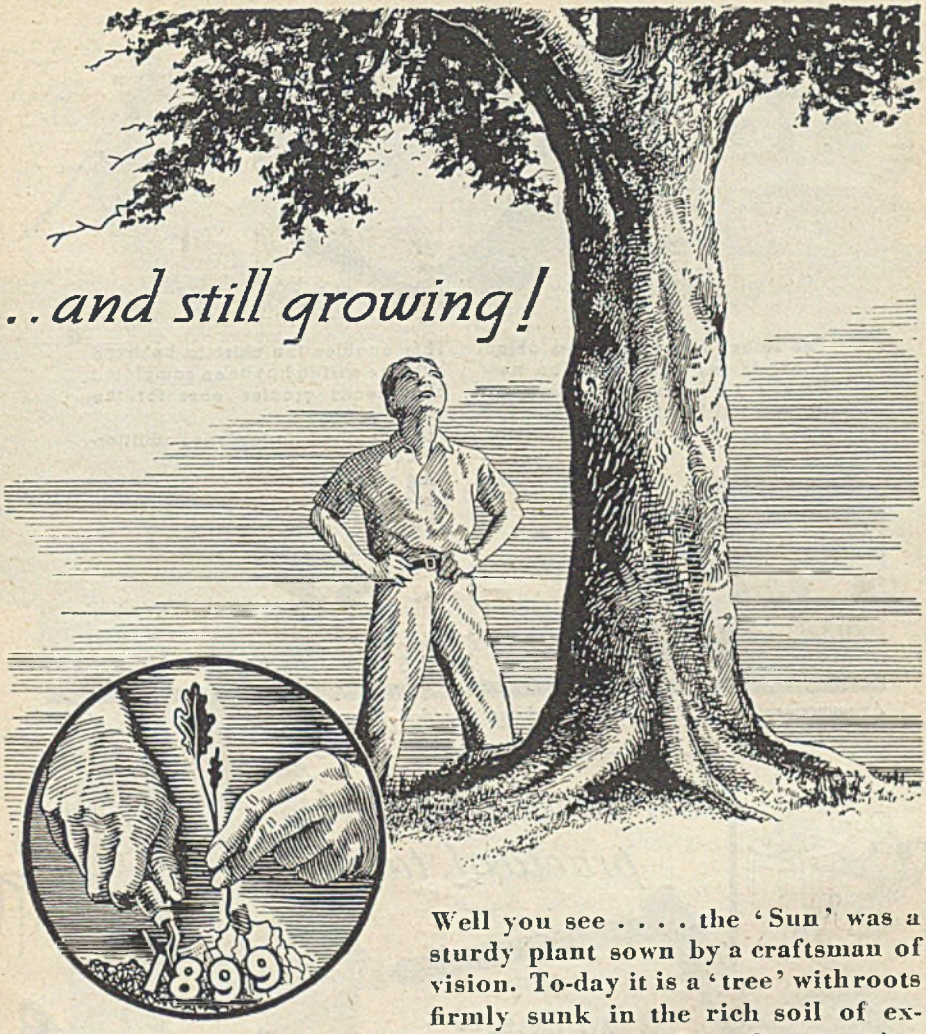

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